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Standardized Bycatch Reporting Methodology 3-year Review Report – 2018

Reviewing SBRM Years 2015, 2016, and 2017

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
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Reviewing SBRM Years 2015, 2016, and 2017

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Editorial Notes

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LIST OF ACRONYMS AND ABBREVIATIONS

AA = access area
ABC = acceptable biological catch
ACCSP = Atlantic Coastal Cooperative Statistics Program
ACE = annual catch entitlements
ACL = annual catch limit
ASM = at-sea Monitoring
ASMFC = Atlantic States Marine Fisheries Commission
CV = coefficient of variation
d/k = discard/kept
ESA= Endangered Species Act
FMAT = Fishery Management Action Team
FMP = fishery management plan
GARFO = Greater Atlantic Regional Fisheries Office
GEN = general
GB = Georges Bank
IFM = industry-funded monitoring
IFS = industry-funded scallop
ITS = incidental take statement
LIM = limited
MA = Mid-Atlantic
MAFMC = Mid-Atlantic Fishery Management Council
MPC = minimum pilot coverage
MSA= Magnuson-Stevens Act
NE = New England
NEFMC = New England Fishery Management Council
NEFOP = Northeast Fisheries Observer Program
NEFSC = Northeast Fisheries Science Center
NOAA = National Oceanic and Atmospheric Administration
NYSDEC=New York State Department of Environmental Conservation
NMFS = National Marine Fisheries Service
OB = observer
OFL = overfishing limit
PTNS = Pre-Trip Notification System
RPA = reasonable and prudent alternatives
SBRM = Standardized Bycatch Reporting Methodology
TAC = total allowable catch
TED = turtle excluder device
TDD = turtle deflector dredges
US = United States
VTR = Vessel Trip Report

LIST OF PREPARERS

This document was prepared by a technical team, referred to as a Plan Development Team (PDT) by the New England Fishery Management Council (NEFMC) or a Fishery Management Action Team (FMAT) by the Mid-Atlantic Fishery Management Council (MAFMC). The team had representatives from the NEFMC, MAFMC, National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC), and NMFS Greater Atlantic Regional Fisheries Office (GARFO). Fiona Hogan and Jason Didden were the co-chairs of the team.

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EXECUTIVE SUMMARY

The Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment to the fishery management plans (FMPs) of the Greater Atlantic Region was implemented in February 2008 to address the requirements of the Magnuson-Stevens Fishery Conservation and Management Act to include standardized bycatch reporting methodology in all FMPs of the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC). In response to a remand by the US Court of Appeals for the District of Columbia concerning observer coverage levels specified by the SBRM, an SBRM Omnibus Amendment was implemented in 2015.

The SBRM can be viewed as the combination of sampling design, data collection procedures, and analyses used to estimate bycatch and allocate observer coverage in multiple fisheries. The SBRM also provides a structured approach for evaluating the efficacy of the allocation of observer coverage (sea days) to multiple fisheries to monitor a large number of species under the 13 different NEFMC and MAFMC fishery management plans and the Endangered Species Act. The SBRM is not intended to be the definitive document on estimation methods nor is it a compendium of discard rates and total discards. Instead, the SBRM is intended to support the application of multiple bycatch estimation methods that can be used in specific stock assessments. The SBRM provides a general structure for defining fisheries into homogeneous groups and allocating/re-allocating observer coverage based on prior information and the expected improvement in overall performance of the program. The general structure helps identify gaps in existing coverage, similarities among species groups that allow for realistic imputation, and the tradeoffs associated with coverage levels for different species. The SBRM allows for continuous improvement in allocation as new information on the results of the previous year's data is obtained, and it requires an annual report on discards occurring in Greater Atlantic Region fisheries to be prepared by National Marine Fisheries Service (NMFS) and provided to the Councils. Annual reports have been completed every year since 2009, including 2012-2014 when there were no SBRM regulations in place.

The SBRM also requires that every 3 years, the Regional Administrator of the Greater Atlantic Regional Fisheries Office (GARFO) and the Science and Research Director of the Northeast Fisheries Science Center (NEFSC) would appoint appropriate staff to work with staff appointed by the executive directors of the councils to obtain and review available data on discards and to prepare a report assessing the effectiveness of the SBRM. This report should include:

(1) a review of the recent levels of observer coverage in each applicable fishing mode;
(2) a review of recent observed encounters with each species in each fishery (or by gear type for turtles) and a summary of observed discards by weight;
(3) a review of the coefficient of variation (CV) of the discard information collected for each fishery;
(4) a review of recent estimates of the total amount of discards associated with each fishing mode (these estimates may differ from estimates generated and used in stock assessments, as different methods and stratification may be used in each case);
(5) an evaluation of the effectiveness of the SBRM at meeting the performance standard for each fishery;
(6) a description of the methods used to calculate the reported CVs and to determine observer coverage levels, if the methods used are different from those described and evaluated in this amendment;

(7) an updated assessment of potential sources of bias in the sampling program and analyses of accuracy;
(8) an evaluation of the implications of the discard information collected under the SBRM if a fishery did not achieve its performance standard;
(9) Council review for consistency with national guidance.

During the July 2013 through June 2016 time period, the Northeast Fisheries Science Center's Fisheries Sampling Branch managed 3 observer programs: the Northeast Fisheries Observer Program (NEFOP), the Industry-funded Scallop Program (IFS), and the At-sea Monitoring Program (ASM) for New England groundfish. A total of 57 unique fleets (which are region, gear type, mesh group, access area, and trips category combinations) have been reported in the 3 annual SBRM analyses (2015 SBRM, 2016 SBRM, and 2017 SBRM). It is possible for a trip to be partitioned into multiple fleets if 2 or more gear types or mesh groups are used during a trip. The result of this partitioning may inflate the number of trips and sea days in each data set. The numbers of unique observed trips, before applying the stratification and conditioning the data set for analysis, were 3,508, 4,023, and 3,802 in SBRM 2015, SBRM 2016, and SBRM 2017 , respectively. The numbers of unique NEFOP sea days were 10,800, 11,726, and 10,500 in SBRM 2015, SBRM 2016, and SBRM 2017, respectively.

In terms of numbers of trips, the percentages of observed trips varied by fleet and ranged from 0.1 to 24%, excluding 2 fleets for which 100% observer coverage was a requirement (New England [NE] small mesh haddock separate trawl and New England Access Area midwater trawl). Over all fleets, the percentage of observed trips ranged from 4.4% to 5.5% annually. The percentage of observed sea days were generally similar and ranged from 7.4% to 8.5%. The observer coverage is higher for sea days than for trips because of the longer mean trip length and relatively higher coverage rates in some fleets.

The majority of fleets have less than 10% observer coverage of trips, sea days, or landings. It should be noted that percent coverage is only one measure for monitoring and that precision of the discard estimates is the specified metric for monitoring adequacy within SBRM.

Observers recorded 329 unique species by weight and 47 species by numbers over the 3-year period from July 2013 to June 2016. The 14 SBRM species groups represent approximately 90% of the total weight of all species recorded by observers. Observers recorded a total of 72 loggerheads (*Caretta caretta*), 11 Kemp's ridley (*Lepidochelys kempii*), 2 leatherback (*Dermochelys coriacea*), 3 green (*Chelonia mydas*), and 8 unknown species of sea turtle from July 2013 to June 2016.

For fish and invertebrate species groups, a combined d/k ratio estimator was used to estimate total annual discards and precision where d = discard pounds of a given species and k = kept pounds of all species in the observer data. The Vessel Trip Report (VTR) landings of all species combined, corresponding to each fleet and SBRM year, were used to expand the discard rate to estimate total discard weight of each SBRM species/species group, fleet, and SBRM year. 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 by 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. Since some sources of error are not encompassed in the CV calculations (e.g., from subsampling of large catches or relying on the captain's estimate

of a haul weight), the estimated CVs are somewhat better (i.e., lower) than the actual precision of estimates.

An importance filter is used to provide a standardized protocol to further refine the number of baseline sea days based on 2 criteria: (a) the importance of the discarded species relative to the total amount of discards by a fleet, and (b) the total fishing mortality from discards. The baseline sea days were filtered with a 95% cut-point in the discard filter and a 98% cut-point for the total mortality from discards filter. To determine the number of sea days (referred to as "SBRM standard sea days" or "SBRM sea days needed") and trips needed to achieve a 30% CV for all species groups within a fleet, the maximum number of sea days for the 14 species groups was used. 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 minimum pilot coverage (3 trips per quarter for each quarter that has industry activity) to maintain some monitoring coverage for that fleet.

Typically, the NEFSC pools data over a 5-year time series and across multiple fishing fleets within the same gear type to estimate turtle bycatch[1]. Estimates generally encompass only the Mid-Atlantic or southern New England regions, where estimated bycatch has occurred. Different approaches have been used to estimate sea turtle bycatch in Mid-Atlantic gear types. In the most recent sink gillnet analysis, a stratified ratio estimator (the ratio of observed turtle bycatch per unit fishing effort) was multiplied by total fishing effort to estimate total bycatch. For otter trawl and scallop dredge gears, a nonlinear regression model was used to estimate bycatch rates as a function of covariates pertaining to gear or environmental characteristics, and then this model was fit to commercial data. The CVs from these analyses are used to estimate the number of sea days needed in sink gillnet and bottom otter trawl (including scallop trawl) gears to achieve a 30% CV goal in future years. These estimated sea days remain in place each year until new bycatch estimates are published (currently, every 5 years). For dredge gear, sea day projections had been derived from CVs around estimated loggerhead bycatch; however, after 2015 sea day needs for turtles on vessels using scallop dredge gear have not been estimated because the utility of observers as a monitoring tool for turtles in the fishery appears to be decreasing.

For the 14 SBRM fish/invertebrate species groups in the 3 SBRM years, 35 of the 42 precision estimates (83%) were less than or equal to 30% CV. Of the 7 species groups in the 3 SBRM years with precision estimates greater than 30% CV, 5 species groups had discards associated with fleets that were filtered out by the importance filter, indicating that discards were a minor component of the total catch of these species groups. The 30% precision standard for estimates of loggerhead fishery interactions was met for Mid-Atlantic sink gillnet fleets and for Mid-Atlantic bottom otter trawl and scallop trawl fleets. The 30% precision standard was not met for estimates of loggerhead interactions in scallop dredge gear nor for Kemp's ridley (49% CV) or leatherback turtles (71% CV) in sink gillnet gear.

The numbers of accomplished sea days were near to the funded days for numerous fleets. For industry-funded scallop fleets, there were more sea days accomplished than allocated via the SBRM. Over all IFS fleets, there were roughly 450 - 1,000 additional accomplished sea days each year above those allocated. This target was due to a regulation change in 2015 that made it difficult to predict how many trips the fleet would be taking in the upcoming year, and thus how many sea days would be needed to cover the fleet at a target percent coverage. For a few agency-funded fleets, there were substantial numbers of unaccomplished sea days, primarily in the Mid-Atlantic otter trawl and gillnet fleets. Over all agency-funded fleets, there were roughly 3,400, 4,300, and

[1] Throughout this document, turtle "bycatch" refers to any kind of interaction between the fishing gear and the turtle, as opposed to only those animals that are landed on the vessel and discarded.

2,702 sea days that were not accomplished in 2015, 2016, and 2017 respectively. The unaccomplished sea days were carried over to the following year. It is notable that the carryover days from 2015 represented approximately 39% of the required days for agency-funded fleets in 2016, 47% in 2017, and 39% in 2018. The SBRM is designed to accommodate funding shortfalls via the prioritization process; hence, there is no reliance on unaccomplished days as a means to fund the required days in the following year.

The SBRM discard estimation analysis uses a broad stratification (region, gear type, mesh group, access area, and trip category) to encompass all federally managed species considered in the SBRM, and it also uses a combined ratio method (discard-to-kept of all species weight ratio). The discard estimates reported here may not necessarily correspond directly to the discard estimates derived for individual stock assessments because of the differences in stratification and data. It is expected, however, that estimates would be in the same order of magnitude. The SBRM discard estimates are not definitive estimates but are indicative of where discarding is occurring among commercial fleets. No survival ratios were applied to the discard estimates; SBRM does not account for the potential survival of organisms returned to the water.

There was no evidence of systematic vessel selection bias. Observed trips generally occurred over the range of number of trips made by vessels within a fleet and SBRM year, with no obvious over or under sampling of few or many trips per vessel. Of the fleets with evidence of vessel selection bias, generally no pattern among fleets stands out; however, evidence of vessel selection bias was present in some gillnet fleets examined.

Similarly, there was no evidence of strong, systematic bias in the mean trip length and mean kept weight of all species of observed and unobserved trips. The differences in mean for trip duration ranged from -1.75 to 0.74 days. Of the 53 fleets examined, 41 fleets (77%) had differences of means less than zero, indicating that observed trips were slightly longer in duration than unobserved trips. However, these differences were generally less than half a day (0.5 days) with only 5 fleets (SBRM year and fleet combinations) greater than a day (the unit of measure of the metric examined).

The differences in mean kept weight of all species ranged from -86,568 to 14,749 pounds. Of the 53 fleets examined, 45 fleets (85%) had differences in means less than zero, indicating the kept weight of all species was greater on observed trips than unobserved trips. For the majority of fleets (75%), the absolute differences in means was less than 25% of the unobserved kept weight.

The precision of discard estimates could impact management, but there is no indication that current levels of precision (even those above 30% CV) are currently causing management difficulties. The SBRM 3-year reviews will continue to look for management problems caused by imprecise discard estimates.

This review did not find any aspect of the SBRM that is inconsistent with the national guidelines specified at 50 CFR Part 600.1610, and no deficiencies were identified that would require an amendment to an FMP to meet these requirements. This report is provided to NMFS for its consideration in making a formal determination in this regard. If, based on the information contained in this report along with other available information, NMFS concludes the Greater Atlantic SBRM is consistent with the national guidance, no additional council action would be required. Any future modifications to the SBRM (e.g., to improve performance or efficiency) would be reviewed for continued consistency with all legal requirements, including the national SBRM guidelines.

BACKGROUND

The Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment to the fishery management plans (FMPs) of the Greater Atlantic Region (NEFMC 2007; NMFS 2008) was implemented in February 2008 to address the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to include standardized bycatch reporting methodology in all FMPs of the New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC). In response to a remand by the US Court of Appeals for the District of Columbia concerning observer coverage levels specified by the SBRM (NMFS 2011), a SBRM Omnibus Amendment was implemented in 2015 (NEFMC, MAFMC, and NMFS 2015).

The SBRM established in the 2015 amendment comprised 7 elements:

(1) The methods by which data and information on discards are collected and obtained;
(2) the methods by which the data obtained through the mechanisms identified in element 1 are analyzed and utilized to determine the appropriate allocation of at-sea observers;
(3) a performance measure by which the effectiveness of the SBRM can be measured, tracked, and utilized to effectively allocate the appropriate number of observer sea days;
(4) a process to provide the councils with periodic reports on discards occurring in fisheries they manage and on the effectiveness of the SBRM;
(5) a measure to enable the councils to make changes to the SBRM through framework adjustments and/or annual specification packages rather than full FMP amendments;
(6) a description of sources of available funding for at-sea observers and a formulaic process for prioritizing at-sea observer coverage allocations to match available funding; and
(7) measures to implement consistent, cross-cutting observer service provider approval and certification procedures and to enable the councils to implement either a requirement for industry-funded observers or an observer set-aside program through a framework adjustment rather than an FMP amendment.

The SBRM can be viewed as the combination of sampling design, data collection procedures, and analyses used to estimate bycatch and allocate observer coverage in multiple fisheries. The SBRM provides a structured approach for evaluating the efficacy of the allocation of observer coverage (sea days) to multiple fisheries in order to monitor a large number of species under both the 13 different fishery management plans and the Endangered Species Act. The SBRM is not intended to be the definitive document on the discard estimation methods, nor is it a compendium of discard rates and total discards (Wigley et al. 2007). Instead, the SBRM is intended to support the application of multiple bycatch estimation methods that can be used in specific stock assessments. The SBRM provides a general structure for defining fisheries into homogeneous groups and allocating observer coverage based on prior information and the expected improvement in overall performance of the program. The general structure helps identify gaps in existing coverage, similarities among species groups that allow for realistic imputation, and the tradeoffs associated with coverage levels for different species. The SBRM allows for continuous improvement in allocation as new information on the results of the previous year's data are obtained.

The amendment requires an annual report on discards occurring in Greater Atlantic Region fisheries to be prepared by National Marine Fisheries Service (NMFS) and provided to the

councils. Annual reports have been completed every year since 2009, including 2012-2014 when there were no SBRM regulations in place. The SBRM reports for 2013 onward are available at the Northeast Fisheries Science Center's (NEFSC) Northeast Fisheries Observer Program's (NEFOP) SBRM webpage. Once a year, the NEFSC Science and Research Director presents a report on catch and discards occurring in Greater Atlantic Region fisheries, as reported by at-sea fisheries observers, to the councils. This annual discard report includes summaries of the trips observed and fishing modes in the relevant time period, funding issues and other related issues and developments, and projections of coverage across fisheries for the upcoming time period. The annual report contains more detailed information regarding: the number of observer trips and sea days scheduled that were accomplished for each fishing mode and quarter, 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 group by fishing mode, and the relationship between sample size and precision for relevant fishing.

To utilize the most recent available data, the annual SBRM analyses use data collected during a 12-month period from July through June. Generally, observer data are audited and available for analysis 90 days after collection; hence, these data are ready to be analyzed beginning in October. From October to January, annual analyses are performed; these include: (1) summarizing the observer data for the Annual Discard Report, (2) updating the sea day analysis to derive SBRM standard sea days (the sea days needed to achieve a 30% coefficient of variation (CV), and (3) prioritizing sea days based on a budget. The SBRM Annual Discard Report with Observer Sea Day Allocation documents are posted online and presented to the councils. The NEFOP budget funds a 12-month period ranging from April through March. The SBRM annual documents are available the SBRM webpage. Figure 1 provides timelines for 2015, 2016, and 2017 SBRM (with 2015 SBRM highlighted) showing the time frame of the data used, when the analysis was conducted, and the time frame of the subsequent sea day schedule.

For estimating turtle discards, data for a particular gear type are pooled over a 5-year period, and estimates are updated every 5 years. The time series for the most recent turtle bycatch estimates are outlined in Table 1.

The SBRM also requires that every 3 years, the Regional Administrator of GARFO and the Science and Research Director of NEFSC would appoint appropriate staff to work with staff appointed by the executive directors of the Councils to obtain and review available data on discards and to prepare a report (i.e., this report) assessing the effectiveness of the SBRM. The following elements are specified in the SBRM Amendment:

(1) A review of the recent levels of observer coverage in each applicable fishing mode;
(2) a review of recent observed encounters with each species in each fishery (or by gear type for turtles), and a summary of observed discards by weight;
(3) a review of the CV of the discard information collected for each fishery;
(4) a review of recent estimates of the total amount of discards associated with each fishing mode (these estimates may differ from estimates generated and used in stock assessments, as different methods and stratification may be used in each case);
(5) an evaluation of the effectiveness of the SBRM at meeting the performance standard for each fishery;
(6) a description of the methods used to calculate the reported CVs and to determine observer coverage levels, if the methods used are different from those described and evaluated in this amendment;

(7) an updated assessment of potential sources of bias in the sampling program and analyses of accuracy; and
(8) an evaluation of the implications of the discard information collected under the SBRM if a fishery did not achieve its performance standard.

The first 3-year review was conducted in 2011-2012 and summarized data from 2009 – 2011 (Wigley et al. 2011 [Part 1], Wigley et al. 2012 [Part 2]). A 3-year review was not conducted for years 2012 – 2014 because SBRM regulations were not in place for those years.

Since the implementation of SBRM, several other management actions have been implemented that modify existing Industry-funded Scallop (IFS) and At-sea Monitoring (ASM) programs and implement additional monitoring programs, e.g., Industry-funded Monitoring (IFM; Table 2).

INTRODUCTION

This document represents the entirety of the 2017 SBRM 3-year Review Report and reviews the annual information presented in SBRM 2015, 2016, and 2017 with regard to the recent levels of observer coverage and observed encounters with species. This report also summarizes estimates of total discards and their associated precision for SBRM species groups and the individual species composing these groups, by fleet and SBRM year, and addresses the 8 elements specified in the SBRM Omnibus Amendment. Additionally, this report contains a review for consistency with national guidance on SBRM.

The review comprises 10 sections, which cover the following topics:

Observer Coverage
Observed Encounters
Discard Estimation, Precision, and Sample Size
Discard Reasons
Effectiveness of SBRM
Refinements to SBRM Methods
Potential Sources of Bias and Accuracy Analyses
Implications for Management
Review for Consistency with National Guidance
Recommendations and Conclusions

This review utilizes the stratification and methods described in the initial SBRM analysis (Wigley et al. 2007) with respect to fish, and summarizes the data reported in SBRM annual reports for 2015, 2016, and 2017 (Wigley et al. 2015, 2016; Wigley and Tholke 2017). These data were collected from July 2013 through June 2016 for 57 fleets and 14 species groups and for the individual species that compose these groups (subsequently referred to as "species/species groups") to encompass all federal FMP managed species in the Greater Atlantic Region. Row numbers have been assigned to each unique fleet. A list of fleet abbreviations is given in Table 3 and Appendix Table 1, and a list of fish/invertebrate species is given in Table 4. Summaries of turtle discards in the SBRM annual reports may have been derived from earlier years, depending on the gear type.

For fish, we use the term "bycatch" synonymously with "discard." In basic terms, bycatch is defined as living organisms that are captured by fishing gear and returned to the water. This

usage is consistent with the definition provided in the MSA where the term "bycatch" means fish which are harvested in a fishery but which are not sold or kept for personal use and includes economic discards and regulatory discards. Bycatch as used by the MSA does not include fish released alive under a recreational catch and release fishery management program (NMFS 2007). We do not define bycatch as the capture and retention of nontarget species, nor do we account for potential survival of organisms returned to the water. Most importantly, we do not base any of our analyses on the potential mortality associated with unobserved encounters with fishing gear. Our omission of these mortality sources does not confirm or deny their potential importance. Rather it explicitly recognizes that such events cannot be observed even when an observer is present on a given trip. Therefore, when using a design-based estimator, there is no basis for extrapolation of unobserved encounters to unobserved sampling units (i.e., trips). Other sources of information (e.g., tagging studies, net pen experiments) can be used to inform consideration of discard mortality.

For turtles, we are using the term “bycatch” synonymously with the Endangered Species Act (ESA) definition of “takes”[2]. Some model-based estimates of loggerhead bycatch include a portion of those considered to be “unobservable” once a gear modification (i.e., a turtle excluder device [TED] or scallop chain mat) is used to exclude turtles (Warden and Murray 2011). “Unobservable” takes are 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. If a portion of these unobservable takes can be quantified (Warden and Murray 2011), they are included in our estimates of turtle bycatch.

During the July 2013 through June 2016 time period, the NEFSC’s Fisheries Sampling Branch managed 3 observer programs: the Northeast Fisheries Observer Program, the Industry-funded Scallop Program, and the At-sea Monitoring Program (NEFOP 2013; NEFSC 2016a, 2016b). In the 2015, 2016, and 2017 SBRM annual analyses for fish/invertebrates, the observer data utilized came from the NEFOP, IFS, and ASM programs and were referred to collectively as “NEFOP” data. In the Data Sources section of each of the annual reports, there is a brief description of the observer data used (also see footnote 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). To acknowledge the distinction between these observer programs (including sampling protocols, goals, and objectives), this document utilizes the term “OB,” rather than “NEFOP,” to refer to the collection of observed trips used in the annual analyses.

1. OBSERVER COVERAGE

1.1 Methods

Using the July-June data from the 3 annual SBRM analyses, the percentage of observed coverage, in terms of trips, sea days, and landings of all species combined, is derived for each fleet and SBRM year by dividing the annual sum of the values for each metric in the OB data set by the annual sum of the values for each metric in the Vessel Trip Report (VTR) data set. Total annual coverage is derived for trips and sea days by summing the values for each metric over all fleets for each SBRM year and then dividing the OB total by the VTR total for each metric.

In this document, observer coverage for turtles is expressed in terms of trips, by gear type, and region over the 5 combined years used in the analysis. Normally for each turtle bycatch

[2] The ESA of 1973 defines takes as: “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

analysis, observer coverage is evaluated at a finer temporal and spatial scale with respect to commercial effort and reported in terms of the unit of effort used in the bycatch rate.

Annually, the spatial and temporal patterns of observer coverage within a fleet are evaluated. Rather than using number of trips (a trip-based metric), the kept weight of all species reported in the VTR was used. The "kept weight with observer coverage" was derived as the kept weight of all species reported in the VTR summed by fleet, statistical area, and quarter, where at least 1 observed trip occurred in the fleet-quarter-statistical area cell and at least 3 observed trips[3] occurred in the fleet-quarter stratum. The "kept weight" was derived as the kept weight of all species reported in the VTR summed over all statistical areas and quarters within a fleet. The percentages of "kept weight with observer coverage" were calculated by dividing the "kept weight with observer coverage" by the "kept weight." These percentages were derived for the individual fleets, confidential fleets combined into "Confidential fleets," "Other minor fleets," and all fleets combined. Additionally, as a relative measure of fleet activity among all fleets, the percentage of "kept weight" was derived by dividing the "kept weight" by the sum of the "kept weight" across all fleets.

1.2 Results

The numbers of OB and VTR trips and sea days, by fleet and SBRM year, used in the annual SBRM analyses are presented in Table 5 and Table 6, respectively. A total of 57 unique fleets (categorized by region, gear type, mesh group, access area, and trips category combinations) have been reported in the 3 annual SBRM analyses. It is possible for a trip to be partitioned if 2 or more gear types or mesh groups are used during a trip. The result of this partitioning may inflate the number of trips and sea days in each data set. Before applying the stratification and conditioning the data set for analysis, the numbers of unique OB trips were 3,508, 4,023, and 3,802 in SBRM 2015, SBRM 2016, and SBRM 2017, respectively. The numbers of unique NEFOP sea days were 10,800, 11,726, and 10,500 in SBRM 2015, SBRM 2016, and SBRM 2017, respectively.

In terms of numbers of trips, the percentages of observed trips varied by fleet and ranged from 0.1% to 24%, excluding 2 fleets for which 100% observer coverage was a requirement (New England [NE] small mesh haddock separate trawl [Row 18] and NE Access Area (AA) midwater trawl [Row 41]; Table 5). Over all fleets, the percentage of observed trips ranged from 4.4% to 5.5%. The percentage of observed sea days were generally similar and ranged from 7.4% to 8.5% (Table 5 and Table 6). The observer coverage is higher for sea days than for trips because of longer mean trip length and relatively higher coverage rates in some fleets.

Observer coverage rates, in terms of percentage of observed trips, sea days, and landings are given in Figure 2, Figure 3, and Figure 4, respectively, by fleet for 28 selected fleets and SBRM year (fleet abbreviations are given in Appendix Table 1). The 28 selected fleets are: Rows 1, 2, 4-8, 11, 18, 19, 24-26, 28, 29, 31-39, 41, 43, 44, 47, 49, and 50; these represent fleets for which discards were estimated in 2 of the 3 years, but excludes the 2 fleets with 100% coverage requirements (Rows 18 and 41). In terms of trips, the observer coverage was highest in the fleets associated with New England (NE) groundfish (Rows 8, 19, and 28; Figure 2) and industry-funded scallop dredge fleets (Rows 34, 35, and 39; Figure 2). The majority of fleets have less than 10% coverage of trips, sea days, or landings (Figure 2 - Figure 4). It should be noted that percent coverage is only one measure for monitoring and that precision of the discard estimates is the specified metric for monitoring adequacy within SBRM.

[3] The 3 trips for fleet-quarter correspond with a minimum threshold for allocating observer coverage.

There was 1 fleet for which the numbers of OB trips and sea days were greater than the VTR trips and sea days. It is unexpected to have observer coverage exceed 100%. In this case, the observer reported 2 mesh sizes (large and small) were used in a trip while the VTR for that trip reported only the large mesh was used; hence, more observed trips than VTR trips appeared in the data sets for this small mesh fleet.

Pilot fleet designation generally indicates little or no observer coverage available for the SBRM sample size analyses for the upcoming year. An exception to this occurs in cases in which OB trips were not temporally distributed throughout the year. Not all fleets considered within the SBRM have OB coverage. There were 21 fleets which required pilot coverage in all 3 years, 12 fleets for which a change between pilot and nonpilot coverage occurred during the 3 years, and 24 fleets that had sufficient OB coverage in all years (Table 5).

Within the 3 SBRM years, there were 12 industry-funded scallop fleets, several confidential fleets, and 2 fleets that were added during the 3-year period.

The 12 scallop resource set-aside industry-funded scallop fleets were:

Row 9 Mid-Atlantic (MA) Access Area General Category Scallop Trawl
Row 10 MA Access Area Limited Category Scallop Trawl
Row 11 MA Open General Category Scallop Trawl
Row 12 MA Open Limited Category Scallop Trawl
Row 32 MA Access Area General Category Scallop Dredge
Row 33 NE Access Area General Category Scallop Dredge
Row 34 MA Access Area Limited Category Scallop Dredge
Row 35 NE Access Area Limited Category Scallop Dredge
Row 36 MA Open General Category Scallop Dredge
Row 37 NE Open General Category Scallop Dredge
Row 38 MA Open Limited Category Scallop Dredge
Row 39 NE Open Limited Category Scallop Dredge

There were several fleets where confidentiality rules applied in each of the SBRM years; the fleets were:

In SBRM 2015, Rows 9, 10, 14, 15, 22, and 54
In SBRM 2016, Rows 10, 14, 15, and 18
In SBRM 2017, Rows 10, 15, 22, and 42

The NE haddock separator trawl and NE AA midwater trawl fleets were not considered in the annual SBRM analyses (denoted by dark shading in the tables). The NE haddock separator trawl fleet (Row 18) was added to the SBRM analyses for 2015 and 2016 (there was no fleet activity that occurred in 2017). The NE AA midwater trawl fleet (Row 41) was added to the SBRM analyses in 2016.

In terms of spatial and temporal patterns of kept weight of all species, the percentage of observer coverage over all fleets was 51%, 56%, and 72% in SBRM 2015, 2016, and 2017, respectively (Wigley et al. 2015, 2016; Wigley and Tholke 2017). For each fleet reported annually, the percentage of kept weight of all species and the percentage of kept weight of all species observed are shown in Figure 5. The percentages of kept weight of all species and kept weight of all species observed generally persist over the 3 years. The annual percentages of kept weight of

all species vary among fleet but do not exceed 21%, and the majority of the fleets had percentages of kept weight of all species observed that exceeded 75% (Figure 5). For nonpilot fleets, the average percentage of observer coverage was 79%, 77%, and 75% in SBRM 2015, 2016, and 2017, respectively (Wigley et al. 2015, 2016; Wigley and Tholke 2017). This finding indicates that the majority of kept weight within the fleet was associated with statistical areas and quarters with observer coverage. The kept weight of all species can be considered a surrogate for fishing effort; hence, observer coverage occurred spatially and temporally where the majority of fishing effort occurred at the statistical area and quarter year scales.

Observed trips utilized for turtle bycatch analyses composed either 5% or 10% of VTR trips depending on the gear type and time series (Table 7). Coverage rates were higher or lower when evaluated at finer temporal/spatial scales (see Murray 2018).

Previously Reported Information

Numbers of OB and VTR trips and sea days by fleet and calendar quarter, and percentages of kept weight of all species are available in Tables 2, 3, and 4 of the annual documents on discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern United States (US) for SBRM 2015, 2016, and 2017 (Wigley et al. 2015, 2016; Wigley and Tholke 2017, respectively).

1.3 Discussion

Percentage of observed coverage (in terms of trips, sea days, or landings) derived in this report should not be confused with the SBRM performance standard (30% CV of discard estimate), the specified metric used to allocate observer coverage among fleets and used to evaluate monitoring adequacy within the SBRM. It is important to note that a constant percentage of observed coverage may result in either over or under sampling the fleet relative to the precision standard.

Observer monitoring of bycatch may have multiple objectives that include: bycatch monitoring of individual species (fish and turtles), compliance monitoring of annual catch entitlements (ACEs), and quota-monitoring of hard total allowable catch (TAC). SBRM focuses on monitoring to achieve acceptable measures of precision. Quota monitoring (including monitoring for compliance with regulations) is more challenging since increased coverage may be necessary to ensure more frequent in-season reports of discards rates. Monitoring rates for compliance with regulations often must be higher to reduce the scope for potential bias in estimation. It must be emphasized that SBRM does not consider the additional monitoring requirements for compliance. Increases in monitoring for compliance issues are based on the expectation that the observed variability in discard rates will include the normal variation plus potential, but unquantified, bias.

The analysis conducted for the spatial and temporal observer coverage used live weight. As a result, fleets using scallop dredge and clam dredge that target species with shells have higher kept weight percentage than other fleets because of the use of “live” weight rather than “landed meat” weight. However, the use of live weight does not distort the observed percentage (spatial or temporal pattern) within a fleet. It is important to remember that percent observer coverage is an indicator of where observed kept weight (or trips) occurred relative to unobserved kept weight (or trips). The percentage observed should not be confused with the precision of the discard estimate, which is the metric used to describe discard variability and to determine the sample size needed for monitoring purposes.

The use of the previous year's data to estimate appropriate sampling coverage in a future year is predicated on the assumption that the discard variance remains constant (see Section 5.0 for variance stability). The sufficiency of the predicted number of sea days generated using data from 1 year can change in response to a number of factors that include: variability in the discard estimates among the 15 SBRM species groups, changes in fishing patterns, changes in distribution and abundance of species groups, etc. The SBRM process is designed to capture such changes by annually updating the sample size analysis.

Because of the time frames associated with the annual SBRM reporting process, SBRM 2015 analyses utilized the sea day allocations which were partially influenced by the SBRM formulaic sea day prioritization (Figure 1). The sea day coverage resulting from the SBRM 2014 sea day schedule does not fully enter the SBRM analysis until SBRM 2016 (i.e., data collected during July 2013 through June 2014 are from a combination of sea day schedules from SBRM 2013 [3 calendar quarters] and SBRM 2014 [1 calendar quarter]). The formulaic prioritization process was first applied to the SBRM 2014 sea day schedule (in advance of the 2015 SBRM Omnibus Amendment); hence, only 1 of the 4 quarters of data used in the SBRM 2015 analyses was affected by the revised prioritization process. The data used for the SBRM 2016 and 2017 analyses were entirely influenced by the formulaic prioritization approach.

2. OBSERVED ENCOUNTERS

2.1 Methods

The observer data used in this section included all hauls from observed trips using "limited" sampling or "complete" sampling protocols and include observed and unobserved hauls. Any observer data that required aggregation beyond the fleet level or data that could not be stratified to a fleet because of confidentiality rules, missing gear or mesh information, were excluded from the fleet summaries. These data, however, are reported in the species group summaries.

A list of all unique species recorded by observers over the 3-year period from July 2013 through June 2016 was compiled; species are recorded in pounds or in number, depending on the taxa. For all observed trips, observed catch quantities (kept and/or discarded) were summed for each species/species group and SBRM year and for each species/species group, fleet, and SBRM year (note: the fleet summaries excluded data that could not be classified to a fleet). Separate summaries are presented for fish/invertebrates (in live pounds) and sea turtles (in numbers).

The percentage of observed trips that encountered a species/species group is derived by dividing the number of observed trips that observed the given species/species group, regardless of catch disposition, by the number of observed trips in each fleet and SBRM year. The annual percentage of observed trips that encountered the species/species group was derived by summing the observed trips that encountered the species/species group over all fleets in each SBRM year and dividing by the sum of the number of observed trips in each SBRM year.

2.2 Results

Fish/Invertebrates

Observers recorded 329 unique[4] species by weight and 47 species by numbers (Appendix Table 2) over the 3-year period from July 2013 to June 2016. A summary of the 14 fish/invertebrate species groups, in weight by disposition is given in Table 8 for the SBRM species groups, the SBRM species groups combined, the non-SBRM species, and all species combined by SBRM year. The 14 SBRM species groups represent approximately 90% of the total weight of all species recorded by observers (Table 8).

Summaries of observed catch weight (kept and discarded) and the percentage of trips that encountered a species/species group by fleet and SBRM year are presented in Appendix Table 3 and Figure 6 - Figure 8. In general, the percentage of trips encountering a species/species group varied across fleets; however, the percentages across SBRM years were similar and indicate persistent fleet/species group interactions. The skate complex, large mesh groundfish, and monkfish were the 3 most frequently encountered species groups on observed trips (Figure 6 and Figure 7). Figure 8 reveals that for many species groups (e.g., skate, spiny dogfish [*Squalus acanthias*], Atlantic surfclam [*Spisula solidissima*]/ocean quahog [*Arctica islandica*], Atlantic herring [*Clupea harengus*]) observed discards were a major component of observed catch in many fleets (symbols clustered along and near the identity line), and this pattern occurred over a wide range of catch sizes and was similar in all 3 years.

Sea Turtles

Observers recorded a total of 72 loggerheads (*Caretta caretta*), 11 Kemp's ridley (*Lepidochelys kempii*), 2 leatherback (*Dermochelys coriacea*), 3 green (*Chelonia mydas*), and 8 unknown species of sea turtle from July 2013 to June 2016 (Table 9 - Table 11). The number of turtles that were observed in older time periods that informed sea day coverage needs during the period of this review are listed in Table 12.

2.3 Discussion

This report is a comprehensive summary of the data collected on observed trips by trained at-sea observers and monitors. No discard estimation resulting from an expansion of discard ratios has been performed for observed encounters summarization. It is improper to calculate discard-to-kept ratios using this summary (Table 8) because the data utilized to generate this summary include data from all hauls for which an observer was "on-watch," including hauls where discard data were not collected because of incidental take sampling and trips with "limited" sampling protocols. It is also improper to compare discard amounts across fleets without accounting for the number of observed trips by fleet; the number of observed trips will vary by fleet. This summary is not intended to replace analyses that subset observer data for discard estimation (see Section 3.0: Discard Estimation, Precision, and Sample Size).

The percentages of trips that encounter species groups are informative. The percentage of trips encountering a species group provides a measure of the expected value of a trip toward reducing the variance of an estimate for a particular species or species group. As noted earlier, not all trips will be informative for all species. For example, an encounter rate of 25% for species A

[4] Unique species reflect the species codes used by observers. Some species have not been identified to the species level, such as starfish, sponge, and sea cucumbers, and there are some cases when species cannot be positively identified and are recorded as a species group not known, e.g., "flounder, NK."

in fleet B would mean that only 1 of 4 trips in fleet B is likely to provide information on species A discards.

3. DISCARD ESTIMATION, PRECISION, AND SAMPLE SIZE

3.1 Methods

Fish/Invertebrates

Since SBRM 2012, the annual SBRM analyses have derived the discard estimates and their associated precision. A detailed description of the data and methods used are given in Wigley et al. 2015, 2016; Wigley and Tholke 2017. In brief, to estimate total annual discards and precision, a combined d/k ratio estimator (Cochran 1963) was used where d = discard pounds of a given species and k = kept pounds of all species in the observer data. The VTR landings of all species combined, corresponding to each fleet and SBRM year, were used to expand the discard rate to estimate total discard weight of each SBRM species/species group, fleet, and SBRM year.

Annual SBRM sample size analyses[5] were also conducted to estimate the number of baseline trips and sea days needed to monitor the 14 species groups in each fleet for each SBRM year. As described in Wigley et al. (2007), 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 by 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 because of little or no observer coverage (no data), or when total discards were zero (no variance), sample size was determined by pilot coverage. To derive quarterly sea days, 2% of the quarterly VTR trips for a fleet, with a minimum of 12 trips per year (3 trips per quarter) and a maximum of 400 trips per year (100 trips per quarter), were multiplied by the quarterly mean VTR trip length. 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 group combination. Thus, for each fleet, a CV of 30% or less is to be attained for each species group within that fleet. Some fleet/species group 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 discard in that fleet was unimportant with respect to either the total discard or total mortality on the resource.

An importance filter was 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 from the discards. Two filters (i.e., fraction of discard filter and fraction of total mortality from discards filter[6]) were applied simultaneously. A detailed description of the SBRM importance filters is given in Wigley et al. (2007), and the 2012 refinement to the importance filter is given in Wigley et al. (2012).

[5] "Sample size analysis" is synonymous with "sea day analysis."

[6] Fraction of total mortality from 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*.

The baseline sea days were filtered with a 95% cut-point in the discard filter and a 98% cut-point for the total mortality from discards filter. 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. To determine the number of sea days (referred to as "SBRM standard sea days" or "SBRM needed sea days") and trips needed to achieve a 30% CV within a fleet, the maximum number of sea days for the 14 species groups (i.e., the maximum number of sea days in a row) was used. This approach ensures that all species groups within a fleet 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 minimum pilot coverage (3 trips per quarter for each quarter that has industry active) to maintain monitoring coverage for that fleet. If the fleet is designated as a pilot fleet, then pilot sea days are used.

Sea Turtles

Typically, the NEFSC pools data over a 5-year time series and across multiple fishing fleets within the same gear type to estimate turtle bycatch. The time series used for the most current estimates of turtle bycatch in the 3 main gear types in which bycatch occurs are presented in the Background section. Estimates generally encompass only the Mid-Atlantic or southern New England regions, where estimated bycatch has occurred and have mainly been for loggerhead turtles, the most common species observed. As of 2018, estimates of leatherback and Kemp's ridley bycatch are also available for sink gillnet gear because of a change in the approach used to estimate bycatch in the most recent analysis (Murray 2018).

Different approaches have been used to estimate sea turtle bycatch in Mid-Atlantic gear types (see Murray 2018, 2015a, 2015b). In the most recent sink gillnet analysis (Murray 2018), a stratified ratio estimator (the ratio of observed turtle bycatch per unit of fishing effort) was multiplied by total fishing effort to estimate total bycatch. For otter trawl and scallop dredge gears, a nonlinear regression model was used to estimate bycatch rates as a function of covariates pertaining to gear or environmental characteristics, and then this model was fit to commercial data (Murray 2015a, 2015b). These estimates are subsequently allocated across fisheries, where a "fishery" is defined as a managed fish or invertebrate species landed, to provide information requested by Greater Atlantic Regional Fisheries Office for their ESA Section 7 consultations. Some model-based estimates of loggerhead bycatch include a portion of those considered to be "unobservable" once a gear modification (i.e., a TED or scallop chain mat) is used to exclude turtles (Warden and Murray 2011).

The CVs from these analyses are used to estimate the number of sea days needed in sink gillnet and bottom otter trawl (including scallop trawl) gears to achieve a 30% precision goal in future years. These estimated sea days remain in place each year until new bycatch estimates are published (currently, every 5 years). For dredge gear, sea day projections had been derived from CVs around estimated loggerhead bycatch (Murray 2012); however, sea day needs for turtles on vessels using scallop dredge gear have not been estimated since 2015 because the utility of observers as a monitoring tool for turtles in the fishery appears to be decreasing (Murray 2015b; NEFSC and GARFO 2017). Since May 2013, the use of turtle deflector dredges (TDDs) with chain mats have been required on scallop dredges in times and areas where loggerhead turtles are known to be most common. These modifications are intended to reduce those interactions[7] in which

[7] Throughout this document, turtle "bycatch" refers to any kind of interaction between the fishing gear and the turtle, as opposed to only those animals that are landed on the vessel and discarded.

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]). Since 2015, observer coverage levels in the Mid-Atlantic scallop dredge fleets have been driven by other species groups. This approach 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.

The number of observed sea days needed to achieve a 30% CV around estimated loggerhead bycatch was derived from Rossman (2007):

$$n_{proj} = (CV_{obs} * \sqrt{n_{obs}}/CV_{proj})^2$$

where n_{proj}= the amount of projected effort (converted to sea days) required to achieve a given precision level; CV_{obs} = the precision levels around estimated bycatch as reported in Murray 2015a (trawl), Murray 2018 (gillnet), or Murray 2012 (dredge); n_{obs}= the observed effort as reported in the above publications; and CV_{proj} = the projected precision level to be achieved.

Historically, sea days have been projected to monitor only loggerheads because estimates of total bycatch and associated CVs were available only for that turtle species. As bycatch estimates become available for other, less commonly observed turtle species, a process is outlined in this report to evaluate monitoring needs for these rare encounters (see Section 6).

3.2 Results

Fish/Invertebrates

Annual VTR landings and estimated discards (live pounds) with associated precision are compiled from the 3 annual fish/invertebrate SBRM analysis as follows: (1) for each of the 14 SBRM species/species groups over all fleets for each SBRM year (Table 13; Figure 9 and Figure 10); and (2) for the 14 SBRM species groups combined by fleet for each SBRM year (Table 14; Figure 11). The skate complex had the highest (> 55%) percentage of discards of the 14 SBRM species groups (Table 13; Figure 9 and Figure 10). Each of the remaining SBRM species groups had discards that were less than 16% of the total annual discards. For the 14 SBRM species groups combined, discards varied by fleet. The NE large mesh otter trawl (Row 8) had the highest percentage of discards among all fleets (34%, 29%, and 25% in SBRM 2015, 2016 and 2017, respectively; Table 14; Figure 10). The landings associated with the various minor fleets aggregated in "Other fleets" generally constituted less than 0.03% of the total landings across all fleets (Table 14).

Precision of the discard estimates are displayed in Figure 12 for each of the 14 SBRM species groups. The 28 selected fleets (those fleets for which discards were estimated in at least 2 of the 3 SBRM years) are shown in Figure 13. The precision associated with the estimated discards of species/species groups in fleets for which discards were considered unimportant (i.e., these groups constituted the lower 5% of the discard mortality and lower 2% of the total mortality and were filtered out via the importance filter process) was not used in the sample size analysis to determine the SBRM sea day standard. Only the precision of the discard estimates of the SBRM species groups that were used in the sample size analysis is shown in Figure 12. The precision estimates for 5 of the 14 SBRM species groups (bluefish [*Pomatomus saltatrix*], tilefish [*Lopholatilus chamaeleonticeps*], Atlantic herring, surf clams/ocean quahog, and Atlantic salmon

[*Salmo salar*]) were not used in the sample size analysis; thus, these species groups are not presented in Figure 13. The precision (CV) of the discard estimates for 14 SBRM species groups that were considered important varied by species groups, fleet, and SBRM year.

The majority of species groups/fleet combinations used in the sample size analysis had 30% CV or less (Figure 12).

For the 14 SBRM species groups in the 3 SBRM years, 35 of the 42 precision estimates (83%) were less than or equal to 30% CV (Table 13). Of the 7 species groups in the 3 SBRM years with precision estimates greater than 30% CV, 5 species groups had discards associated with fleets that were filtered out by the importance filter indicating that discards were a minor component of the total catch of these species groups. For the precision estimates of the individual species that composed the 14 SBRM species groups in the 3 SBRM years, see Wigley et al. 2015, 2016; Wigley and Tholke 2017.

With regard to precision of the discard estimates, many of the species groups in the scallop industry-funded fleets have CVs below 30% (Figure 12). The numbers of observer sea days in the scallop fleets are based on the fraction of landed value allocated to discard monitoring and the daily compensation rate. The compensation rate[8] is designed to avoid biases that might arise if vessels avoided observers at low compensation rates or changed their fishing behavior at high compensation rates. Realized coverage rates generally exceed the SBRM standard sea days.

The SBRM sea day standard (numbers of sea days needed to achieve a 30% CV for all SBRM species groups within a fleet) and the prioritized funded sea days by fleet and SBRM year, are given in Table 15. The SBRM sea day standard varied across years for a given fleet because of the variability in discard estimates among the 15 SBRM species groups, changes in fishing patterns, and changes in both the distribution and abundance of the species groups. The use of the previous year's data to estimate appropriate sampling coverage in a future year is predicated upon the assumption that the discard variance remains constant (see Section 5.0 for variance stability). In 2015, a funding shortfall triggered the formulaic prioritization process. The sea days allocated were reduced in 2 fleets (MA small mesh otter trawl Row 5 and NE large mesh otter trawl Row 8; Table 15). In 2016 and 2017, there was not a funding shortfall; however, a decision was made not to fully fund 1 fleet in 2016 (NE large mesh otter trawl Row 8) and 2 fleets in 2017 (NE large mesh otter trawl Row 8 and NE lobster pot; Table 15). Hence, the sea days allocated were fewer than the sea days needed to achieve a 30% CV for red deepsea crab (*Chaceon quinquedens*) in those fleets (see Section 6.0 for further details).

Table 15 also presents the accomplished sea days by SBRM year and fleet for 2015, 2016, and 2017. The numbers of accomplished sea days were near to the funded days for numerous fleets. For industry-funded scallop fleets, there were more sea days accomplished than allocated via the SBRM. Over all IFS fleets, there were roughly 450 - 1,000 additional accomplished sea days each year above those allocated (Table 15). This target was due to a regulation change in 2015[9] that made it difficult to predict how many trips the fleet would be taking in the upcoming

[8] Considerations in the compensation rate analysis include: a compensation rate that does not induce bias in vessel selection, the cost of carrying an observer, landings per unit effort (LPUE), and expected scallop prices. The Industry-funded Scallop program allows the vessels an increase in landings to help defray the costs of carrying an observer. The sale of the additional scallops allocated to each boat supplied the funding for the at-sea costs of the observer coverage.

[9] The regulation change in 2015 refers to changes made through Framework 26 to the Atlantic Sea Scallop FMP. Vessels were no longer required to submit a broken trip notification form if they were unable to land their full possession limits on an access area trip. Vessels also no longer needed to apply to NMFS to receive or wait for NMFS to issue a compensation trip to fish their remaining access area scallop allocation. This change allowed the

year and thus how many sea days would be needed to cover the fleet at a target percent coverage. For a few agency-funded fleets, there were substantial numbers of unaccomplished sea days, primarily in the Mid-Atlantic otter trawl and gillnet fleets (e.g., Row 6, 24-26; Table 15). Over all agency-funded fleets, there were roughly 3,400, 4,300, and 2,702 sea days that were not accomplished in 2015, 2016, and 2017 respectively (Table 15).

Sea Turtles

Total estimated bycatch of turtles and associated CVs by gear type are summarized in Table 16, and sea days needed to achieve a 30% CV are summarized in Table 17. Further details are provided in the associated references.

Previously Reported Information

Discard estimates, their associated precision, and the sample sizes needed in the upcoming year are available in Tables 5A (species group) and 5B (individual species) by fleet in the annual documents on discard estimation, precision, and sample size analyses for 14 federally managed species groups in the waters off the northeastern US for SBRM 2015, 2016, and 2017 (Wigley et al. 2015, 2016; Wigley and Tholke 2017, respectively). Sample sizes needed for all 15 species groups are given in annual discard report with observer sea day allocations (NEFSC and GARFO 2015, 2016, 2017).

3.3 Discussion

Fish/Invertebrates

The SBRM discard estimation analysis used a broad stratification (region, gear type, mesh group, access area, and trip category) to encompass all federally managed species considered in the SBRM and used a combined ratio method (discard-to-kept of all species weight ratio). The discard estimates reported here may not necessarily correspond directly with the discard estimates derived for individual stock assessments because of differences in stratification and data. It was expected, however, that estimates would be in the same order of magnitude. **The SBRM discard estimates were not definitive estimates but were indicative of where discarding was occurring among commercial fleets.**

This review report presents the discard estimates derived through the SBRM process. The following caveats apply:

- A broad stratification scheme has been used to encompass all the federally managed species in the Greater Atlantic Region. Species-specific stock assessment analyses may differ from this report because of differences in stratification and data used that include calendar year versus SBRM year, region (based on port of departure) versus area fished, and VTR landings versus dealer landings.
- Region, based on port of departure, was used for deploying observers, and it was recognized that area fished would provide a better stratification for discard estimation.
- The SBRM analysis utilized the Vessel Trip Report data. Dealer (*CFDERSyyyy*) data did not contain mesh or area fished information until the trip-based allocation was performed.

vessels more flexibility to fish their allocation across as many or as few trips as needed, so long as their possession limit was not exceeded on any 1 trip. Whereas, previously they would need to fill out broken trip forms and wait for NMFS to give them the remainder of their pounds if they came under the trip limit.

The trip-based allocation of dealer (*CFDETT/SyyyyAA*) data was conducted annually and was not available when each of the annual SBRM analyses was initiated.
    - The VTR point location was used to determine access area for commercial scallop fleets.
    - There were differences in species pounds between the VTR and Dealer data sets: VTR reports the good-faith hail weights while Dealer data provide actual landings weight.
- Some imputation was needed because of limited temporal observer coverage of some fleets. It was recognized that using half-year estimates may not be appropriate for all species and that in some cells quarterly discard ratios were based on small sample sizes. This approach contributed to lower precision (higher variability) of the discard estimates.
- Because of data limitations, discards were not estimated for all fleets, thus *total* discards were underestimated.

No survival ratios were applied to the discard estimates; we do not account for potential survival of organisms returned to the water. When comparing discard estimates from this study with those from stock assessments, it is useful to note that survival ratios are applied in stock assessments for Georges Bank and Gulf of Maine stocks of Atlantic cod (*Gadus morhua*), Atlantic sea scallop (*Placopecten magellanicus*), skates, spiny dogfish, fluke (*Paralichthys dentatus*), southern New England/Mid-Atlantic and Gulf of Maine stocks of winter flounder (*Pseudopleuronectes americanus*), and southern New England/Mid-Atlantic yellowtail flounder (*Limanda ferruginea*).

Pilot coverage has been used when the bycatch ratio is zero, when variance of the bycatch ratio or when the variance of the composite total discards is zero. It is recognized that pilot coverage may result in too much coverage in cases where no observer coverage is needed for a cell.

The SBRM Omnibus Amendment requires 30% CV or less to be attained for each species group within each 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. Thus, the use of the importance filter is a key feature to the SBRM in that it focuses the sampling to fleets where it is needed most and not wasted on small, imprecisely estimated discards.

The SBRM sample size analyses do not address the coverage needed for individual sectors or multiple stock components of a species. The analytical basis for the allocation of future sea day coverage in the SBRM 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.

Because of the unaccomplished sea days, 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 species in some fleets; however, it does not mean that all species within a given fleet will not meet the precision standard. See Sections 5 for further discussion on this topic.

The unaccomplished sea days were carried over to the following year. It is notable that the carryover days from 2015 represented approximately 39% of the required days for agency-funded fleets in 2016, 47% in 2017, and 39% in 2018. The SBRM is designed to accommodate funding

shortfalls via the prioritization process, hence there is no reliance on unaccomplished days as a means to fund the required days in the following year.

The goal of the NEFOP is to achieve all sea days allocated by the SBRM each year; however, reaching target coverage has posed significant challenges in recent years. The SBRM allocated sea days on the NEFOP Sea Day Schedule (non-pretrip notification trips) have increased substantially since the beginning of the last NEFOP 5 year contract awarded in 2012. With the implementation of the 2015 SBRM Omnibus Amendment and the formulaic allocation of sea days, observer coverage was fully funded in more fleets than in previous years under the previous SBRM Amendment with a consultation process. The 2015 SBRM Omnibus Amendment with the formulaic allocation resulted in higher coverage that was notable in some Mid-Atlantic fleets (519 SBRM days tasked to Mid-Atlantic fleets in 2012 vs 3,286 days in 2017). This higher coverage was seen by some industry members as an undue burden, leading them to refuse to take observers without formal documentation of selection (e.g., a selection letter) or enforcement intervention. The observer provider company had to increase their outreach, expand their observer cadre, and change their message to build stronger relationships/trust with industry in a relatively short period of time. Through substantial efforts, the understanding of the SBRM sea day requirements and tolerance of observer coverage is gradually increasing, but this change is taking time.

Historically, vessels have been selected for NEFOP trips via dock intercept or phone communication. With the number of sea days tasked, the NEFOP providers have had to increase their use of formal selection letters to inform permit holders that their vessels have been selected for observer coverage. Although coverage may be technically achievable (i.e., below 100%), it has been logistically difficult to deploy observers on vessels at a rate greater than 20% without a requirement for a pretrip notification to the provider. In many cases this difficulty is due to low industry tolerance of observer coverage. [See Section 10.0 for the SBRM Fishery Management Action Team (FMAT) recommendation for use of a system like pretrip notification to reduce/eliminate the need for dock side intercept or phone communication.]

Additionally, observer retention is also an obstacle to achieving target sea days. Observers work hard to obtain trips, but continue to have difficulty in the field with substantial push back from industry. This has led to dissatisfaction with their positions in some cases. Providers also report difficulty maintaining the needed level of observers because there are large seasonal variations in the amount of sea days tasked throughout the course of the year.

The Fisheries Sampling Branch has implemented many changes to assist with improving sea day accomplishments. Some of these changes include: (1) the addition of a second NEFOP provider through a federal government General Services Administration contract, (2) modifications to the new 5 year contract (awarded June 8, 2018) that require the achievement of at least 90% of the tasked sea days, (3) removal of erroneous fleets[10] and a documented process to do so annually, (4) increased in-person outreach to industry across both regions, (5) permit letters informing operators of expected annual observer coverage for their state and gear type, (6) internal NEFSC SBRM quarterly meetings to facilitate communication across divisions within the science center, (7) presentations at both fishery management Councils on the SBRM and related

[10] In the Wigley and Tholke 2018 analysis “erroneous” fleets were identified which resulted from either VTR misreporting the gear type used, fishing outside the regulations (using smaller mesh size than allowed), or inconsistent gear codes between data collection systems. The required observer sea days associated with these fleets were set to zero. This action assists with improving sea day accomplishments by removing fleets that would be impossible to deploy observers on and, therefore, those erroneous fleets would always show a deficiency in observer coverage achievements. This approach also allows the observer provider to focus on deploying observers on real fleets.

achievements, (8) Mid-Atlantic area lead stationed in New Jersey for more efficient outreach and follow-up with vessel operators, (9) as well as greater collaboration with the National Oceanic and Atmospheric Administration (NOAA) Fisheries Office of Law Enforcement to assist with timely vessel trip refusal follow up and outreach to encourage compliance. The Fisheries Sampling Branch feels these changes have made a positive impact on accomplishments as is reflected in 2017 agency-funded fleet accomplishments (see Table 15).

4. DISCARD REASONS FOR FISH AND INVERTEBRATES

4.1 Methods

As mentioned above, the MSA requires FMPs to include conservation and management measures that, to the extent practicable, minimize bycatch. Thus, it could be useful to know what portion of the discards is associated with regulatory measures. As described in the SBRM Omnibus Amendment (NEFMC 2007; NEFMC 2015), fish may be discarded for a variety of reasons including regulatory and economic reasons. It is important to note that the reasons behind the discards and the measures that could be used to reduce discards are not the focus of the SBRM.

For each of the 3 SBRM years, species group and fleets, the fish dispositions associated with discarding (as reported by the at-sea observer) have been grouped into the following 6 discard reason categories: “No Market,” “Regulation (size),” “Regulation (quota),” “Regulation (other),” “Poor Quality,” and “Other.” The fish dispositions and the discard reason categories are summarized in Appendix Table 4. The discard reasons “No Market” and “Poor Quality” would be considered economic discards and not regulatory discards.

The observed (non-extrapolated) discards associated with each of 6 discard reason categories were summed for each species group, fleet, and SBRM year for the fleets where discards could be estimated. For individual fleets, the percentage of observed discards by discard reason category was derived by dividing the sum of the observed discards for each discard reason category by the sum of the total observed discards for each species group, fleet, and SBRM year. The extrapolated discard reason category percentages were the same as the observed discard reason category percentages. For the “Other fleets filtered out” (an aggregated fleet that represents fleets where the variance of the discard estimate was not used in the annual SBRM sample size analysis), the observed discard reason category percentages were then multiplied by the total estimated (extrapolated) discards for each species group, fleet, and SBRM year to derive the estimated discards by discard reason category for each species group, fleet, and SBRM year for each of the fleets associated with the aggregated fleet. For each “Other fleets filtered out,” the total estimated discards by discard reason category were summed over the fleets that comprise the fleet aggregation for each species group and SBRM year. The extrapolated discard reason category percentage was derived by dividing the estimated discards for each discard reason category by the sum of the total estimated discards for each species group/species, fleet, and SBRM year. For each “Other fleets filtered out,” the extrapolated discard reason category percentages were the observed discard reason category percentages weighted by the estimated discards in each fleet.

Information from the annual discard reports have been summarized in graphic form for this review report.

4.2 Results

Over the 14 species groups, the discard reasons remained relatively stable over the 3 SBRM years. The majority (between 81% and 84%) of discards were attributed to "No Market," 14% to 15% were attributed to "Regulation" (size, quota, and other) and the remaining discard percentages were evenly split between "Poor Quality" and "Other." The reasons for discarding varied by species group; however, the patterns of discard reasons persisted over years (Figure 14).

Previously Reported Information

Annually, the discard reasons associated with the observer (non-extrapolated) discards are summarized by species group and fleet (see Appendix Tables 3A and 3B in Wigley et al. 2015, 2016; Wigley and Tholke 2017).

4.3 Discussion

When considering mechanisms to reduce discards, it may be useful to know why discarding is occurring. Fish may be discarded for economic reasons (e.g., no market or poor quality) or for regulatory reasons (size, quota, or other). It is important to note that a large discard reason percentage may be associated with a small quantity of discards. Additionally, it is important to note that for many species, the discards are associated with fleets that have been filtered out by the importance filter.

It should also be noted that the observer classifies the discards by fish disposition based upon NEFOP protocols (NEFOP 2013; NEFSC 2016a and 2016b) where the observer asks the captain/crew why species are being discarded. Thus, these data should be considered a form of self-reported data and as such these data are difficult to verify and should be interpreted carefully. Additionally, the NEFOP protocols for collecting discard reasons recognized that more than 1 discard reason could apply to a particular subset of discards. Information on discard reason is available within the NEFOP database to support further analysis needed by Plan Development Teams or Take Reduction Teams.

5. EFFECTIVENESS OF SBRM

5.1 Methods

Fish/Invertebrates

Performance Standard

The SBRM Omnibus Amendment established a performance standard for the Greater Atlantic Region. The SBRM performance standard is a 30% CV of the total discards (NEFMC 2015). This performance standard applies to each unique fleet, species group, and SBRM year. In this section, each unique fleet, species group, and SBRM year is referred to as a cell. Each cell in the 3 SBRM years was classified to 1 of the following 6 SBRM performance classifications:

> Not Applicable – SBRM performance was not applicable. The variance of the discard estimate was not available; fleets were not considered within the annual SBRM analysis (Box 1; Figure 15).

Unknown – SBRM performance was unknown. The variance of the discard estimate was not used because there was no observer coverage (Box 2; Figure 15) or insufficient observer coverage (Boxes 3 and 4; Figure 15). This SBRM performance classification is associated with pilot fleets only. Discards cannot be reliably estimated for cells with insufficient OB coverage. Designation of pilot coverage is described in Wigley et al. 2007.

Met (filtered out) – SBRM performance was met because the discard CV was less than or equal to 30% (Boxes 5 and 7b; Figure 15), and the variance of discard was not used in the annual sample size analysis because of the importance filter (cell filtered out). This SBRM performance classification is associated with nonpilot fleets only.

Not Met (filtered out) – SBRM performance was not met because the discard CV was greater than 30% (Box 7a; Figure 15) and the variance of discard was not used in the annual sample size analysis because of the importance filter (cell filtered out). This SBRM performance classification is associated with nonpilot fleets only.

Met – SBRM performance was met because the discard CV was less than or equal to 30% (Box 9; Figure 15) and the variance of discard was used in the annual sample size analysis. This SBRM performance classification is associated with nonpilot fleets only.

Not Met – SBRM performance was not met because the discard CV was greater than 30% CV (Box 8; Figure 15) and the variance of discard was used in the annual sample size analysis. This SBRM performance classification is associated with nonpilot fleets only.

This is the same classification used for fish species group in the 2011 SBRM 3 year Review Report (Wigley et al. 2012). In the 2011 SBRM 3 year Review, Box 6 (Met) was used for sea turtles; Box 6 is not used in this Review Report.

Variance Stability

The SBRM uses the variance of discards from the previous year to determine the number of sea days needed in the next year. This assumes the variance of the discard estimates are stable such that the variances can be used from 1 year to inform the sample size needed in the following year. It assumes the persistence of fishing behavior over time.

To investigate the stability of the discard variances, comparisons of the discard variance and comparisons of coefficient of variation of the discards were conducted for fleet and species groups between the 3 SBRM years. The variance and CV of the discard estimates from each SBRM year were compared across years by plotting all combinations and generating a regression line with 68% confidence ellipse using all nonpilot cells that were not filtered out through the importance filter (cells associated with “Met” and “Not Met”; Boxes 8, and 9, Figure 15). A fourth root transformation was applied to the data set to accommodate zeros.

A summary of number of trips needed to achieve a 30% CV by species group, fleet, and SBRM year (taken from the Table 7 and Figure 3 in the annual SBRM analyses; Wigley et al. 2015, 2016; Wigley and Tholke 2017) and the relationship between CV and sample size (trips) are presented for 10 selected fleets. These 10 selected fleets represent those fleets with sample sizes for species groups that were not filtered out in all year SBRM years.

5.2 Results

Fish/Invertebrates

Performance Standard

The 6 SBRM performance classifications ("Not Applicable," "Unknown," "Met [filtered out]," "Not Met [filtered out]," "Met," and "Not Met") and the characteristics of the cells associated with each performance classification are depicted in Figure 15. When considering fleets across all 3 SBRM years, there is a total of 798 cells for each SBRM year (57 fleets x 14 species groups). The number of cells by SBRM performance classification and SBRM year is presented in Table 18. The number of fleets by SBRM performance classification, species group, and SBRM year is presented in Table 19. The number of species groups by fleet are given in Table 20. The fleet, species groups and associated CV for cells that did not meet the SBRM performance standard are listed in Appendix Table 5.

There are 14 cells (1 fleet x 14 species groups) in SBRM 2015 and in SBRM 2017 that are "Not Applicable" (Table 18).

Cells associated with pilot coverage and the SBRM performance classification of "Unknown" were considered separately from the cells with sufficient data (nonpilot cells). There were 448, 378, and 308 cells and 32, 27, and 22 fleets in 2015, 2016, and 2017 respectively (Table 18 and Table 19) with "Unknown" performance classification across all species groups and fleets. The "Unknown" cells were associated with the pilot fleets (fleets with no or insufficient observer coverage in all years; Table 5) where all species groups within these fleets were "Unknown" (Table 18 and Table 19).

Cells with the SBRM performance classification of "Met" (filtered out) and "Not Met" (filtered out), Boxes 5, 7a, and 7b (Figure 15), respectively, were also excluded from the set of cells used in the evaluation of effectiveness. The filtered out cells represent fleets and species groups where discards are considered a minor component of total catch and were not used in the annual sample size analyses to determine coverage for the subsequent year. The total number of cells removed because of the importance filter in SBRM 2015, 2016, and 2017 were 294 (176+ 118), 372 (221+151), and 423 (271+152), respectively (Table 19).

In the evaluation of effectiveness, only the cells used in the annual sample size analysis (cells associated with Boxes 8, and 9; Figure 15) were considered. The numbers of cells considered in the evaluation are: 42 (34+8), 48 (41+7), and 53 (47+6) in SBRM 2015, 2016, and 2017, respectively (Table 18). On an annual basis, the percentages of cells that met the SBRM performance standard in SBRM 2015, 2016, and 2017 were 81% (34/42), 85% (41/48), and 87% (47/53), respectively. Across SBRM years, the percentages of cells that met the SBRM performance standard in SBRM 2015, 2016, and 2017 vary by species group and fleet. The annual SBRM performance classifications for cells in the analysis were summarized by species group using the 6 categories (Table 19) and summarized by fleet using the following 3 categories: (1) "Not Met," (2) "Met," or (3) "Met" and "Not Met" that were filtered out (Table 20). There were 5 species groups (Atlantic salmon, bluefish, Atlantic herring, surfclam and ocean quahog, and tilefish) without any cells classified as "Met" or "Not Met" (Table 19).

In SBRM 2015, a majority (32 of 56) of fleets were pilot fleets; however, the number of pilot fleets declined to 27 and 22 in 2016 and 2017, respectively (Table 5, Table 19). For the nonpilot fleets, there were 7, 8, and 12 fleets in SBRM 2015, 2016, and 2017, respectively, for which all non-filtered species groups "MET" the performance classification. Appendix Table 5 lists the cells, by SBRM year, species group, and fleet where the performance standard was "Not Met." Consequences to management are discussed in Implications for Management (Section 8).

Variance Stability

The comparison of discard variances and comparisons of discard CV revealed a relatively strong relationship between SBRM years indicating that the assumption of similar variance across years holds (Figure 16). Confidence/prediction ellipses were stronger for the SBRM 2015 and SBRM 2016 comparison and the SBRM 2016 and SBRM 2017 comparison indicating that the variances and CVs are more similar with a one-year difference than with a 2-year difference (the SBRM 2015 and SBRM 2017 comparison).

It is important to note that the number of trips (and number of sea days) for the 14 species groups varies by SBRM year within a given fleet. The variability may be due to either the changes in fishing patterns or changes in the determining species group for that year (species filtered out or not) or a combination of any one of these changes. The number of SBRM trips needed within a fleet, the expected coverage (number of trips needed for April through March divided by the number of VTR trips for the July-June in the analysis), and the fish species group determining the coverage (summarizes fish species group only) are given in Table 21. Examples of nonpilot fleets with relatively stable numbers of SBRM trips needed include the NE large mesh otter trawl (Row 8) fleet in which red deepsea crab was the determining species group in all 3 years, NE large mesh gillnet (Row 28) in which spiny dogfish was the determining species group in all 3 years, and MA open limited (LIM) scallop dredge (Row 38) in which monkfish (*Lophius americanus*) was the determining species group in all 3 years. Examples of fleets in which the number of needed SBRM trips changed among years as the result of changes in observer coverage (pilot to nonpilot) include MA AA general (GEN) scallop dredge (Row 9), MA twin trawl (Row 13), and MA and NE fish pot fleets (Rows 44 and 45). The MA small mesh gillnet (Row 24), NE open midwater trawl (Row 43), and the NE lobster pot fleet (Row 50) are examples of fleets with large changes from year to year as the result of changes in determining species (minimum pilot coverage [MPC] in which all species filtered out vs a species group determining the sea days). The variance stability between years is also revealed in the relationship between CV and sample size (number of trips needed) among the 3 SBRM years for fleets in which sample size was determined by discard variances for species groups that were not filtered out (Figure 17). There were 10 selected fleets for which sample size was estimated by the discard variances in all 3 SBRM years. In general, there are similarities between years and species groups (many of the curves overlay one another and/or the same species group determined coverage; Table 21 and Figure 17). There are some exceptions, such as MA large mesh otter trawl (Row 6) and NE large mesh haddock separator trawl (Row 19) in which needed trips in 1 year was greater than the other 2 years (Figure 17).

Previously Reported Information

Previously reported information on precision of discard estimates is available at a cell level by species group, fleet, and SBRM year in Tables 5A and 5B, the relationships between precision (CV) and the sample size needed for species groups and fleets that were not filtered are given in Figure 3, and the sample sizes needed in Table 7 of the annual documents (Wigley et al. 2015, 2016; Wigley and Tholke 2017).

Sea Turtles

Based on 5-year pooled datasets (see Table 1 in Section 1 for years included), the 30% precision standard for estimates of loggerhead fishery interactions was met for Mid-Atlantic sink gillnet fleets (Murray 2018) and for Mid-Atlantic bottom otter trawl and scallop trawl fleets

(Murray 2015a). The 30% precision standard was not met for estimates of loggerhead interactions in scallop dredge gear (73% CV; Murray 2015b), nor for Kemp's ridley (49% CV) or leatherback turtles (71% CV) in sink gillnet gear (Murray 2018).

Estimated loggerhead interactions in scallop dredge gear had low precision because of the lack of "observable" interactions in gear equipped with turtle excluder devices (Murray 2015a). As noted earlier, since 2015 observer coverage levels in the Mid-Atlantic scallop dredge fleets have been driven by other species groups because of the lack of observable turtle interactions. Estimated Kemp's ridley and leatherback interactions in gillnet gear also did not meet the 30% precision goal; this is not surprising as the level of observer coverage in Mid-Atlantic sink gillnet gear was designed to meet precision goals only for loggerheads. Encounters with Kemp's ridley and leatherback species are not as common as loggerheads, and these low encounter rates likely contributed to higher variability around the estimates.

5.3 Discussion

Fish/Invertebrates

Performance Standard

The SBRM is designed to allow for a feedback process to occur, such that, if there is uncertainty about a discard estimate (not filtered out) of a given species group within a fleet, then more sea days are required to monitor the fleet. The effectiveness of the SBRM at meeting the performance standard is not only dependent upon the assumption of variance stability from one year to the next, but on other factors including the overall magnitude of the funding, constraints on the use of these funds and the competing objectives among the various FMPs (applicable to a portion of 2015 SBRM; Figure 1) associated with the time frame of the data used. Thus, the data used in SBRM 2015 had observer coverage allocated during calendar years 2013 and 2014. In 2015 SBRM, not all fleets had been allocated the number of sea days needed to achieve the performance standard; this impacts the data evaluated in subsequent SBRM analyses (Figure 1). Although many of the pilot fleets are fleets associated with "selective gears" and have a specific target species for which incidental catch of other SBRM species is not likely, such as clam dredge, hagfish pot, etc., the performance standard cannot be evaluated for pilot fleets. There is a general indication that discarding within these fleets is minimal; however, maintaining minimum pilot coverage (3 trips per quarter) would be one way to provide information such that at-sea coverage of *all* fleets could be evaluated relative to the performance standard and the feedback process within the SBRM could be evaluated.

When considering the SBRM performance standard, it is important to examine only those fleets and species groups that are nonpilot and not filtered (important) in the evaluation. By doing so, the relative magnitude of the discard to total catch is factored into the evaluation since this is factored into the number of sea days required.

Given the regional priorities, in conjunction with groundfish compliance monitoring, funding has been directed towards non-selective gear types (otter trawl, gillnets) with known nontargeted catch in years prior to 2014. However, SBRM 2016 is the first year in which the entire data set used is based on data where the sea days were allocated by the formulaic prioritization process – i.e., sea days were allocated to all fleets except for 2 fleets in which industry effort was too low to support 3 trips per calendar quarter. Using the formulaic prioritization process since SBRM 2014 has resulted in more fleets with allocated sea days. However, there were instances in which some fleets did not receive the number of sea days needed. As mentioned in Sections 3.0 and 5.0, a funding shortfall in SBRM 2015 triggered the prioritization process in which 2 fleets

did not receive sufficient sea days. Because of allocation decisions made prior to the prioritization process, 1 fleet in SBRM 2016 and 2 fleets in SBRM 2017 did not receive the full number of needed sea days (see Section 6 for further details).

Implications of including At-sea Monitoring trips in the SBRM analyses

The annual SBRM analyses used observed trips from the NEFSC's Observer database (see footnote 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017) that contains NEFOP trips, IFS trips, as well as ASM trips, and other observed trips of commercial fishing activity. Annual comparisons of NEFOP and ASM trips and NEFOP and Atlantic States Marine Fisheries Commission (ASMFC) trips revealed there were generally similar discard rates between NEFOP and ASM trips and NEFOP and ASMFC trips indicating that these observed trips were sampling the same population and therefore could be pooled together for analysis.

When evaluating the SBRM performance criteria, the inclusion of the compliance monitoring trips, state-funded trips, and other observed trips (referred to as compliance/state/other trips; described in detail below) may elevate the sample size within a fleet and lower the associated CV for the species groups within that fleet. Hence, the inclusion of compliance/state/other trips may impact the performance classification of the CV of the discard estimates. It is important to note that the inclusion of the compliance/state/other trips is not expected to change the sample sizes needed in the upcoming year because more trips would only produce slightly different estimates caused by sampling variability but would not be expected to exhibit any directional bias.

To evaluate how many additional fleet and species group combinations would have had a performance classification of "NOT MET," the number of adjusted OB trips was determined by subtracting the compliance/state/other trips from the number of OB trips used in each fleet and SBRM year in the annual analyses (Table 22). The compliance/state/other trips that were removed were observed trips associated with ASM program (program codes 230 and 231), ASMFC (program code 042), New York State Department of Environmental Conservation (NYSDEC; program code 044), and Closed Area Exempted Fishing Permit (program code 240), all of which were observed trips associated with the NEFOP program. There are 9 fleets in SBRM 2015, 8 fleets in SBRM 2016, and 10 fleets in SBRM 2017 that had adjusted OB trips. Fleets in which the sea days for all species groups were filtered out by the importance filter ("F") or pilot fleets ("P") were excluded from this evaluation (Table 22). The numbers of trips needed for a 30% CV were derived in the annual analyses for each SBRM and are given in Table 23 - Table 25 for SBRM 2015, 2016, and 2017, respectively. As mentioned above, the number of trips needed to achieve a 30% CV does not change. These values were taken from Table 7 in the annual SBRM analysis (Wigley et al. 2105, 2016; Wigley and Tholke 2017). If the number of trips needed to achieve a 30% CV for a species group and fleet combination is between the OB trips used in the annual analysis and the adjusted OB trips (compliance/state/other trips removed), then the performance classification would have changed from "MET" to "NOT MET." This change indicates the precision of the discard estimate was impacted by the elevated sample size when the compliance/state/other trips were included (Table 23 - Table 25). Figure 18 shows the relationship between CV and number of trips for NE large mesh haddock separator trawl (Row 19) in SBRM 2015, 2016, and 2017 and indicates the number of trips needed to achieve a 30% CV (SBRM Trips Needed, blue vertical lines) as well as the number of OB trips (red vertical line) and the adjusted

OB trips (green vertical line). In SBRM 2015 (top panel), the number of trips needed (blue line) is greater than the OB trips and adjusted OB trips and no change in performance classification occurred for spiny dogfish. In SBRM 2016 (middle panel), there was no change in performance classification for spiny dogfish (SBRM needed trips for dogfish was greater than OB and adjusted OB trips); however, there would have been a performance classification change (from "MET" to "NOT MET") for small mesh groundfish species group and for the skate complex, but not for large mesh groundfish species group. In SBRM 2017 (bottom panel), there would have been a performance classification change for large mesh groundfish species group.

For each species group and fleet combination that would have had a change in performance classification had the adjusted OB trips been used in the annual analyses, the adjusted CV of the discard estimate was derived using the adjusted OB trips and the existing variance for each species group and fleet (i.e., the adjusted CV was taken from the existing sample size curve; Appendix Table 6). If time had allowed, the CV using only OB trips could have been computed. These values would be expected to lie close to the existing sample size curve with no directional bias. However, as the sample size decreases, the variability of the CV estimates increases because of random sampling effects. As sample sizes get small, this variability could produce noticeably different CV estimates because of the increased sampling variability (i.e., the variance of the variance increases with decreased sample size).

For SBRM 2015, there would have been 9 fleets with adjusted OB trips (Table 22). Within the 9 fleets, there were 30 species groups for which discards and their associated precision were used in the annual sample size analysis. Within the 9 fleets, there would have been 2 fleets and 2 species groups (fluke-scup-black sea bass in the NE small mesh otter trawl [Row 7] and spiny dogfish in the NE extra large mesh gillnet fleet [Row 29]) for which the performance classification would have changed from "MET" to "NOT MET" had the adjusted OB trips been used (Table 23). The remaining 28 species groups would not have changed performance classifications (these cells remained either "MET" or "NOT MET").

For SBRM 2016, there would have been 8 fleets with adjusted OB trips (Table 22). Within these 8 fleets, there were 32 species groups for which discards and their associated precision were used in the annual sample size analysis (Table 24). Within the 8 fleets, there would have been 3 fleets and 4 species groups (skate complex in the MA small mesh otter trawl [Row 5], spiny dogfish in the NE small mesh otter trawl [Row 7], and small mesh groundfish and skate complex in the NE large mesh haddock separator trawl [Row 19]) for which the performance classification would have changed from "MET" to "NOT MET" had the adjusted OB trips been used (Table 24). The remaining 28 species groups would not have changed performance classification (these cells remained either "MET" or "NOT MET").

For SBRM 2017, there would have been ten fleets with adjusted OB trips (Table 22). Within these ten fleets, there were 33 species groups for which discards and their associated precision were used in the annual sample size analysis. Within the 10 fleets, there would have been 3 fleets and 3 species groups (squid-butterfish-mackerel in the MA small mesh otter trawl [Row 5], large mesh groundfish in the NE large mesh haddock separator trawl [Row 19], and spiny dogfish in the NE extra large mesh gillnet [Row 29]) for which the performance classification would have changed from "MET" to "NOT MET" had the adjusted OB trips been used (Table 25).

The remaining 30 species groups would not have changed performance classification (these cells remained either "MET" or "NOT MET").

Although including the compliance/state/other trips had a relatively limited impact on the number of fleet and species group combinations that changed performance classification, a change in performance classification did occur. Hence, the most appropriate data set to evaluate the SBRM performance (attaining the precision standard) would be to restrict the data set to only observed trips funded by SBRM. The SBRM FMAT recommends excluding compliance/state/other observed trips in the evaluation of the effectiveness of SBRM.

The conclusion and recommendation above then leads to the question of whether or not the compliance/state/other trips (i.e., ASM, ASMFC, NYSDEC) should be removed from the annual SBRM discard estimation and precision analyses. The need to decouple SBRM-funded observed trips from other observed trips (such as ASM for groundfish compliance monitoring) has been recognized in various SBRM discussions. The factors for consideration include:

- Programs that have different goals and objectives.
    - SBRM provides a foundation of observer coverage across all fleets for all council-managed species and turtles to achieve discard estimates with a given precision.
    - ASM provides coverage to ensure compliance of fishing regulations within subcomponents of some fleets.
- The deployment stratification between programs differs such that potential bias may occur.
- If ASM trips are "different" from NEFOP trips, then excluding ASM trips should occur to reduce potential bias.
- If ASM trips are the "same," then excluding ASM trips does not alter the shape of the CV curve (sampling the same population) and thus does not change the number of trips needed in the upcoming year. No directional bias in the discard variance is expected.
- Comparisons to determine if observed trips are "similar" between programs become more and more challenging as monitoring programs proliferate to support compliance monitoring of individual FMPs or permit category within an FMP.
- The intent of SBRM is to provide a sound allocation of observer coverage associated with the SBRM funding sources to form the foundation of observer coverage in the region such that all council-managed species (and turtles) will have discard estimates with a standard precision.
- Excluding compliance monitoring trips (e.g., ASM) or State-funded trips (e.g., ASMFC, NYSDEC that have NEFOP sampling protocols) from the SBRM analyses does not preclude their use in stock assessments or quota monitoring.
- The SBRM calculations are provided for the industry-funded scallop fleets to allow confirmation that the IFS program at least meets the SBRM 30% CV standard. The IFS fleets have additional data needs beyond SBRM that often lead to higher coverage rates.

Operationally, the compliance/state/other trips are not needed to estimate SBRM sample sizes in the upcoming year. While the variance of the sample variance will increase as sample size decreases, the estimate of the sample sizes needed is not expected to change (no directional bias is

expected). The discard variances are not incorporated in the importance filter and the discard estimates are not considered as definitive but rather indicative of where discarding is occurring.

It is reasonable to expect that individual FMP compliance monitoring observed trips (or State-funded observed trips) that have different objectives and goals, use different stratification, that may be limited in geographical area or type of permit, or that support varying levels of observer coverage on sub-components within SBRM fleets would contribute to potential bias within a SBRM fleet.

The stratification and differential coverage levels of the compliance monitoring trips could create potential bias within SBRM fleets. Hence, the SBRM FMAT recommends the exclusion of individual FMP compliance monitoring program trips from future SBRM annual analyses of discard estimation, precision and sample size analyses.

Variance Stability

Evidence suggests the assumption that discard variances are stable over time is valid, particularly for a one-year lag. If fishing behavior changes because of regulatory change, then relationship between years may weaken in the year following the regulatory change. A similar weakening in the relationship may occur when fish populations change – strong year class moving through the fishery. These types of analyses should be conducted on a periodic basis. Conducting sample size analyses annually minimizes the time to a 1 year difference.

6. REFINEMENTS TO SBRM METHODS

Fish/Invertebrates

The methods used for the 2015, 2016, and 2017 SBRMs are described in Wigley et al. 2007, 2015, 2016; Wigley and Tholke 2017; NEFSC and GARFO 2015, 2016, 2017. No changes to the methods used for discard estimation and precision occurred during the 3 years in review. However, methodological refinements have been incorporated into the sample size analyses used for fish/invertebrate species groups in the 2015, 2016, and 2017 SBRMs. These refinements are described below.

Importance filter refinement

Based on the 2011 SBRM 3-year Review Report FMAT results and recommendations[11], a refinement to the importance filters has been incorporated into the annual SBRM sample size analyses since 2012. The importance filter used in the 2015, 2016, and 2017 SBRMs does not include an unlikely filter (Figure 19).

Trip filter applied in 2015 SBRM but subsequently removed because of unintended consequences

A refinement to the sample size analysis was developed in 2014 to address the potential for excessive observer coverage created by using a pilot coverage policy for fleets with overall low activity. Pilot coverage had been designed to provide the minimum number of trips sufficient to compute the variance of discard estimates and subsequently the derivation of sea days needed. The number of sea days per quarter could not be reduced further without omitting the fleet from

[11] The 2011 SBRM FMAT found that no changes to the final determination of the SBRM standard sea days would have occurred if the unlikely filter had been removed from the importance file in 2009, 2010, and 2011 SBRM.

the sample size analysis. A standardized approach, similar to the 2 filters used in the importance filter (Wigley et al. 2007), was employed to remove fleets with overall low trip activity. This approach hereafter is referred to as the trip filter. In the trip filter, the percentage of VTR trips for a fleet was derived by dividing the number of VTR trips in a fleet by the total number of VTR trips across all fleets. The fleets were then ranked (smallest to largest) by the percentage of trips in a fleet and the cumulative percentage for each fleet was then derived. A cut point of 1% was selected to remove fleets that contained the lowest cumulative 1% of the total trips. Thus the trip filter excluded those fleets, which in aggregate, constituted less than 1% of all commercial fishing activity. Fleets which constituted the upper cumulative 99% of all trips remained in the analysis.

Before the trip filter was applied, trips associated with the MA shrimp trawl fleet were partitioned into 2 groups: trips fishing in Pamlico Sound and trips fishing in ocean waters. This partitioning was needed 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 total number of trips for the MA shrimp trawl fleet was adjusted before the trip filter was applied. When the trip filter was applied in 2015 SBRM, 21 of the 56 fleets were removed (See NEFSC and GARFO, 2015, Appendix Table 2; Table 5, Step 2). It is useful to note that the trip filter did not remove sea days associated with fleets that had discards determined to be important. Although the trip filter removed the fleets with overall low activity from the sample size analysis, some of these fleets may have had observer coverage assigned via the Pre-Trip Notification System (PTNS) or the scallop call-in program hence, the 2015 needed sea days may have been slightly underestimated. However, it is important to note that these fleets had very low trip activity and the activity was expected to remain low. 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. Such fleets fall below practical detection limits.

However, applying the trip filter resulted in unintended consequences to the importance filter, such as the significant challenges associated with unobserved fleets, as described below. To allow observer coverage to be obtained in all SBRM fleets, the trip filter is no longer applied. The trip filter was applied in 2015 SBRM (Note: the revised SBRM Amendment was not in place in 2014). The partitioning of Mid-Atlantic shrimp trawl trips between ocean and sound waters continued in 2015, 2016 and 2017 SBRMs.

Adjustment to the sea days needed were made prior to the prioritization process in 2016 and 2017 SBRM

In the SBRM annual analyses, there have been high sea day requirements (>2,000 days) in some fleets because of high variability of red deepsea crab discards. Policy decisions were made not to allow sea day requirements for red deepsea crab to drive the sea day requirements for the NE large mesh otter trawl fleet in 2016 and the NE lobster pot and NE large mesh otter trawl fleets in 2017. The details are described in full here from NEFSC and GARFO (2017).

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 2016 and 2017 SBRM analyses, there are some fleets without observer coverage and hence no estimated discards for these fleets to feed into the importance filter. The MA and NE crab pot fleets are among the fleets with no observer coverage in the time periods analyzed. There are several indications that substantial amounts of red deepsea crab discards occur in these 2 fleets. These indications are: fishery regulations that prohibit possession of female red deepsea 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.

The self-reported discards of red deepsea crab in the MA and NE crab pot VTR data were considered a minimum discard value and were explored to inform a decision to not allow the sea day requirement for red deepsea crab to drive the sea day requirement for the NE large mesh otter trawl fleet in the 2016 SBRM Annual Discard Report with Observer Sea Day Allocation. In 2017, the VTR self-reported discard value would result in the sea day requirement for red deepsea crab in the NE lobster pot fleet being excluded by the importance filter. However, the discard value in the NE large mesh otter trawl fleet would be within a few percentage points of having the sea day requirement excluded by the importance filter. It is recognized that the sea day requirement for red deepsea crab in the NE large mesh otter trawl fleet would not be excluded based on the importance filter alone, but a non-traditional data source was used for this investigation. In the SBRM analyses, it is also recognized that other fleets may be in similar situations, where the sea day requirement is driven by the requirement for a species group that is close to being excluded by 1 of the importance filters. Altering any aspect of the SBRM analysis and process is avoided unless the situation is particularly egregious, as it is in this case (4,460 sea days difference).

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. Thus, it appears that the red deepsea crab situation is unique in having a large amount of discards reported in VTR data for 2 unobserved fleets (MA and NE crab pot fleets). This situation was not anticipated in the development or early implementation of SBRM, and it could lead to a distorted priority in how to allocate resources and observers to obtain quality bycatch estimates of all fisheries. If an adjustment is not made, it is believed that allowing the red deepsea crab anomalies to dictate such a disparately high level of observer coverage, potentially at the expense of having available observers in other fleets, is inconsistent with the intent of the SBRM.

To address this situation temporarily, near-term decisions regarding sea day requirements were made in 2016 and 2017, and observers were deployed in the crab pot fleets in order to have the data to better inform the SBRM analysis next year. It was decided not to allow sea day requirements for red deepsea crab to drive the sea day requirements for NE lobster pot and NE large mesh otter trawl fleets in 2017. Further holistic explorations are being considered to determine if there are other solutions beyond simply increasing observer coverage.

If the sea day requirements for red deepsea crab were allowed to drive the process, the sea day requirement for NE large mesh otter trawl fleet would have been 3,531 days in 2016. For 2017 SBRM, the sea day requirements for NE large mesh otter trawl fleet would have been 5,256 days and NE lobster pot fleet would have been 602 days. Instead, coverage for these fleets was not based on the initial calculated sea days, but rather based on the penultimate sea day requirements: 760 days to meet requirements for fluke-scup-black sea bass in NE large mesh otter trawl fleet in 2016 SBRM and 796 sea days to meet requirements for fluke-scup-black sea bass in the NE large

mesh otter trawl fleet and 17 sea days (minimum pilot coverage) in the NE lobster pot fleet in 2017 SBRM, respectively (see NEFSC and GARFO 2016 and 2017, Table 5, Step 2).

Pilot Coverage and Minimum Pilot Coverage refinement in 2016 and 2017 SBRM

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, such as (a) when effort changed sharply between years, or (b) when the fleet effort comprises only a few trips. To address the latter, a refinement was made to the sample size/sea day analysis (Wigley et al. 2016): if there were less than 3 VTR trips in a fleet and quarter in the 12-month time period used in the analysis, then pilot coverage and minimum pilot 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. In each of the 2016 and 2017 SBRM analyses, there were 2 fleets where industry activity was so low that pilot coverage and minimum pilot coverage was zero. This refinement should not be confused with the trip filter described above, which is no longer in use.

In addition to the Fish/Invertebrate species group issues and recommendations above, the SBRM FMAT recommends these planned changes for future SBRM analyses:

(1) The inclusion of blueline tilefish (*Caulolatilus microps*) in the Tilefish species group in 2018 SBRM analyses;
(2) The consideration of ESA-list species such as sturgeon [Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*)] as species groups;
(3) Expansion of the sampling frame for New England and Mid-Atlantic lobster pot fleets to include all vessels using lobster pot gear in 2019 SBRM analyses; and
(4) Utilization of a PTNS-like system for all fleets.

Sea Turtles

Rarity filters

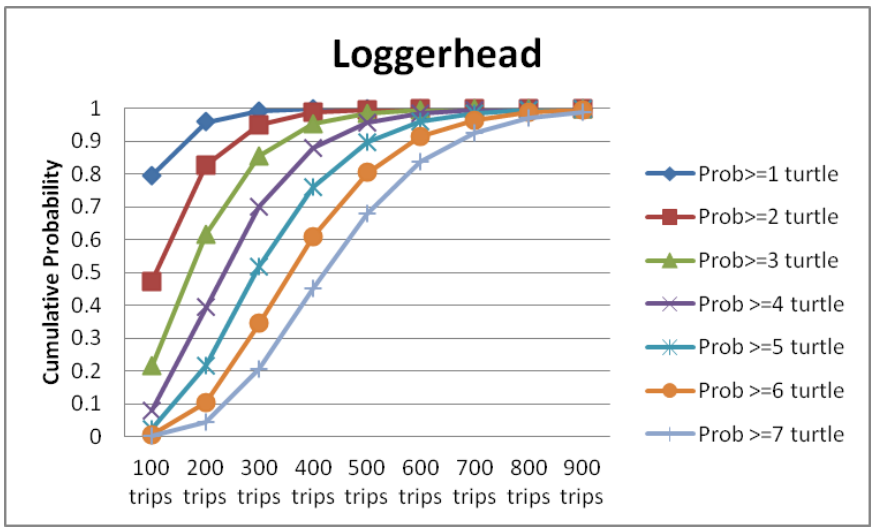
High levels of monitoring are typically required to estimate the magnitude of rare events with high precision (low CVs). Depending on the goal, at some point monitoring rare species may become impractical, given limited resources and the need to meet monitoring objectives for species managed under MSA and ESA. Under the current SBRM framework, “importance” filters are applied to the 14 species assemblages of fish to remove sea days associated with fleets that contribute the smallest fraction of discards and the smallest fraction of total mortality (Wigley et al. 2007). This is done to ensure that the observer coverage in the upcoming year is not driven by imprecise estimates of small quantities of discards. This section describes types of filters that could be explored for “rare” species (such as turtles), whereby species are filtered from gear types based on extremely low frequency of encounters with that gear type. Examples are provided here for individual sea turtle species, though use of the filters could also be explored for other rare fish species (such as sturgeon). The filter would operate at the individual species level, rather than the species assemblage filter as done for fish, because turtles and other species are managed at the individual species or distinct population segment level under the ESA. The “frequency of encounters” could be defined by (1) the probability of encountering a turtle given a certain amount of observer coverage; or (2) the observed encounter rate in the gear type over a 5-year period.

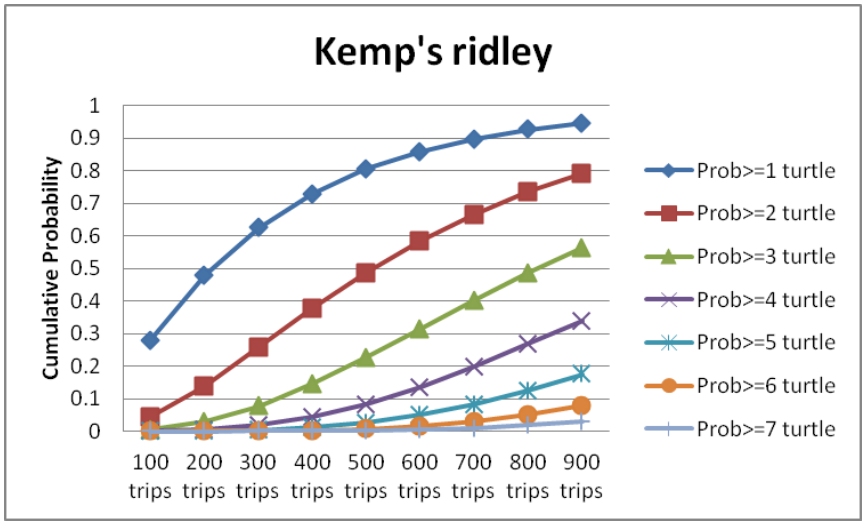
Turtle species would be filtered from gear types (i.e., determining monitoring amounts to achieve a 30% CV) when the probability of encounter or encounter rate is less than a specified value.

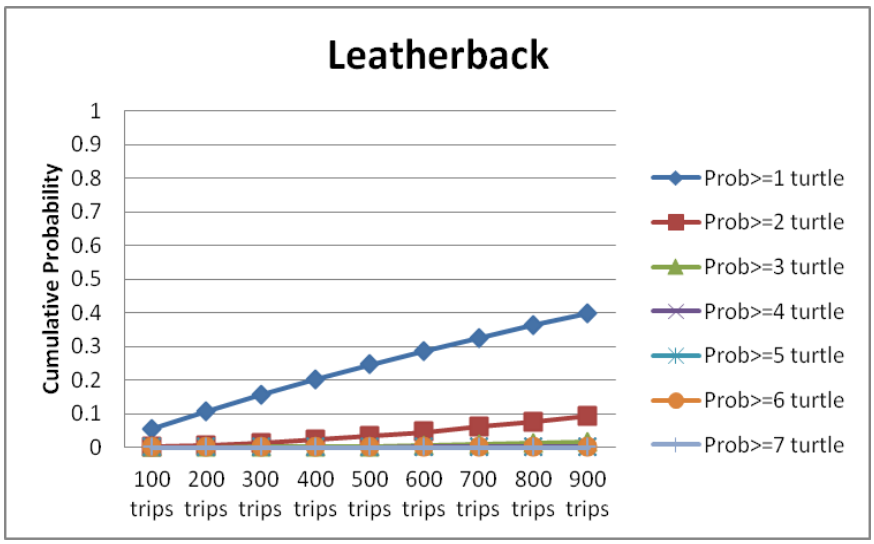
Filter 1: Probability of encounter

Wade (1999) outlines a process for evaluating the probability of observing 1 or more animals under various levels of observer coverage. The purpose is to investigate whether sampling is adequate to examine the expected number of observed mortalities for a given true mortality rate. One could use this approach to model the probability of observing 1 or more turtles of a given species, (knowing the "true" amount of turtle mortality in the fishery and the total amount of effort in the fishery from a recent analysis) under various amounts of sea day coverage.

For example, one could evaluate the probability of observing a certain number of turtles of a given species in sink gillnet gear for a given number of observed trips, based on estimated interactions and effort in the fishery from 2012-2016 (Murray 2018). The following figures depict the cumulative probability, assuming a Poisson distribution (Smith 1999), of observing designated counts of loggerhead, Kemp's ridley, and leatherback turtles given various amounts of observed gillnet trips:







A decision would need to be made on the minimum number of turtles that needed to be observed, as well as an acceptable probability of observing a turtle. The SBRM FMAT has recommended that for this filter, a turtle species would be filtered from SBRM sea day estimation if there was <50% probability of observing 5 or more turtles over 800 trips in a year. Five was chosen as a minimum number of turtles because in past sea turtle bycatch estimates for dredge, gillnet, and trawl gear, a CV of <= 30% was achieved when there were more than 5 loggerhead sea turtles observed per year. While many factors influence the precision of a bycatch estimate (such as estimation method, characteristics of the sample, sample size, etc.), 5 turtles was chosen as the threshold for the number of sea turtles needing to be observed. In the past several years, fisheries observers have sampled at least 800 trips in gillnet and trawl gear in the Mid-Atlantic region, so 800 was recommended as the level of monitoring for evaluating probability scenarios.

If one were to apply this filter in practice using the cumulative probabilities shown for loggerhead, Kemp's ridley and leatherback turtles in Mid-Atlantic gillnet gear, then Kemp's ridley and leatherback turtles would be filtered out, and observer coverage would be driven by loggerhead species or by fish assemblages, based on the 30% CV precision goal.

Filter 2: Encounter rate

An alternative and simpler metric might be to filter a turtle species based on its encounter rate in observed trips over the most recent 5-year period. The following table shows the number of observed trips, observed turtle encounters, and encounter rate (turtles/trip) in sink gillnet gear in the Mid-Atlantic and Georges Bank (GB) from 2012-2016:

Year	No. of observed trips in MA/GB sink gillnet gear	No. of observed loggerhead /encounter rate	No. of observed Kemp's ridley/ encounter rate	No. of observed leatherback /encounter rate
2012	638	6/0.01	1/0.00	1/0.00
2013	607	4/0.01	0/0	0/0
2014	955	10/0.01	0/0	0/0
2015	988	5/0.01	6/0.01	0/0
2016	1226	2/0.00	0/0	1/0.00

Year	No. of observed trips in MA/GB sink gillnet gear	No. of observed loggerhead /encounter rate	No. of observed Kemp's ridley/ encounter rate	No. of observed leatherback /encounter rate
Total	**4414**	**27/0.01**	**7/0.00**	**2/0.00**

A decision would need to be made on the encounter rate threshold which triggers the filter. For instance, if the encounter rate threshold was set at 0.01 (i.e., 1 turtle observed in 100 trips), then any species with an encounter rate <0.01 over the 5 year period would be filtered out, and coverage levels in gillnet fleets would be driven by other species groups. In the example above, Kemp's ridley and leatherback turtles would be filtered out, and observer coverage would be driven by loggerhead species or by fish assemblages, based on the 30% CV precision goal.

The SBRM FMAT prefers Filter 1 because it is a more informed metric to determine rarity; therefore, they did not identify an encounter rate threshold which would trigger this filter.

Application of Filter 1: An Example

An example of how filter 1 might be applied to the annual SBRM sample determination process is as follows:

Step 1: Utilize the most recent turtle analysis which reports the total number of turtle interactions and CVs, by species, in a gear type in a region of interest (i.e., Mid-Atlantic).

Step 2: Based on estimated interactions and effort in the gear type of interest, determine if the species is too "rare" to estimate coverage levels in the upcoming SBRM year. This will be based on decision criteria established for Filter 1 to define "rarity" (e.g., the probability of observing >=5 turtle in 800 trips is <50%). If no, (species is not considered too rare), proceed to Step 3. If yes, (species is considered too rare), stop here and coverage needs will be driven by other species groups.

Step 3: Estimate the amount of sea days needed to achieve a 30% precision goal around turtle interaction rates in the gear type.

Step 4: Integrate sea days needed for turtles with those needed for fish in the SBRM prioritization and allocation process.

If Filter 1 was to be applied to turtles in gillnet fleets in SBRM 2018, based on the example decision criteria in Step 2, Kemp's ridley and leatherback turtles would be filtered out and sea days for all turtles would be driven by loggerheads.

Had Filter 1 with the same decision criteria been utilized in determining sea day coverage for turtles in the years covered by this review, loggerhead turtles would not have been filtered in either Mid-Atlantic sink gillnet or bottom trawl gear. Estimates of non-loggerhead species are not available in earlier time periods to assess whether they would have been filtered out under this approach.

Rarity filters for other ESA-listed species (e.g., Atlantic salmon, sturgeon) should be evaluated and implemented. In some cases, the rarity filter described for sea turtles may be appropriate for other species. In other cases, new filters may need to be considered and developed.

For example, bycatch estimates are sparse for Atlantic salmon because of their low occurrence in bycatch data. Therefore, it may not be appropriate to use the filter described for sea turtles for Atlantic salmon. Different filters may need to be considered for this species. For ESA-listed bycatch species, the FMAT recommends that rarity filters be considered and implemented, as appropriate.

Combining Sea Days Needed for Fish/Invertebrates and Sea Turtles

The approach used to combine the sea days needed for fish/invertebrates and sea turtles is described in the annual allocation of observer sea days (NEFSC and GARFO 2015, 2016, 2017). The approach used in these 3 years differs slightly from the approach used previously. The use of VTR sea days (rather than the sea days needed for fish) represents a refinement to the sea day allocation methods used in 2012, 2013, 2014, and those described in the 2015 SBRM Omnibus Amendment. This refinement results in the sea days needed to monitor turtles to be distributed among fish/invertebrate fleets based on industry activity. Additionally, this refinement preserves the number of turtle days within each turtle gear type group. These 2 features were not present in the previous method in which the numbers of day needed for fish/invertebrates were used.

7. ACCURACY AND POTENTIAL SOURCES OF BIAS ANALYSES

7.1 Methods

Vessel Selection Bias: qualitative analysis

The annual 2015, 2016, and 2017 SBRM data sets for VTR and OB were used. The numbers of annual trips for each distinct vessel were summed within each data set, fleet, and SBRM year. The cumulative sum of trips by distinct vessels within each data set, fleet, and SBRM year was derived by ordering (largest to smallest) the number of annual trips made by distinct vessels. The cumulative percentage of the annual kept weight of all species and the cumulative percentage of distinct vessels was derived by ordering the sum of the annual kept weight of all species for a given vessel, from largest to smallest, then converting to the percentage of the sum of the kept weight of all species for the fleet for each fleet and SBRM year, and summing the percentage over the number of distinct vessels.

Vessel Selection Bias: exploratory quantitative analysis

Vessel selection bias was explored using randomized tests to explore how likely the observed frequencies of vessels being selected for an observed trip would be if the selection process were completely random. The metric maximum number of observed trips for a given permit was used. The VTR trips used in the annual SBRM data sets were tagged as either unobserved or observed using one or the other of 2 methods. For the July 2013 through June 2016 time period, the VTR serial number reported on any observed trips in the NEFSC's observer database was used to find the corresponding VTR trip identifier in the VTR database and then matched to VTR trips within the SBRM analysis data set. If a VTR trip had an observer of any kind, then the trip was tagged as observed. Additionally, a trip midpoint matching scheme was also used to identify VTR trips that had an observer on board. For a given permit, a VTR and observed trip were considered a match if the midpoint of a VTR trip fell between the dates of the observer trip. When a match occurred, the VTR trip was tagged as observed for this method. If a

VTR trip was tagged as observed by either method, the VTR trip was marked as observed for the analysis. For each SBRM year, fleet, and permit, the number of observed trips was calculated, and the maximum value was determined (referred to as the maximum number of observed trips for a given permit). For each SBRM year and fleet examined, 5000 randomized trials were conducted by randomly assigning an observed flag across all possible trips. For each randomized trial, the maximum number of observed trips for a given permit was derived and a distribution of these maximum values was formed. For each SBRM year and fleet, a p-value was calculated as the number of randomized trials with a greater maximum observed trips for a single permit divided by the number of randomized trips (5000). A low p-value indicates that it is unlikely that the actual maximum number of observed trips per permit was due to chance alone, thus indicating vessel selection bias.

Observer Bias

In this report, observer bias is defined as a differential outcome of a trip when an observer is present compared to when an observer is not present on a commercial fishing trip. Two trip outcomes were examined: mean trip duration and mean kept weight of all species on unobserved and observed VTR trips within a fleet were evaluated to determine if observer bias occurred on trips in the 2015 – 2017 SBRM annual analyses. A randomization test was used to determine whether the difference between the means is large enough to reject the null hypothesis that the 2 groups (unobserved VTR trips and observed VTR trips) have the same outcomes.

The VTR trips used in the annual SBRM data sets were tagged as either unobserved or observed using one or the other of 2 methods. For the July 2013 through June 2016 time period, the VTR serial number reported on any observed trips in the NEFSC's observer database was used to find the corresponding VTR trip identifier in the VTR database and then matched to VTR trips within the SBRM analysis data set. If a VTR trip had an observer of any kind, then the trip was tagged as observed. Additionally, a trip mid-point matching scheme was also used to identify VTR trips that had an observer on board. For a given permit, a VTR and observed trip were considered a match if the midpoint of the VTR trip fell between the dates of the observer trip. When a match occurred, the VTR trip was tagged as observed for this method. If a VTR trip was tagged as observed by either method, the VTR trip was marked as observed for the analysis. The means of each metric were derived for each VTR trip group (unobserved and observed) within each fleet for fleets in which there were at least 30 observed trips. Although the NE and MA surfclam and ocean quahog dredge fleets were excluded from the analysis because these fleets had less than 30 observed trips (Table 5), these fleets would have also been excluded from this analysis because this fishery does not use VTR (no VTR serial number available to distinguish a unique trip) and the trip's sail date are not reported in the clam logbook or dealer data. Plots of unobserved and observed mean trip duration and mean kept weight of all species by fleet were made for each SBRM year. A linear regression with 68% confidence ellipse was shown for each plot to demonstrate the strength of the relationship. The actual difference of mean trip duration and the actual difference of mean kept weight of all species between VTR trip groups (unobserved minus observed) were derived by fleet and SBRM year and then compared to the distribution of differences for each metric derived by randomizing the VTR trip tag defining the 2 groups of VTR trips ("unobserved" or "observed"). For each fleet and SBRM year examined, 5000 randomized trials were conducted. For each randomized trial, the differences between metric means were derived and a distribution was formed. For each fleet and SBRM year, a p-value was calculated as the number of randomized trials with a greater absolute difference than the actual difference

divided by 5000 (the number of randomized trials). A low p-value indicates that it is unlikely that the actual difference between metric means of the 2 groups of VTR trips was due to chance alone, thus indicating observer bias.

7.2 Results

Vessel Selection Bias: qualitative analysis

There are a few vessels that appear to have been selected at high or low rates during some timeframes that may need additional investigation; however, some variation in vessel selection rate is expected because of random sampling within a fleet. Overall, there was no evidence of systematic vessel selection bias (Figure 20). Observed trips generally occurred over the range of number of trips made by vessels within a fleet and SBRM year, with no obvious over- or under-sampling of few or many trips per vessel. Observed trips generally occurred over the range of the cumulative distribution of annual kept weight by a vessel, with no obvious over- or under-sampling of low or high catch trips (Figure 20, right-hand plots).

Vessel Selection Bias: exploratory quantitative analysis

There was no evidence of vessel selection bias, as measured by the maximum number of observed trips for a given permit in 35 (66%) of the 53 fleets (Table 26). Of the fleets with evidence of vessel selection bias, generally no pattern among fleets stands out; however, evidence of vessel selection bias was present in some gillnet fleets examined. Figure 21 depicts the results from the randomization tests for 1 fleet, the NE extra large mesh gillnet fleet (Row 29), in each of 3 SBRM years for the maximum number of observed trips for a given permit.

Observer Bias

There were 53 fleets (unique SBRM year and fleet combinations) with 30 or more observed VTR trips (Table 26). These fleets comprised mostly otter trawl, gillnet, and scallop dredge gear. The sample sizes varied by VTR group, SBRM year, and fleet. The sample sizes of unobserved VTR trips within a SBRM year and fleet were generally greater than 2,000 trips, and the sample sizes of observed trips were generally greater than 100 trips. The mean trip duration and mean kept weight of all species for unobserved and observed VTR trips by SBRM year and fleet are given in Table 26 and Figure 22.

For differences in mean trip duration, the annual 68% confidence ellipses of the linear regression are centered on the identity line, indicating no strong, large-scale systematic bias for these fleets (Figure 22, top plot). The differences in mean for trip duration ranged from -1.75 to 0.74 days. Of the 53 fleets examined, 41 fleets (77%) had differences of means less than zero indicating observed trips were slightly longer in duration than unobserved trips. However, these differences were generally less than half a day (0.5 days) with only 5 fleets (SBRM year and fleet combinations) greater than a day (the unit of measure of the metric examined). The fleets are: MA small mesh otter trawl (Row 5) in SBRM 2016, NE large mesh otter trawl (Row 8) in SBRM 2015, MA open limited scallop dredge (Row 38) in SBRM 2017 and the NE lobster pot (Row 50) in SBRM 2016 and SBRM 2017. Figure 23 depicts the results from the randomization tests for 1 fleet, the NE extra large mesh gillnet fleet (Row 29), in each of 3 SBRM years for each metric: mean trip duration (top panel) and mean kept weight of all species (bottom panel). The differences of the mean metric between unobserved and observed VTR trips from the 5000 randomized trials forms a probability distribution of the possible differences under the null hypothesis that the VTR

trip tag (unobserved/observed) is exchangeable (i.e., the mean of the 2 groups are the same). The actual difference of the mean metric is given by the green solid vertical line (Figure 23). In this fleet, there is evidence that the difference in mean trip duration between the 2 VTR trip groups is large enough to reject the null hypothesis in SBRM 2016 and 2017 but not in SBRM 2015 (Figure 23; top panel). In other words, there was evidence of observer bias in SBRM 2016 and 2017 with respect to trip duration (observed trips had longer trip durations than unobserved trips). In this fleet, there is evidence that the difference in mean kept weight between the 2 VTR groups was large enough to reject the null hypothesis in SBRM 2017 but not in SBRM 2015 and 2016 (Figure 23; bottom panel). In other words, there was evidence of observer bias in SBRM 2017 with respect to kept weight of all species (observed trips had greater kept weight than unobserved trips). There were 31 of the 51 fleets (58%) with a p-value >= 0.05 indicating there was no strong evidence to reject the null hypothesis that mean trip duration between unobserved and observed VTR trips are the same.

For differences in mean kept weight of all species, the annual 68% confidence ellipses are centered on the identity line, indicating no strong, large-scale systematic bias for these fleets; however, there were some SBRM years and fleet combinations outside the ellipse that were above and below the identity line (Figure 22; bottom plot). The differences in mean kept weight of all species ranged between -86,568 and 14,749 pounds. Of the 53 fleets examined, 45 fleets (85%) had differences in means less than zero indicating the kept weight of all species was greater on observed trips than unobserved trips. For the majority of fleets (75%), the absolute differences in means was less than 25% of the unobserved kept weight. There were 25 of the 53 fleets (47%) with a p-value >= 0.05 indicating there was no evidence to reject the null hypothesis that the mean kept weight of all species is the same between unobserved and observed VTR trips. There were 28 fleets (53%) for which there was evidence (p-values < 0.05) to reject the null hypothesis. Of these 28 fleets, 14 fleets had absolute differences in means that were less than 25%; however, there were 6 fleets in which the difference in means were greater than 100% of the unobserved kept weight. The 6 fleets are: MA small mesh otter trawl (Row 5) in 2016, NE small mesh otter trawl (Row 7) in SBRM 2015, 2016, and 2017, and the NE lobster pot fleet in SBRM 2016 and 2017. For 21 (40%) of the 53 fleets examined, there was no evidence of observer bias in both metrics (mean trip duration and mean kept weight of all species) while there was evidence of observer bias in both metrics for 18 fleets (34%) indicating observed trips were long in duration and kept weight was greater than unobserved trips. For 14 (26%) fleets, there was no evidence of observer bias in 1 metric, but there was evidence in the other metric. There were some fleets with potential observer bias in the trip duration; however, the bias appears to be small (for most fleets, less than half a day) based on the difference of the means. The majority (32 of 53) of fleets have less than 20% difference (in absolute magnitude) from the unobserved mean catch. For the 28 fleets for which there was evidence of potential observer bias in the kept weight of all species, the bias appears to vary in magnitude among these fleets. The largest absolute differences were generally associated with larger mean catch weights.

7.3 Discussion

Vessel Selection Bias

There are some observed trips for vessels without a VTR (red bars without a blue bar). These occurrences are not wide spread and primarily occurs in MA and NE small mesh otter trawl fleets. Data leveraging between databases remains important (cross-checking OB and VTR for subtrip reporting compliance) when these data are audited. These occurrences may indicate

possible VTR trips that have not reported all gear/mesh combinations used during a trip. Another contributing factor may be the use of mesh size groups. A boundary (use of cut-point to partition mesh size groups) point must be used; however, the cut-point used may not always coincide with the observer data mesh size because the observer mesh size is an average of 10 mesh size observations and mesh can stretch and/or shrink with use

There are multiple selection systems in use: PTNS for fleets associated with Northeast Multispecies FMP, call-in program for fleets associated with the scallop FMP, and dock-side intercept for remaining fleets. Qualitative and quantitative results by fleet do not reveal differences among selection systems. The ASM data are included in the analysis. The PTNS is used to deploy at-sea monitors on some trips in NE fleets that are associated with the Northeast Multispecies FMP.

Observer Bias

Randomization tests utilize probability theory to express the likelihood of chance as a source for the difference in an outcome. Randomization tests provide a level of significance as a measure of strength of the evidence against the null hypothesis. Randomization tests can be used on data that are not normally distributed. Randomization tests are valid even without random samples (Manly 1997).

Database limitations require multiple approaches to identify VTR trips. There may be some VTR trips that were observed but not identified as such. All observed trips (included those trips that were not used in SBRM) were used to identify which VTR trips had an observer on board.

In the analysis, 2 groups of VTR data were used. Randomization tests do not identify causes of outcome differences (such as VTR reporting differences versus fishing behavior differences). Observer bias can be due to different causes.

Some SBRM fleets are known to have skewed distributions for trip duration and/or kept weight of all species because of the vessel composition within a fleet (vessel size, port location, etc.). Randomization tests are not restricted to normally distributed data. Using the mean of the 2 metrics in the randomization tests is consistent with how these data are used in the annual SBRM analysis (i.e., means are used and data are not transformed).

There were some fleets that had relatively minor differences in mean kept weight of all species (e.g., <20%) even when there was evidence that the means were not the same. Fleets with greatest differences in mean kept weight of all species (sometime more than 100%) were fleets with a bi-modal distribution of mean trip duration and/or mean kept weight of all species. NE lobster pot fleet (Row 50) is an example of a fleet with bi-modal trip duration (both near-shore and offshore trips). MA and NE small mesh otter trawl fleets (Rows 5 and 7) are examples of fleets with bi-modal distribution in kept weight of all species. The use of Pretrip Notification System or similar system would improve vessel selection in some fleets, including those with bi-modal trip duration and/or kept weight of all species. Note, the vessel selection plots (and the randomized tests) for fleets with differences in mean kept weight of all species do not reveal evidence of vessel bias. This is a reminder that examining data using multiple approaches can be useful before drawing a conclusion.

Statistical versus practical differences should be considered when evaluating these results. Significant differences (i.e., reject the null hypothesis) indicates that differences in group means are not likely caused by sampling error. However, if the sample size is large enough, then statistically significant differences can be found even with very small differences. Awareness of

sample sizes and the magnitude of the absolute differences in means should be considered when interpreting results.

Recent studies examining observer data for potential bias have mostly focused on groundfish fleets (subcomponents of selected fleets within SBRM). A comprehensive examination of potential bias in all SBRM fleets is a large task that will continue to require future work. Future analyses could consider additional trip outcome metrics such as mean number of species reported, number of areas fished, and an evaluation of minimum observer sample size (i.e., could fleets with less than 30 observed trips be considered). The use of 30 observed trips (the minimum sample size selected for the bias analysis) is greater than the minimum pilot coverage (12 observed trips) prescribed for some fleets. The difference in sample sizes resulted in the exclusion of minimum pilot coverage fleets from the bias analysis.

8. IMPLICATIONS FOR MANAGEMENT

8.1 Consequences to Management when SBRM Performance Standard Is Not Met

Species managed under Council FMP or protected under ESA

For fish and invertebrates, the species group and fleet combinations for which the SBRM performance standard was "Not Met" for SBRM years 2015-2017 are listed in Appendix Tables 5 and 6. Over all, there were 8 species group/fleet combinations with "Not Met" cells in 2015 (large mesh groundfish in NE hand line and NE Lobster Pots/Traps; monkfish in MA large mesh otter trawl, MA extra large mesh gillnet, and MA scallop dredge; squid-butterfish-mackerel in NE small mesh otter trawl; red deepsea crab in NE large mesh otter trawl; and spiny dogfish in NE Haddock separator trawl), 7 in 2016 (small mesh groundfish in MA small mesh otter trawl; squid-butterfish-mackerel in MA small mesh otter trawl; red deepsea crab in NE large mesh otter trawl; skate complex in MA twin otter trawl; and spiny dogfish in NE haddock separator trawl, MA small mesh gillnet, and NE midwater trawl), and 6 in 2017 (spiny dogfish in NE longline and MA scallop trawl; small mesh groundfish in MA small mesh otter trawl; monkfish in NE small mesh otter trawl; and red deepsea crab in NE large mesh otter trawl and NE Lobster Pots/Traps). For loggerhead turtles, the SBRM performance standard was not met in the MA scallop dredge for the time period of January 2009 – December 2014 (Table 1; Table 16).

The SBRM performance standard may not be achieved if there are insufficient sea days in a given fleet. Inadequately funded fleets (caused by funding shortfall or policy decisions to not fully fund selected fleets) and/or unaccomplished sea days may result in insufficient sample sizes and CVs that are greater than 30% for 1 or more species groups within a given fleet. There were 5 fleets that were not fully funded in SBRM 2015-2017. In 2015 SBRM, fleets not fully funded because of funding shortfall were: MA small mesh otter trawl (Row 5, turtles) and NE large mesh otter trawl (Row 8, red deepsea crabs; NEFSC and GARFO 2015). The policy decisions in 2016 and 2017 regarding red deepsea crabs results in fleets that would not be expected to meet the 30% CV standard: NE large mesh otter trawl (Row 8, red deepsea crabs; NEFSC and GARFO 2016) in 2016 and NE large mesh otter trawl (Row 8, red deepsea crabs) and NE lobster pot (Row 50, red deepsea crabs; NEFSC and GARFO 2017) in 2017. Unaccomplished days have been described previously (see Section 3.0). The decision not to fully fund selected fleets has been described previously (see Section 6.0)

There is a temporal difference between the SBRM analysis timeframe (July through June) versus the annual sea day allocation cycle (April through March), which may also differ from the ultimate use of discard data (e.g., many stock assessments use January through December). As a result, the impacts to estimated discard precision may be spread over multiple analysis periods.

Unknown cells are those in which the CV was unknown because of no or insufficient observer coverage (pilot fleets), and are listed in Table 19. These cells are generally unlikely to produce substantial discards and would usually be filtered out in the SBRM prioritization process (an exception might be red deepsea crab discards in the crab pot fleets). Consequently, these unknown cells are not expected to change catch estimates that would impact management decisions. The number of unknown cells has decreased steadily (Table 18) with the implementation of the formulaic prioritization process in 2015.

For the scallop fishery, the number of sea days assigned to the fishery has exceeded the amount SBRM dictates, for years 2015-2017. The observer coverage to monitor the scallop fleets is partly funded by the scallop observer set-aside, and federal funding is used to cover shore-side administrative costs. The scallop FMP established the observer set-aside program (Industry-funded Scallop Program that increases coverage beyond SBRM) to improve bycatch estimates of finfish caught in the scallop fishery, monitor interactions of the scallop fishery with endangered and threatened sea turtles, and provide for at-sea biological sampling.

The 30% precision standard was not met for estimates of loggerhead interactions in scallop dredge gear (73% CV; Murray 2015b), nor for Kemp's ridley (49% CV) or leatherback turtles (71% CV) in sink gillnet gear (Murray 2018). Estimated loggerhead interactions in scallop dredge gear had low precision because of the lack of "observable" interactions in gear equipped with turtle excluder devices (Murray 2015a). As noted earlier, since 2015 observer coverage levels in the Mid-Atlantic scallop dredge fleets have been driven by other species groups because of the lack of observable turtle interactions. Estimated Kemp's ridley and leatherback interactions in gillnet gear also did not meet the 30% precision goal; this is not surprising as the level of observer coverage in Mid-Atlantic sink gillnet gear was designed to meet precision goals only for loggerheads. Encounters with Kemp's ridley and leatherback species are not as common as loggerheads, and these low encounter rates likely contributed to higher variability around the estimates.

Fish and Invertebrates species groups

As mentioned above, each year some species group/fleet combinations may not achieve the performance standard for estimating discards. When evaluating the impacts to management, it is also useful to consider the precision of total discards of a species group combined across all fleets (this is not suggesting that the performance standard should be changed). Table 14 lists the species groups and the total amount kept and discarded each year for 2015-2017. Of the 42 (14 species groups x 3 years) estimates of total discards, there were 6 instances in which the precision of the total discards of a species group exceeded a 30% CV. These were: Atlantic salmon in 2015 (90% CV), Atlantic herring in 2015 (48% CV) and 2016 (31% CV), red deepsea crab in 2015 (35% CV), Atlantic surfclam-ocean quahog in 2016 (37% CV) and 2017 (44% CV), and golden tilefish (*Lopholatilus chamaelonticeps*) in 2016 (38% CV). For most of these cases, discards represented less than 1% of total catch, so were a minor component of total catch.

In the annual discard reports, Table 5B in Wigley et al. 2015, 2016 and Wigley and Tholke 2017, breaks out the species groups by species. When examined by individual species, there are additional cases where the total estimated discards across all fleets has a CV greater than 30%.

These were: white hake (*Urophycis tenuis*) in 2015 (95% CV) and 2016 (34%), offshore hake (*Merluccius albidus*) in all 3 years (47% CV 2015, 42% CV 2016, and 37% CV 2017), Atlantic mackerel (*Scomber scombrus*) in 2015 (65% CV) and 2016 (33% CV), northern shortfin squid (*Illex illecebrosus*) in 2015 (33% CV), longfin inshore squid (*Doryteuthis [Amerigo] pealeii*) in 2017 (38% CV), Atlantic cod in 2017 (32% CV), and Atlantic wolffish (*Anarhichas lupus*) in 2017 (101% CV). While the SBRM 30% CV performance standard applies to species group and fleet combinations, lower precision of estimated discards for these individual species may impact efforts to assess and manage these species. However, for most of these species with discard CVs above 30%, the total amount of fish discarded is low compared to the amount of fish kept and landed, so less precise estimates of discards may not have an impact on total catch of the species. The exception is offshore hake, where the amount discarded often exceeds the amount kept and landed. However, total catches of offshore hake were low overall. Therefore, the potential impacts of less precise discard estimates on management/science would likely be low.

Some species are managed at a stock level that is not coastwide. To provide additional perspective on CVs at the stock level, Table 27 summarizes the available discard CVs used in recent Northeast Stock Assessment Workshop benchmark assessments from 2014-2016, Northeast groundfish operational assessments, and the most recent Mid-Atlantic Data Updates (reports presented to the Scientific and Statistical Committee [SSC] meetings). For the stocks with available information, nearly all estimates for total discards had a 30% CV or less. Total estimated discards used in the stock assessments represent 1 or more fleets - the largest contribution to the total catch will contribute the most to the resulting precision at the stock level.

It is important to note that discard uncertainty is not the only source of uncertainty in an assessment – other inputs such as survey indices, natural mortality assumptions, catchability assumptions, etc. all have varying degrees of uncertainty and that uncertainty may or may not be integrated into assessments. If discard estimates are or become a substantial source of mortality, lower precision discard estimates could potentially impact management. Assessment results could be less precise, leading to inconsistent estimates of stock status and sustainable catches. If discard imprecision increases overfishing limit (OFL) uncertainty, a Council's SSC may recommend lower Acceptable Biological Catch (ABC) limit. This could lead to less fishing opportunities and foregone yield. While SSCs have not specifically tied uncertainty in estimated bycatch to particular ABC reductions, the MAFMC SSC has highlighted the uncertainty in commercial discards as a key consideration in its application of the Council's risk policy in recommending ABC for some species, including Atlantic mackerel, longfin inshore squid, and northern shortfin squid. Highly imprecise discard estimates could lead to annual catch limits (ACL) overages and reactive paybacks that can disrupt future fishing years. In such a situation, a Council may use management uncertainty buffers or larger discard set-asides to decrease chances of an ACL overage, which could further reduce fishing opportunities and yield. While these kinds of paybacks and subsequent uses of larger buffers have no happened to date, proactive management uncertainty buffers are used in the management of butterfish (*Peprilus triacanthus*) and Atlantic mackerel partly to account for the variability in discard estimates, even though the estimates are not imprecise by SBRM standards. The Northeast Skate Complex FMP also utilizes an uncertainty buffer between the ABC and total annual limit (TAL), partially because of concerns about discard imprecision (NEFMC 2018a). The OFL is not defined for the skate complex.

Given the management implications of discard estimates, stakeholder distrust and frustration may arise from imprecise discard estimates, but this does not appear to be occurring currently related to commercial discard estimates of Council-managed SBRM species.

ESA Species

Currently, estimates of interactions between commercial fishing gear and sea turtles are available for trawl (loggerheads; Murray 2015a), gillnet (loggerhead and hard-shelled; Murray 2013), and scallop dredge (loggerhead and hard-shelled; Murray 2011, 2015b) gear in the US Mid-Atlantic. To inform section 7 consultation under the ESA, interactions were further estimated by managed fish species landed for trawl and gillnet gear in several of those reports (Murray 2013, 2015a). Section 7 biologists in the NMFS Greater Atlantic Region assigned these interactions to the appropriate FMP and used the information to evaluate impacts to turtles from proposed actions under the FMP. Specifically, the bycatch estimates were used to determine current incidental take rates in the fisheries and to assess whether the continued authorization of the fisheries would jeopardize the continued existence of the species. If the authorization of 1 or more fisheries is determined to jeopardize the species, mandatory reasonable and prudent alternatives (RPAs) are required to remove jeopardy. Should the consultation conclude that a fishery will not jeopardize the continued existence of the species, an incidental take statement (ITS) is issued. Mandatory reasonable and prudent measures, and terms and conditions accompany the ITS. These measures are designed to minimize and monitor the impact of the fishery on the species.

As these estimates are used to assess fishery level impacts to sea turtles, changes in the precision (i.e., CV) of these estimates have potential implications for management. Less precise estimates (i.e., CV >30%) will have larger confidence intervals. Regardless of higher uncertainty in the bycatch estimate, the estimate, in combination with other sources of information, will still be used to make a determination of fishery level impacts to sea turtles as it is the best available information at the time of a Section 7 Assessment. To avoid underestimating impacts to sea turtles, the upper ends of the catch estimates' confidence intervals are often used in an assessment of impacts. Therefore, with less precision, the analyzed impact level of sea turtle incidental take[1] may be higher than what is actually occurring, resulting in an overestimate of the level of impacts a fishery may be having on a sea turtle species. This in turn would have management consequences as ESA section 7's jeopardy determination will decide whether a proposed fishery action will or will not need to be modified to eliminate jeopardy to the species (i.e., RPA). Any management decisions concluded during ESA Section 7 consultation remain in place until new information becomes available to potentially change this determination.

Atlantic salmon bycatch is very rarely observed (Tables 8 and 9; Figures 6, 7, and 8; NMFS NEFSC FSB 2017). In evaluating the number of fleets by performance classification for 2015-2017 (Table 20), Atlantic salmon were always classified as not applicable, unknown, or filtered out by the importance filter. In no fleets were the performance classifications categorized as met or not met. Sea days required to monitor Atlantic salmon bycatch with 30% CV precision have not been projected because of the low encounter rate of these species.

Although this could have management implications, observer coverage levels in SBRM fleets operating in the Greater Atlantic Region are driven by other fish species groups, many of which overlap in time and space with Atlantic salmon. This ensures that some level of coverage still exists to help monitor Atlantic salmon bycatch and inform management (e.g., ESA section 7). The observed bycatch data from these programs is considered in recovery planning, Section 7 consultation, and other management actions.

8.2 Other Management Implications: Nonfederally Managed Species

While not directly related to SBRM performance (since non-federally managed species are not included in the SBRM), there are regular occasions when discards of non-federally managed species are caught in federally-managed fisheries, and these discards may be important for assessment/management purposes. Precision of those non-federally management species does not determine SBRM observer sea day coverage, but observers record all catch on observed hauls when on a trip, so data are generated for non SBRM species. Data collected under the SBRM can be used to estimate the discards of non-federally management species in federal fisheries, for example see Tholke et al. 2017.

Councils may develop separate monitoring programs, such as the proposed industry-funded monitoring for the Atlantic herring fishery (related to river herring bycatch) to address perceived coverage gaps. The SBRM framework also allows for contributions and collaboration with non-federal stakeholders to increase observer coverage above the level called for by the SBRM, which could improve CVs for non-federally managed species in federal fleets. For example, the ASMFC has secured funding through Atlantic Coastal Cooperative Statistics Program to increase observer coverage to improve discard estimates in fleets of interest in the Mid-Atlantic region. While this increased coverage can provide more precise discard estimates, it can also cause outreach problems as fishermen are approached more often for observer coverage. In addition, monitoring programs with different goals/objectives or stratification from the SBRM may be very difficult to combine. As mentioned previously, the SBRM was designed to meet the specific requirements of the MSA and, as a result, is focused on species managed under a Council FMP or protected under the ESA. Expanding the focus of the SBRM beyond these species would require careful consideration of the potential implications. If the list of species groups considered within SBRM is to be expanded, then the next steps would include: (1) developing a list of non-federally managed species (all or a selected subset of species that occur in federal waters) that would particularly benefit from additional discard information that could be addressed through SBRM (before adding species, an evaluation of current discard information would need to occur); (2) exploring the stratification needed for non-federally managed species and evaluating if existing stratification of fleets is adequate; and (3) if appropriate, developing prioritization protocols for when funding is inadequate for fleets where the determining species is a non-federally managed species, including considering that coverage of fleets driven by non-federally managed species could result in lower precision of federally managed species' discards in other fleets if overall funding remains constant (or decreases).

SBRM data are also used for a wide variety of other purposes, for example conservation under the Marine Mammal Protection Act, quota monitoring, development of management alternatives by Councils, and public data requests. While SBRM data are often important for these purposes, the evaluation of the effectiveness of SBRM data for these other uses is beyond the scope of this report.

8.3 Management Implications: Summary

In summary, the precision of discard estimates could impact management, but there is no indication that current levels of precision (even those above 30% CV) are currently causing management difficulties. The SBRM 3-year reviews will continue to look for management problems caused by imprecise discard estimates.

9. COUNCIL REVIEW FOR CONSISTENCY WITH NATIONAL GUIDANCE

The Magnuson-Stevens Fishery Conservation and Management Act requires that all FMPs establish a standardized reporting methodology to assess the amount and type of bycatch occurring in a fishery. On January 19, 2017, NOAA's NMFS published a final rule (82 FR 6317) establishing national guidance on complying with this requirement. As required by 50 FR 600.1610(b), Councils, in coordination with NMFS, must review their FMPs and make any necessary changes so all FMPs are consistent with the guidance by February 21, 2022.

The national guidance, codified at 50 CFR Part 600.1610(a), sets out 4 considerations for a standardized bycatch reporting methodology to address.

- Information about the Characteristics of Bycatch in the Fishery
- Feasibility
- Data Uncertainty
- Data Use

This section of the review report comprises the SBRM FMAT review of the SBRM on behalf of New England and Mid-Atlantic Fishery Management Councils for their respective FMPs for consistency with the national guidance in general, and the 4 considerations in particular. The NMFS Greater Atlantic Regional Fisheries Office will use this review, along with any other relevant information, to determine whether the SBRM is fully consistent with the guidance, or if any FMP changes are necessary before the February 2022 deadline.

9.1 Characteristics of Bycatch in the Fishery

The Greater Atlantic SBRM provides extensive information about the characteristics of bycatch in federally managed fisheries. Section 5 of this report provides a review of the methods used to derive discard estimates as well as a review of estimated discards in recent years. Annual bycatch reports, required under the SBRM, provide detailed information on the amount of bycatch by species and fishing mode. Stock assessment workgroups routinely incorporate SBRM-based bycatch data when estimating total fishing mortality for managed species. The specific importance of bycatch as a component of overall fishing mortality may vary for each managed stock, and the stock assessment report provides those stock-specific details.

9.2 Feasibility

The SBRM is designed to incorporate feasibility concerns such as cost, technical, or operational limitations. As detailed in the SBRM Omnibus Amendment, the SBRM process includes multiple steps to ensure the effective and efficient collection of bycatch information. The SBRM also includes mechanisms for reviewing and adjusting the SBRM so that it can continue to adapt to changing needs, resources, or technological developments.

The SBRM procedure for determining the number of observer days consists of first calculating the observer sea days required to achieve a CV standard of 30 percent and then applying several adjustments. The importance filter is designed to remove particular combinations of fishing mode and bycatch species where the magnitude of discards are low and of small consequence to the discarded species. The importance filter eliminates (1) fishing modes for a species that together contribute less than 5 percent of the cumulative discards of that species and (2) fishing modes for a species when the total discards of the species in those modes are less than 2 percent of the

cumulative fishing mortality of that species. As a result, the observer days for each fishing mode will be set by the needs of the species with the highest observer day requirements, after some species are removed by the importance filter.

In addition to adjusting the observer sea days based on the importance filter, the SBRM also adjusts the sea days based on a prioritization process that depends on funding. The prioritization process involves 2 steps: First, identifying the available funding for the SBRM, and second, if a funding shortfall exists, eliminating observer sea days, in a formulaic way, until the total observer sea days can be covered by the available funding. The goal is to prioritize observer sea days so as to minimize the number of fishing mode and species group combinations that have a CV higher than 30 percent.

The requirement for a review of the SBRM process every 3 years allows the Councils to assess whether the SBRM is operating as intended and to identify any needed changes. These changes may address operational shortcomings within the SBRM. However, they could also address changing priorities by the Councils, or implement technological changes that could improve operational efficiency or reduce potential bias in discards estimates. These ongoing opportunities for review and adjustment ensure that the SBRM process continues to provide valuable information on bycatch occurring in the fisheries as operational, technological, or cost constraints may change.

9.3 Data Uncertainty

The SBRM assigns observer sea days based on achieving bycatch estimates that meet a precision-based performance standard. The current 30% CV standard is a useful benchmark, but is not an absolute threshold measure for the utility of discard estimates. Section 6 of this report evaluates how effective the SBRM has been in achieving the 30% CV standard. The potential implications for management of not achieving the CV standard are discussed in Section 8. The detailed examination of data uncertainty within those sections are not repeated here.

While this report assesses the uncertainty of SBRM-derived bycatch information within the context of the SBRM itself, other uses of discard information may result in different levels of precision in bycatch estimates. For example, a stock assessment may use SBRM-derived data to estimate total discard of a species over a different time period rather than breaking it out by specific SBRM fleet and year. Each application of SBRM-derived bycatch data may need to determine the appropriate level of data uncertainty.

9.4 Data Use

Specific details about the design of the SBRM, such as data elements, sampling design, sample sizes, and reporting frequency, are discussed in the SBRM Omnibus Amendment and in the annual discard reports. Many of those elements are also reviewed and discussed within this report. All of these data considerations have been carefully developed by the Councils, in coordination with their Scientific and Statistical Committees and the Northeast Fisheries Science Center, to ensure that the SBRM incorporates necessary scientific methods and techniques to provide bycatch information that is useful across the wide array of fisheries and species that occur in our region.

The SBRM provides the bycatch data for the region that is routinely used in many aspects of fishery management. The Science Center uses these data in stock assessments to incorporate bycatch into estimates of total fishing mortality. The Regional Office often includes bycatch for

some quota monitoring and when evaluating whether total catch is less than annual catch limits for management stocks. SBRM bycatch data, as well as data from supplemental observer coverage specifically for monitoring protected species interactions, are used in Endangered Species Act Section 7 consultations. The Councils use SBRM-derived bycatch information to assess if new management measures are necessary, to develop measures, and/or to evaluate the potential impacts of measures. The Councils' SSCs use this information as they review the status of the fisheries and develop acceptable biological catch recommendations. All aspects of fishery management in the Region that have bycatch implications use data from the SBRM. Bycatch estimates based on SBRM data are also available to the public through the National Bycatch Report.

9.5 Conclusion

This review did not find any aspect of the SBRM that is inconsistent with the national guidelines specified at 50 CFR Part 600.1610, and no deficiencies were identified that would require an amendment to an FMP to meet these requirements. This report is provided to NMFS for its consideration in making a formal determination in this regard. If, based on the information contained in this report along with other available information, NMFS concludes the Greater Atlantic SBRM is consistent with the national guidance no additional Council action would be required. Any future modifications to the SBRM (e.g., to improve performance or efficiency) would be reviewed for continued consistency with all legal requirements, including the national SBRM guidelines.

10. RECOMMENDATIONS AND CONCLUSIONS

- The SBRM FMAT recommends excluding compliance/state/other observed trips in the evaluation of the effectiveness of SBRM for fish species. The stratification and differential coverage levels of the compliance monitoring trips could create potential bias within SBRM fleets. The SBRM FMAT also recommends the exclusion of individual FMP compliance monitoring program trips from future SBRM annual analysis of discard estimation, precision and sample size analyses for fish.

- The SBRM Omnibus Amendment requires 30% CV or less to be attained for each species group 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. Thus, the use of the importance filter is a key feature to the SBRM in that is focuses the sampling to fleets where it is needed most and not wasted on small imprecisely estimated discards. The SBRM FMAT recommends continued use of importance filters.

- High levels of monitoring are typically required to estimate the magnitude of rare events, such as sea turtle encounters, with high precision (low CVs). The SBRM FMAT recommends using a "rarity" filter (see section 6.0) for sea turtles to prevent sea day needs in some fleets from being driven by species with a low probability of encounter with the fishing gear. If a rare species is filtered from the sea day estimation process, monitoring of the rare species would still occur, but the targeted level of monitoring would be driven by other species groups. In addition to recommending the rarity filter for sea turtles, the SBRM

FMAT recommends that rarity filters be developed and implemented, as appropriate, for other ESA-listed species such as Atlantic salmon and sturgeon.

- Using the formulaic prioritization process since SBRM 2014 results in more fleets with allocated sea days. However, there were instances in which some fleets did not receive the number of sea days needed or initially estimated. A funding shortfall in SBRM 2015 triggered the prioritization process in which 2 fleets did not receive sufficient sea days. Because of allocation decisions made prior to the prioritization process, 1 fleet in SBRM 2016 and 2 fleets in SBRM 2017 did not receive the full number of needed sea days. The SBRM FMAT recommends continued use of the formulaic prioritization process for transparent determination of how limited funds are allocated.

- Evidence suggests the assumption that discard variances are stable over time is valid, particularly for a one-year lag. If fishing behavior changes because of a regulatory change, then relationship between years may weaken in the year following the regulatory change. A similar weakening in the relationship may occur when fish populations change – for example, if a strong year class is moving through the fishery. These types of analyses should be conducted on a periodic basis. Conducting sample size analyses annually minimizes the time to a one-year lag. The SBRM FMAT recommends continued use of the most recent data available to track changes in discarding because of changes in management or fleet behavior when allocating future observer coverage.

- No evidence of systematic vessel selection bias and no strong evidence of observer bias was detected in the analyses conducted for this report. Recent studies examining observer data for potential bias have mostly focused on groundfish fleets (sub-components of selected fleets within SBRM). A comprehensive examination of potential bias in all SBRM fleets is a large task that will continue to require future work. Future analyses could consider addition trip outcome metrics such as mean number of species reported, number of areas fished, and an evaluation of minimum observer sample size (e.g., could fleets with less than 30 observed trips be considered). The SBRM FMAT recommends continued exploration of potential biases in the data collection process and examination of how these might impact sea day allocations.

- The SBRM FMAT recommends the following planned changes (some of which will be implemented in 2018 SBRM annual analysis)

  (1) The inclusion of blueline tilefish in the Tilefish species group in 2018 SBRM analyses;
  (2) The consideration of ESA-list species such as sturgeon (Atlantic sturgeon and shortnose sturgeon) as species groups;

  (3) Expanding the sampling frame for New England and Mid-Atlantic lobster pot fleets to include all vessels using lobster pot gear in future SBRM analyses; and

  (4) Utilize a PTNS-like system for all fleets as identified in the regional fishery dependent data initiative (implementation date to be determined).

The SBRM provides a general structure for defining fisheries into homogeneous groups and objectively allocating observer coverage based on prior information to achieve a preselected precision criterion (30% CV), while following a predetermined set of rules to eliminate fleets with highly imprecise estimates of small amounts of discards. This allows for changes in sea day allocation from year to year as new information is obtained. The general structure helps identify gaps in existing coverage and the tradeoffs associated with coverage levels for different species. Additionally, the incorporation of annual refinements supports continual improvements. These refinements address new issues as they arise because of changes in fleet behavior, regulatory changes, and/or advances in statistical techniques. This 3 year review allows examination of the successes and challenges remaining.

There is evidence that one of the methodology's main assumptions, variance stability from year to year, is met. However, the effectiveness of the SBRM does not hinge solely on the methodology's assumptions. The amount of funding to support the required sea days is equally important, as well as the ability to accomplish the funded sea days.

Overall, the SBRM represents one of the most comprehensive programs for planning and executing observer monitoring coverage of federally managed fisheries; no aspect of the SBRM was inconsistent or deficient with the national guidelines for an SBRM. Following the implementation of the 2015 SBRM Omnibus Amendment, the first 3 years of the program, summarized in this report, illustrate the utility of the approach for monitoring discards in these fisheries and the real-world limitations of implementing an ideal system. The SBRM process contains a formulaic approach to allocate sea days among fleets to stay within the available funds while achieving the precision standard for the most species groups/fleet combinations.

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Table 1. Time series for most recent sea turtle discard estimates. Two time periods are listed for sink gillnet gear because the older analysis (b) informed the sea day needs for turtles in the Standard Bycatch Reporting Methodology years covered in this review. Cc = Loggerhead (*Caretta caretta*), Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Unk = unidentified hard-shelled species.

Gear Type	Species	Time frame	Reference
Sink Gillnet(a)	Cc, Lk, Dc, Unk	January 2012 – December 2016	Murray 2018
Sink Gillnet(b)	Cc, Unk	January 2007 – December 2011	Murray 2013
Scallop Dredge	Cc	January 2009 – December 2014	Murray 2015a
Bottom Otter Trawl (includes Scallop Trawl)	Cc	January 2009 – December 2013	Murray 2015b

Table 2. List of management actions associated with monitoring since the implementation of Standard Bycatch Reporting Methodology. EFH = Essential Fish Habitat, ASM = At-sea Monitoring, CV = Coefficient of Variation, NMFS = National Marine Fisheries Service, NE = New England, IFM = Industry-funded Monitoring.

Fishery Management Plan (FMP)	Measures	Reference
Atlantic Mackerel, Squid, and Butterfish Amendment 11	Capacity cap, update EFH, establish recreational mackerel allocation	MAFMC 2011
Northeast Multispecies Framework 48	Clarified goals and objectives of ASM	NEFMC 2013b
Atlantic Herring Amendment 5	Improved catch information, enhanced monitoring and sampling of catch at-sea, address bycatch issues	NEFMC 2013a
Northeast Multispecies Framework 55	Adjusted ASM program to ensure likelihood that discards for groundfish stocks monitored at 30% CV	NEFMC 2016
Blueline Tilefish Amendment 6	Addition of blueline tilefish (*Caulolatilus microps)* to tilefish FMP	MAFMC 2017
Amendment 23 (under development)	Potential changes to groundfish monitoring and reporting	
Industry-funded Monitoring Amendment (implementation expected in 2019)	Omnibus amendment establishing cost sharing responsibilities between NMFS and industry for additional monitoring across all NE FMPs except NE multispecies and scallops. Establishes IFM program for the herring fishery	NEFMC 2018b

Table 3. Fleet stratification abbreviations used in fish/invertebrate sections.

Abbreviation	Definition
NE	New England ports (RI and northward)
MA	Mid-Atlantic ports (CT and southward)
Sm	Small mesh (less than 5.50 in)
Lg	Large mesh (from 5.50 to 7.99 in for gillnet; 5.50 in and greater for trawl)
Xlg	Extra large mesh (8.00 in and greater for gillnet)
AA	Access area
OPEN	Nonaccess area
GEN	General category
LIM	Limited access category

Table 4. List of the 14 fish and invertebrate species groups (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 implemented in the waters off the northeastern United States.

Species Group	Scientific name
ATLANTIC SALMON (SAL)	*Salmo salar*
BLUEFISH (BLUE)	*Pomatomus saltatrix*
FLUKE - SCUP - BLACK SEA BASS (FSB)	
Black sea bass	*Centropristis striata*
Fluke	*Paralichthys dentatus*
Scup	*Stenotomus chrysops*
HERRING, ATLANTIC (HERR)	*Clupea harengus*
LARGE MESH GROUNDFISH (GFL)	
American plaice	*Hippoglossoides platessoides*
Atlantic cod	*Gadus morhua*
Atlantic halibut	*Hippoglossus hippoglossus*
Atlantic wolffish	*Anarhichas lupus*
Haddock	*Melanogrammus aeglefinus*
Ocean pout	*Zoarces americanus*
Pollock	*Pollachius virens*
Redfish	*Sebastes fasciatus*
White hake	*Urophycis tenuis*
Windowpane flounder	*Scophthalmus aquosus*
Winter flounder	*Pseudopleuronectes americanus*
Witch flounder	*Glyptocephalus cynoglossus*
Yellowtail flounder	*Limanda ferruginea*
MONKFISH (MONK)	*Lophius americanus*
RED DEEPSEA CRAB (RCRAB)	*Chaceon quinquedens*
SEA SCALLOP (SCAL)	*Placopecten magellanicus*
SKATE COMPLEX[1] (SKATE)	Rajidae
Barndoor skate	*Dipturus laevis*
Clearnose skate	*Raja eglanteria*
Little skate	*Leucoraja erinacea*
Rosette skate	*Leucoraja garmani*
Smooth skate	*Malacoraja senta*
Thorny skate	*Amblyraja radiate*
Winter skate	*Leucoraja ocellata*
SMALL MESH GROUNDFISH (GFS)	
Offshore hake	*Merluccius albidus*
Red hake	*Urophycis chuss*
Silver hake	*Merluccius bilinearis*
SPINY DOGFISH (DOG)	*Squalus acanthias*
SQUID[2] - BUTTERFISH - MACKEREL (SBM)	
Atlantic mackerel	*Scomber scombrus*
Butterfish	*Peprilus triacanthus*
Northern shortfin squid	*Illex illecebrosus*
Longfin inshore squid	*Doryteuthis (Amerigo) pealeii*
SURFCLAM - OCEAN QUAHOG (SCOQ)[3]	
Surfclam	*Spisula solidissima*
Ocean quahog	*Arctica islandica*
TILEFISH (TILE)	*Lopholatilus chamaeleonticeps*

Table 5. Number of observed (OB) and Vessel Trip Report (VTR) trips and percentage of observer coverage, by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through 2014 data), SBRM 2016 (July 2014 through June 2015 data) and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. An "*" indicates OB trips greater than VTR trips. "P" indicates fleets for which pilot coverage was assigned. NE = New England; MA = Mid-Atlantic. See Table 3 for fleet stratification abbreviations.

Fleet					SBRM 2015				SBRM 2016				SBRM 2017			
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot
1	Longline	OPEN	all	MA	all		194		P	14	226	6.2		8	163	4.9	
2	Longline	OPEN	all	NE	all	30	492	6.1		8	898	0.9		9	852	1.1	
3	Hand Line	OPEN	all	MA	all	1	3,108	<0.1	P	6	2,857	0.2	P	3	2,869	0.1	P
4	Hand Line	OPEN	all	NE	all	12	2,195	0.5		16	2,667	0.6		30	2,702	1.1	
5	Otter Trawl	OPEN	all	MA	sm	357	3,839	9.3		360	3,088	11.7		387	3,311	11.7	
6	Otter Trawl	OPEN	all	MA	lg	179	4,183	4.3		227	3,886	5.8		172	4,005	4.3	
7	Otter Trawl	OPEN	all	NE	sm	279	3,588	7.8		319	3,381	9.4		325	3,973	8.2	
8	Otter Trawl	OPEN	all	NE	lg	998	6,665	15.0		1,046	5,849	17.9		734	5,439	13.5	
9	Scallop Trawl	AA	GEN	MA	all		13		P	3	86	3.5	P	6	158	3.8	
10	Scallop Trawl	AA	LIM	MA	all		3		P		2		P		1		P
11	Scallop Trawl	OPEN	GEN	MA	all	24	279	8.6		8	136	5.9		10	64	15.6	
12	Scallop Trawl	OPEN	LIM	MA	all		25		P		4		P		8		P
13	Otter Trawl, Twin	OPEN	all	MA	all	1	49	2.0	P	22	178	12.4		5	133	3.8	P
14	Otter Trawl, Twin	OPEN	all	NE	all	2	19	10.5	P	3	15	20.0	P	3	22	13.6	P
15	Otter Trawl, Ruhle	OPEN	all	MA	lg		8		P		2		P		4		P
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	2	18	11.1	P	5	23	21.7	P	1	27	3.7	P
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	1	9	11.1	P	4	24	16.7	P		10		P
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	7	6	*		5	5	100.0					
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	28	124	22.6		60	324	18.5		28	171	16.4	
20	Shrimp Trawl	OPEN	all	MA	all		405		P	3	130	2.3	P	1	100	1.0	P
21	Shrimp Trawl	OPEN	all	NE	all		131		P		71		P		77		P
22	Floating Trap	OPEN	all	MA	all		85		P		80		P		76		P
23	Floating Trap	OPEN	all	NE	all		10		P		17		P		15		P
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	13	1,938	0.7		69	2,084	3.3		233	1,638	14.2	
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	10	2,015	0.5		70	1,854	3.8		237	2,212	10.7	
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	34	2,120	1.6		132	1,828	7.2		152	1,707	8.9	
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm		5		P		9		P		4		P
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	715	3,621	19.7		745	3,292	22.6		460	2,614	17.6	
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	393	2,933	13.4		539	3,297	16.3		408	3,421	11.9	

Table 5, continued.

Fleet						SBRM 2015				SBRM 2016				SBRM 2017			
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot
30	Purse Seine	OPEN	all	MA	all		229		P		172		P		221		P
31	Purse Seine	OPEN	all	NE	all	34	296	11.5		13	315	4.1		9	237	3.8	
32	Scallop Dredge	AA	GEN	MA	all	3	67	4.5	P	29	1,041	2.8		90	2,050	4.4	
33	Scallop Dredge	AA	GEN	NE	all	7	71	9.9		2	24	8.3	P	37	430	8.6	
34	Scallop Dredge	AA	LIM	MA	all	18	200	9.0		56	416	13.5		67	547	12.2	
35	Scallop Dredge	AA	LIM	NE	all	34	328	10.4		79	446	17.7		88	625	14.1	
36	Scallop Dredge	OPEN	GEN	MA	all	105	2,226	4.7		91	1,906	4.8		80	1,878	4.3	
37	Scallop Dredge	OPEN	GEN	NE	all	113	3,597	3.1		124	3,190	3.9		91	2,906	3.1	
38	Scallop Dredge	OPEN	LIM	MA	all	48	449	10.7		37	350	10.6		40	449	8.9	
39	Scallop Dredge	OPEN	LIM	NE	all	126	1,043	12.1		109	869	12.5		104	933	11.1	
40	Danish Seine	OPEN	all	MA	all		85		P		56		P		45		P
41	Mid-water Paired & Single Trawl	AA	all	NE	all					20	20	100.0		7	8	87.5	
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	2	13	15.4	P	1	26	3.8	P		11		P
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	105	439	23.9		43	363	11.8		18	364	4.9	
44	Pots and Traps, Fish	OPEN	all	MA	all	4	971	0.4	P	7	947	0.7		11	677	1.6	
45	Pots and Traps, Fish	OPEN	all	NE	all		923		P	3	623	0.5	P	16	597	2.7	
46	Pots and Traps, Conch	OPEN	all	MA	all	2	1,107	0.2	P	7	958	0.7	P	28	1,149	2.4	
47	Pots and Traps, Conch	OPEN	all	NE	all	2	1,119	0.2	P	18	1,087	1.7		18	1,297	1.4	
48	Pots and Traps, Hagfish	OPEN	all	NE	all		47		P		69		P		39		P
49	Pots and Traps, Lobster	OPEN	all	MA	all	2	1,692	0.1	P	13	1,487	0.9		16	1,484	1.1	
50	Pots and Traps, Lobster	OPEN	all	NE	all	37	26,168	0.1		94	26,106	0.4		225	27,956	0.8	
51	Pots and Traps, Crab	OPEN	all	MA	all		54		P		86		P		52		P
52	Pots and Traps, Crab	OPEN	all	NE	all	1	81	1.2	P		63		P		49		P
53	Beam Trawl	OPEN	all	MA	all		114		P		81		P		109		P
54	Beam Trawl	OPEN	all	NE	all		47		P		20		P		102		P
55	Dredge, Other	OPEN	all	MA	all		288		P		255		P		305		P
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all		1,824		P		1,591		P	22	1,758	1.3	
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all		2,726		P		1,744		P	23	2,175	1.1	
Total						**3,729**	**84,284**	**4.4**		**4,410**	**80,624**	**5.5**		**4,202**	**84,229**	**5.0**	

Table 6. Number of observed (OB) and Vessel Trip Report (VTR) sea days and percentage of observer coverage, by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data) and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. An "*" indicates OB sea days greater than VTR sea days. "P" indicates fleets for which pilot coverage was assigned. NE = New England; MA = Mid-Atlantic. See Table 3 for fleet stratification abbreviations.

Fleet					SBRM 2015				SBRM 2016				SBRM 2017			
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot
1	Longline	OPEN	all	MA	all		1,303		P	155	1,456	10.6		74	1,246	5.9	
2	Longline	OPEN	all	NE	all	34	540	6.3		12	904	1.3		10	861	1.2	
3	Hand Line	OPEN	all	MA	all	1	3,395	<0.1	P	17	3,135	0.5	P	14	3,201	0.4	P
4	Hand Line	OPEN	all	NE	all	13	2,385	0.5		33	3,077	1.1		71	3,186	2.2	
5	Otter Trawl	OPEN	all	MA	sm	993	8,824	11.3		997	6,761	14.7		977	7,039	13.9	
6	Otter Trawl	OPEN	all	MA	lg	425	9,156	4.6		583	9,350	6.2		442	9,310	4.7	
7	Otter Trawl	OPEN	all	NE	sm	735	9,318	7.9		933	8,847	10.5		1,051	10,443	10.1	
8	Otter Trawl	OPEN	all	NE	lg	3,864	18,811	20.5		3,611	17,347	20.8		2,488	15,878	15.7	
9	Scallop Trawl	AA	GEN	MA	all		26		P	6	174	3.4	P	14	335	4.2	
10	Scallop Trawl	AA	LIM	MA	all		21		P		17		P		4		P
11	Scallop Trawl	OPEN	GEN	MA	all	49	535	9.2		12	242	5.0		15	124	12.1	
12	Scallop Trawl	OPEN	LIM	MA	all		140		P		20		P		43		P
13	Otter Trawl, Twin	OPEN	all	MA	all	9	164	5.5	P	31	272	11.4		14	310	4.5	P
14	Otter Trawl, Twin	OPEN	all	NE	all	14	129	10.9	P	28	115	24.3	P	25	171	14.6	P
15	Otter Trawl, Ruhle	OPEN	all	MA	lg		23		P		13		P		5		P
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	12	58	20.7	P	27	72	37.5	P	4	58	6.9	P
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	9	71	12.7	P	35	139	25.2	P		74		P
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	56	49	*		30	30	100.0					
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	223	990	22.5		475	2,458	19.3		234	1,461	16.0	
20	Shrimp Trawl	OPEN	all	MA	all		2,157		P	16	597	2.7	P	5	531	0.9	P
21	Shrimp Trawl	OPEN	all	NE	all		135		P		91		P		122		P
22	Floating Trap	OPEN	all	MA	all		85		P		80		P		76		P
23	Floating Trap	OPEN	all	NE	all		15		P		17		P		15		P
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	13	1,994	0.7		86	2,172	4.0		263	1,651	15.9	
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	11	2,120	0.5		71	1,918	3.7		247	2,285	10.8	
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	48	2,478	1.9		173	2,235	7.7		182	2,006	9.1	
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm		5		P		14		P		4		P
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	1,088	5,391	20.2		1,154	5,068	22.8		672	4,003	16.8	
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	565	4,366	12.9		702	4,823	14.6		567	5,107	11.1	

Table 6, continued.

Fleet					SBRM 2015				SBRM 2016				SBRM 2017			
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot	OB	VTR	Percent Coverage	Pilot
30	Purse Seine	OPEN	all	MA	all		231		P		174		P		223		P
31	Purse Seine	OPEN	all	NE	all	73	618	11.8		29	661	4.4		22	524	4.2	
32	Scallop Dredge	AA	GEN	MA	all	5	146	3.4	P	46	1,774	2.6		175	3,794	4.6	
33	Scallop Dredge	AA	GEN	NE	all	17	152	11.2		5	57	8.8	P	72	849	8.5	
34	Scallop Dredge	AA	LIM	MA	all	142	1,580	9.0		415	2,895	14.3		515	3,999	12.9	
35	Scallop Dredge	AA	LIM	NE	all	267	2,579	10.4		656	3,582	18.3		694	4,780	14.5	
36	Scallop Dredge	OPEN	GEN	MA	all	185	3,816	4.8		177	3,473	5.1		161	3,929	4.1	
37	Scallop Dredge	OPEN	GEN	NE	all	168	4,662	3.6		196	4,291	4.6		167	4,244	3.9	
38	Scallop Dredge	OPEN	LIM	MA	all	431	4,053	10.6		356	3,168	11.2		415	3,996	10.4	
39	Scallop Dredge	OPEN	LIM	NE	all	1,270	10,301	12.3		1,139	8,953	12.7		1,002	8,880	11.3	
40	Danish Seine	OPEN	all	MA	all		85		P		56		P		49		P
41	Mid-water Paired & Single Trawl	AA	all	NE	all					61	62	98.4		33	35	94.3	
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	9	51	17.6	P	8	134	6.0	P		45		P
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	455	1,426	31.9		160	1,189	13.5		62	1,170	5.3	
44	Pots and Traps, Fish	OPEN	all	MA	all	4	1,005	0.4	P	7	970	0.7		11	717	1.5	
45	Pots and Traps, Fish	OPEN	all	NE	all		956		P	3	625	0.5	P	16	617	2.6	
46	Pots and Traps, Conch	OPEN	all	MA	all	2	1,341	0.1	P	7	976	0.7	P	28	1,165	2.4	
47	Pots and Traps, Conch	OPEN	all	NE	all	2	1,122	0.2	P	18	1,092	1.6		18	1,298	1.4	
48	Pots and Traps, Hagfish	OPEN	all	NE	all		338		P		535		P		325		P
49	Pots and Traps, Lobster	OPEN	all	MA	all	2	2,270	0.1	P	18	1,882	1.0		19	1,834	1.0	
50	Pots and Traps, Lobster	OPEN	all	NE	all	133	34,395	0.4		235	34,443	0.7		485	36,393	1.3	
51	Pots and Traps, Crab	OPEN	all	MA	all		108		P		176		P		149		P
52	Pots and Traps, Crab	OPEN	all	NE	all	8	550	1.5	P		442		P		358		P
53	Beam Trawl	OPEN	all	MA	all		324		P		215		P		253		P
54	Beam Trawl	OPEN	all	NE	all		55		P		37		P		115		P
55	Dredge, Other	OPEN	all	MA	all		308		P		265		P		314		P
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all		3,735		P		3,212		P	66	3,147	2.1	
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all		3,230		P		2,292		P	71	2,822	2.5	
Total						**11,335**	**154,121**	**7.4**		**12,723**	**149,074**	**8.5**		**11,401**	**155,573**	**7.3**	

Table 7. Data sources used in most recent sea turtle discard estimates (see reference documents for more detailed information, including effort metrics used in bycatch analyses). Two time periods are listed for sink gillnet gear because the older analysis (b) informed the sea day needs for turtles in the Standardized Bycatch Reporting Methodology years covered in this review. Data represented cover a 5-year time span. VTR = Vessel Trip Report.

Gear Type	Observed trips	VTR trips	% Coverage (trips)	Reference
Sink Gillnet(a)	4,902	51,533	10%	Murray 2018
Sink Gillnet(b)	2,867	52,310	5%	Murray 2013
Scallop Dredge	1,594	34,241	5%	Murray 2015a
Bottom Otter Trawl (includes Scallop Trawl)	4,100	77,590	5%	Murray 2015b

Table 8. Observed catch weight (kept and discarded, live weight, lb) from observed trips for each of the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups, the 14 SBRM species groups combined, the non-SBRM species, and all species combined for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). This summary includes data that cannot be classified to a fleet; all species excludes sea turtles, marine mammals, and sea birds.

	SBRM 2015		SBRM 2016		SBRM 2017	
Species Group	**Kept**	**Discarded**	**Kept**	**Discarded**	**Kept**	**Discarded**
ATLANTIC SALMON (*Salmo salar*)	0	7	0	0	0	0
BLUEFISH (*Pomatomus saltatrix*)	113,377	3,772	85,630	10,752	145,629	5,702
FLUKE (*Paralichthys dentatus*) - SCUP (*Stenotomus chrysops*) - BLACK SEA BASS (*Centropristis striata*)	1,773,753	472,399	2,448,481	438,963	1,673,476	583,977
HERRING, ATLANTIC (*Clupea harengus*)	57,174,107	19,130	37,378,043	31,404	10,767,014	34,647
LARGE MESH GROUNDFISH	12,641,599	917,521	10,480,111	1,008,359	7,538,934	785,185
MONKFISH (*Lophius americanus*)	3,048,725	506,749	2,919,042	433,032	2,573,655	539,999
RED DEEPSEA CRAB (*Chaceon quinquedens*)	316	12,278	6	14,758	1,380	12,549
SEA SCALLOP (*Placopecten magellanicus*)	17,675,961	310,061	19,419,825	697,709	20,509,908	1,640,991
SKATE COMPLEX (Rajidae)	3,511,484	10,164,028	5,124,930	9,173,989	3,302,637	7,326,385
SMALL MESH GROUNDFISH	1,160,382	443,764	1,911,610	588,609	1,434,140	468,079
SPINY DOGFISH (*Squalus acanthias*)	1,084,562	3,078,065	1,865,547	2,476,629	2,329,472	1,438,349
SQUID (*Doryteuthis* [Amerigo] *pealeii, Illex illecebrosus*)- BUTTERFISH (*Peprilus triacanthus*) - MACKEREL (*Scomber scombrus*)	7,931,055	452,110	8,350,342	459,516	7,208,932	703,918
SURFCLAM (*Spisula solidissima*) - OCEAN QUAHOG (*Arctica islandica*)	63	1,772	0	1,092	5,338,209	35,153
TILEFISH (*Lopholatilus chamaeleonticeps*)	1,802	691	196,110	979	59,127	1,878
14 SBRM Species Groups, Combined	*106,117,186*	*16,382,348*	*90,179,677*	*15,335,792*	*62,882,514*	*13,576,813*
Non-SBRM species	*6,852,359*	*6,305,466*	*3,535,329*	*7,604,350*	*2,573,935*	*6,077,345*
ALL SPECIES, COMBINED	112,969,546	22,687,814	93,715,006	22,940,142	65,456,449	19,654,158

Table 9. Observed encounters with turtles for Standardized Bycatch Reporting Methodology Year 2015 (July 2013 – June 2014). Cc = Loggerhead (*Caretta caretta*), Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Cm = Green (*Chelonia mydas*), Unk = Unidentified hard-shelled species.

Gear Type	Cc	Lk	Dc	Cm	Unk
Scallop Dredge	1	0	0	0	0
Sink Gillnet	5	0	0	0	0
Bottom Otter Trawl (includes Scallop Trawl and Twin Trawl)	18	0	1	0	2
Lobster Pot	0	0	1	0	0
Total	24	0	2	0	2

Table 10. Observed encounters with turtles for Standardized Bycatch Reporting Methodology Year 2016 (July 2014 – June 2015). Cc = Loggerhead (*Caretta caretta*), Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Cm = Green (*Chelonia mydas*), Unk = Unidentified hard-shelled species.

Gear Type	Cc	Lk	Dc	Cm	Unk
Scallop Dredge	0	0	0	0	0
Sink Gillnet	10	2	0	0	4
Bottom Otter Trawl (includes Scallop Trawl and Twin Trawl)	20	1	0	1	0
Total	30	3	0	1	4

Table 11. Observed encounters with turtles for Standardized Bycatch Reporting Methodology Year 2017 (July 2015 – June 2016). Cc = Loggerhead, Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Cm = Green (*Chelonia mydas*), Unk = Unidentified hard-shelled species.

Gear Type	Cc	Lk	Dc	Cm	Unk
Scallop Dredge	1	1	0	0	0
Sink Gillnet	5	4	0	1	2
Bottom Otter Trawl (includes Scallop Trawl and Twin Trawl)	12	3	0	1	0
Total	18	8	0	2	2

Table 12. Observed turtles in older time periods which informed sea days in July 2013 – June 2016. Cc = Loggerhead, Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Cm = Green (*Chelonia mydas*), Unk = Unidentified hard-shelled species.

Gear Type	Time frame	Ref	Cc	Lk	Dc	Cm	Unk
Scallop Dredge	January 2009 – December 2014	Murray 2015a	4	0	0	0	0
Sink Gillnet	January 2007 – December 2011	Murray 2013	13	5*	2	12*	4
Bottom Otter Trawl (includes Scallop Trawl and Twin Trawl)	January 2009 – December 2013	Murray 2015b	101	1	4	2	1

*All of the Green and Kemp's ridley interactions occurred inside the barrier islands of Core Sound off North Carolina during 2009 and were observed via the alternative platform observer program.

Table 13. Vessel Trip Report landings (kept, live lb), estimated discards (live lb) and associated coefficient of variation (CV) for 14 Standardized Bycatch Reporting Methodology (SBRM) species groups for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). These CVs were not used in annual SBRM sample size analyses.

	SBRM 2015			SBRM 2016			SBRM 2017		
Species Group	**Kept**	**Discarded**	**CV**	**Kept**	**Discarded**	**CV**	**Kept**	**Discarded**	**CV**
ATLANTIC SALMON (*Salmo salar*)	0	33	0.896	0	0		0	0	
BLUEFISH (*Pomatomus saltatrix*)	2,425,470	42,651	0.208	1,683,332	69,420	0.207	1,602,925	48,125	0.187
FLUKE (*Paralichthys dentatus*) - SCUP (*Stenotomus chrysops*) - BLACK SEA BASS (*Centropristis striata*)	24,270,213	4,938,161	0.082	24,918,724	3,530,731	0.093	21,559,046	6,810,931	0.078
HERRING, ATLANTIC (*Clupea harengus*)	205,198,713	161,166	0.481	201,593,411	131,943	0.309	153,832,424	219,925	0.281
LARGE MESH GROUNDFISH	43,030,840	6,490,149	0.072	41,459,546	7,032,899	0.064	36,681,712	6,543,347	0.073
MONKFISH (*Lophius americanus*)	15,185,788	5,788,810	0.063	14,708,490	4,250,416	0.065	16,735,138	6,917,842	0.062
RED DEEPSEA CRAB (*Chaceon quinquedens*)	2,377,378	101,478	0.346	2,826,537	237,234	0.090	2,998,989	230,472	0.206
SEA SCALLOP (*Placopecten magellanicus*)	293,019,773	5,239,579	0.152	260,024,519	8,610,113	0.095	302,288,416	22,713,394	0.073
SKATE COMPLEX (Rajidae)	28,988,443	90,410,596	0.049	30,741,687	80,948,684	0.045	31,068,989	84,794,666	0.054
SMALL MESH GROUNDFISH	15,147,162	3,588,055	0.121	16,000,733	3,703,902	0.127	13,590,525	3,805,198	0.143
SPINY DOGFISH (*Squalus acanthias*)	9,615,296	21,649,953	0.069	16,243,293	14,527,332	0.075	17,391,487	12,848,406	0.067
SQUID (*Doryteuthis* [Amerigo] *pealeii, Illex illecebrosus*)- BUTTERFISH (*Peprilus triacanthus*) - MACKEREL (*Scomber scombrus*)	59,323,508	4,410,980	0.208	55,317,121	2,744,859	0.193	57,940,219	6,033,940	0.159
SURFCLAM (*Spisula solidissima*) - OCEAN QUAHOG (*Arctica islandica*)	471,657,929	23,214	0.264	339,687,298	9,073	0.371	445,440,701	2,654,459	0.439
TILEFISH (*Lopholatilus chamaeleonticeps*)	1,609,148	4,078	0.286	1,432,214	6,800	0.380	960,871	22,627	0.224

Table 14. Vessel Trip Report landings (kept, live lb), estimated discards (live lb) and associated coefficient of variation (CV) for the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups combined, by fleet for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Light shading indicates confidential fleets. Dark shading indicates fleets not considered and blanks indicate fleets with no observe data in the annual SBRM analyses. These CVs were not used in annual SBRM sample size analyses. See Table 3 for fleet stratification abbreviations.

Fleet						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Kept	Discarded	CV	Kept	Discarded	CV	Kept	Discarded	CV
1	Longline	OPEN	all	MA	all	1,711,479			1,663,161	116,446	0.386	1,155,953	239,923	0.293
2	Longline	OPEN	all	NE	all	1,298,479	191,878	0.348	3,343,427	106,575	0.990	3,236,766	712,867	0.391
3	Hand Line	OPEN	all	MA	all	296,320	0		283,724	1,859	0.649	295,388	0	
4	Hand Line	OPEN	all	NE	all	936,874	241,032	0.496	1,832,723	64,156	0.603	2,420,243	82,314	1.272
5	Otter Trawl	OPEN	all	MA	sm	31,649,299	15,743,702	0.099	25,734,057	7,156,771	0.151	22,783,110	17,834,444	0.091
6	Otter Trawl	OPEN	all	MA	lg	13,561,150	23,208,344	0.111	13,640,578	18,705,797	0.093	15,847,982	23,473,099	0.109
7	Otter Trawl	OPEN	all	NE	sm	54,835,765	6,270,852	0.135	53,574,756	8,729,883	0.100	52,410,056	11,160,966	0.085
8	Otter Trawl	OPEN	all	NE	lg	57,234,642	48,045,393	0.069	50,928,385	36,364,925	0.065	49,838,534	38,124,791	0.089
9	Scallop Trawl	AA	GEN	MA	all				429,539	151,313	0.504	770,913	1,171,385	0.279
10	Scallop Trawl	AA	LIM	MA	all									
11	Scallop Trawl	OPEN	GEN	MA	all	996,246	970,264	0.174	302,630	434,923	0.146	94,556	90,425	0.404
12	Scallop Trawl	OPEN	LIM	MA	all	658,754			43,203			65,861		
13	Otter Trawl, Twin	OPEN	all	MA	all	1,148,765	111,251	0.000	1,136,191	1,677,848	0.528	2,041,787	273,458	0.644
14	Otter Trawl, Twin	OPEN	all	NE	all							956,977	232,195	0.106
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	902,390	201,543	0.035	1,409,864	154,257	0.035	1,278,037	70,672	0.000
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	72,306	47,532	0.000	703,151	95,951	0.052	84,471		
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	202,022	65,702	0.044						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	2,412,967	719,501	0.189	6,448,116	2,534,619	0.124	4,133,646	1,571,765	0.198
20	Shrimp Trawl	OPEN	all	MA	all	8,386			378,256	330,579	0.000	24,682	202,521	0.000
21	Shrimp Trawl	OPEN	all	NE	all	369,649			132,543			216,788		
22	Floating Trap	OPEN	all	MA	all				99,526					
23	Floating Trap	OPEN	all	NE	all	18,352			5,698			4,406		
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	1,352,331	32,594	1.830	1,508,681	480,715	0.914	2,102,717	126,908	0.418
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	3,912,719	260,911	0.500	4,321,157	210,566	0.804	6,049,093	351,477	0.158
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	6,823,553	884,919	0.196	6,094,991	741,865	0.091	5,636,861	1,240,389	0.108
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	376			17,059			2,286		
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	7,956,540	3,671,919	0.077	9,479,800	3,504,153	0.111	7,288,013	2,507,663	0.144
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	15,175,147	2,768,834	0.080	19,510,458	2,193,163	0.079	18,829,387	2,833,050	0.132

Table 14, continued.

Fleet					SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Kept	Discarded	CV	Kept	Discarded	CV	Kept	Discarded	CV
30	Purse Seine	OPEN	all	MA	all	0			0			0		
31	Purse Seine	OPEN	all	NE	all	48,499,422	14,518	0.512	60,894,749	155	0.284	55,865,565	3,073	1.113
32	Scallop Dredge	AA	GEN	MA	all	360,682	14,608	0.559	5,738,125	795,501	0.289	10,951,668	2,285,526	0.135
33	Scallop Dredge	AA	GEN	NE	all	449,517	18,842	0.560	295,522	14,765	0.000	2,404,835	186,041	0.135
34	Scallop Dredge	AA	LIM	MA	all	15,570,539	2,259,686	0.246	42,748,672	2,834,935	0.207	56,539,840	7,442,331	0.132
35	Scallop Dredge	AA	LIM	NE	all	31,504,235	3,199,689	0.135	45,926,321	6,372,043	0.089	72,391,699	8,229,817	0.117
36	Scallop Dredge	OPEN	GEN	MA	all	9,888,426	2,047,323	0.099	8,503,097	2,205,293	0.096	6,822,826	2,579,774	0.081
37	Scallop Dredge	OPEN	GEN	NE	all	8,982,229	899,483	0.122	7,441,196	950,811	0.125	6,735,750	1,471,620	0.133
38	Scallop Dredge	OPEN	LIM	MA	all	55,320,621	5,430,521	0.081	32,681,559	7,017,729	0.114	39,530,325	7,680,559	0.085
39	Scallop Dredge	OPEN	LIM	NE	all	167,907,405	24,837,485	0.059	113,651,751	20,724,851	0.081	103,183,698	15,963,423	0.075
40	Danish Seine	OPEN	all	MA	all	0			0			5,661		
41	Mid-water Paired & Single Trawl	AA	all	NE	all				11,386,626	63	0.201	2,815,151	2,735	0.204
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	3,163,000	9,468	0.000	5,864,525	0				
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	148,023,920	73,127	0.403	122,356,757	414,841	0.647	91,457,330	563	0.401
44	Pots and Traps, Fish	OPEN	all	MA	all	366,848	111,657	0.215	315,059	113,947	0.448	297,394	109,269	0.786
45	Pots and Traps, Fish	OPEN	all	NE	all	319,991			182,435	96,868	0.249	177,560	106,601	0.215
46	Pots and Traps, Conch	OPEN	all	MA	all	3,346	2,129	0.145	19,649	1,613	2.224	3,847	584	0.401
47	Pots and Traps, Conch	OPEN	all	NE	all	0	42,794	0.000	425	210	0.316	250	2,511	0.983
48	Pots and Traps, Hagfish	OPEN	all	NE	all	0			0			0		
49	Pots and Traps, Lobster	OPEN	all	MA	all	140,018	132,628	0.169	149,041	29,982	0.586	176,371	51,969	0.596
50	Pots and Traps, Lobster	OPEN	all	NE	all	25,205	317,539	0.990	39,229	313,497	0.273	151,424	341,016	0.349
51	Pots and Traps, Crab	OPEN	all	MA	all	176,310			384,758			312,429		
52	Pots and Traps, Crab	OPEN	all	NE	all	2,201,739	1,237	0.000	2,452,754			2,540,660		
53	Beam Trawl	OPEN	all	MA	all	675,527			132,589			246,704		
54	Beam Trawl	OPEN	all	NE	all				35,047			247,236		
55	Dredge, Other	OPEN	all	MA	all	0			0			0		
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	256,367,297			179,817,208			248,442,275	3,724,696	0.317
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	215,812,072			160,899,490			198,441,125	1,160,914	0.236
Confidential Fleets						271,892			904,806	159,938	0.177	3,388,896		
Other Fleets						2,284,907			793,842			1,392,414		
TOTAL						1,171,849,660	142,848,902	0.034	1,006,636,905	125,803,405	0.032	1,102,091,443	153,643,333	0.034

Table 15. Standardized Bycatch Reporting Methodology (SBRM) sea day standard (Step 5 Sea Days Needed COMBINED), sea days allocated (Step 12 Sea Day Allocated for April-March), and observed days for April-March) by fleet for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Industry-funded scallop (IFS) fleets are not shown by fleet. Totals are for all fleets (agency-funded and industry-funded scallop fleets combined), and subtotals for agency-funded and IFS fleets are given. Dark shading indicates fleets not considered in the annual SBRM analyses. Yellow shading indicates fleets in which sea days were reduced via the prioritization process because of a shortfall in funding. Orange shading indicates fleets in which the next largest sea day values were used but no prioritization occurred. ASM = At-sea Monitoring; MMPA = Marine Mammal Protection Act. See Table 3 for fleet stratification abbreviations.

	Fleet					SBRM 2015			SBRM 2016			SBRM 2017		
						Step 5	Step 12*		Step 5	Step 12		Step 5	Step 12	
Row	Gear Type	Access Area	Trip Cat.	Region	Mesh	2015 Sea Days Needed COMBINED	Sea Days Allocated for April 2015 - March 2016 (TOTAL)	Observed Days April 2015 - Mar 2016	2016 Sea Days Needed COMBINED	Sea Days Allocated for April 2016 - March 2017 (TOTAL)	Observed Days April 2016 - Mar 2017	2017 Sea Days Needed COMBINED	Sea Days Allocated for April 2017 - March 2018 (TOTAL)	Observed Days April 2017 - Mar 2018
1	Longline	OPEN	all	MA	all	85	85	88	93	93	94	94	94	91
2	Longline	OPEN	all	NE	all	14	14	15	12	12	24	44	44	62
3	Hand Line	OPEN	all	MA	all	70	70	16	66	66	6	65	65	52
4	Hand Line	OPEN	all	NE	all	48	48	50	14	14	31	14	14	96
5	Otter Trawl	OPEN	all	MA	sm	1,577	1340	898	1717	1717	1303	1381	1381	1597
6	Otter Trawl	OPEN	all	MA	lg	1,636	1636	366	1870	1870	548	1828	1828	695
7	Otter Trawl	OPEN	all	NE	sm	1,311	1311	911	798	798	906	1946	1946	1884
8	Otter Trawl	OPEN	all	NE	lg	4,647	731	1308	760	760	644	796	796	1286
13	Otter Trawl , Twin	OPEN	all	MA	all	0	0	15	109	109	24	30	30	55
14	Otter Trawl , Twin	OPEN	all	NE	all	0	0	25	48	48	33	89	89	21
15	Otter Trawl, Ruhle	OPEN	all	MA	lg	0	0	5	0	0	0	4	4	0
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	0	0	4	29	29	0	14	14	13
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	0	0	24	63	63	7	24	24	0
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	0	0	0	0	0	0			0
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	302	302	168	628	628	71	219	219	45
20	Shrimp Trawl	OPEN	all	MA	all	0	0	10	65	65	20	50	50	25
21	Shrimp Trawl	OPEN	all	NE	all	9	9	0	11	11	0	33	33	0
22	Floating Trap	OPEN	all	MA	all	0	0	0	6	6	0	6	6	0
23	Floating Trap	OPEN	all	NE	all	0	0	0	3	3	0	3	3	0
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	784	784	255	890	890	356	720	720	357
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	834	834	220	786	786	291	998	998	161
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	975	975	159	917	917	182	875	875	177
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	0	0	0	8	8	1	0	0	1
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	103	103	300	225	225	187	240	240	275
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	240	240	241	190	190	224	507	507	440
30	Purse Seine	OPEN	all	MA	all	6	6	0	6	6	0	7	7	0
31	Purse Seine	OPEN	all	NE	all	31	31	33	19	19	25	21	21	28
40	Danish Seine	OPEN	all	MA	all	0	0	0	16	16	0	7	7	0
41	Mid-water Paired & Single Trawl	AA	all	NE	all		0	25	6	6	81	25	25	55
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	0	0	0	30	30	13	13	13	17
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	39	39	70	440	440	255	40	40	59
44	Pots and Traps, Fish	OPEN	all	MA	all	22	22	8	12	12	7	13	13	16
45	Pots and Traps, Fish	OPEN	all	NE	all	42	42	15	16	16	17	10	10	16
46	Pots and Traps, Conch	OPEN	all	MA	all	28	28	18	21	21	22	12	12	10
47	Pots and Traps, Conch	OPEN	all	NE	all	22	22	22	9	9	9	9	9	9
48	Pots and Traps, Hagfish	OPEN	all	NE	all	0	0	0	97	97	11	97	97	0
49	Pots and Traps, Lobster	OPEN	all	MA	all	47	47	15	15	15	16	15	15	17
50	Pots and Traps, Lobster	OPEN	all	NE	all	572	572	647	18	18	19	17	17	21
51	Pots and Traps, Crab	OPEN	all	MA	all	0	0	0	23	23	8	28	28	16
52	Pots and Traps, Crab	OPEN	all	NE	all	0	0	0	84	84	101	83	83	113
53	Beam Trawl	OPEN	all	MA	all	35	35	0	40	40	0	31	31	0
54	Beam Trawl	OPEN	all	NE	all	0	0	0	11	11	0	13	13	1
55	Dredge, Other	OPEN	all	MA	all	11	11	0	10	10	0	11	11	2
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	75	75	47	64	64	64	21	21	28
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	65	65	62	46	46	52	16	16	26
TOTAL						15,786			11,610			11,705		
Agency-funded fleet subtotal						13,630	9,477	6,040	10,291	10,291	5,652	10,469	10,469	7,767
Industry-funded scallop fleet subtotal (IFS fleets not shown)						2,156	2,512	2,969	1,319	2,850	3,927	1,236	2,741	3,410
TOTAL (excludes ASM days, MMPA days, and prioritized days not allocated)							11,989	9,009		13,141	9,579		13,210	11,177

* ASM days have been removed from Step 12 in 2015

Table 16. Estimated turtle interactions and coefficient of variation (CV) by gear type. Cc = Loggerhead (*Caretta caretta*), Lk = Kemp's ridley (*Lepidochelys kempii*), Dc = Leatherback (*Dermochelys coriacea*), Unk = unidentified hard-shelled species.

Gear Type	Average Annual Estimated interactions (CV)				Region	Reference
	Cc	Lk*	Dc*	Unk		
Sink Gillnet	141 (0.29)	29 (0.43)	5 (0.71)	22 (0.37)	Mid-Atlantic & Georges Bank	Murray 2018
Scallop Dredge	22 (0.73)	N/A	N/A	N/A	Mid-Atlantic	Murray 2015a
Bottom Otter Trawl (includes Scallop Trawl)	231 (0.13)	N/A	N/A	N/A	Mid-Atlantic	Murray 2015b

*While these species have been observed in dredge and/or trawl gear, they were too rare to estimate total interactions with the model-based approach taken in the analysis.

Table 17. Estimated sea days needs/year to monitor loggerhead turtle (*Caretta caretta*) interactions to achieve a 30% coefficient of variation, by Standardized Bycatch Reporting Methodology (SBRM) year.

Gear Type	Sea Days			Reference
	2015	2016	2017	
Sink Gillnet*	2593	2593	2593	Murray 2013
Scallop Dredge	1293	N/A	N/A	Murray 2015a
Bottom Otter Trawl (includes Scallop Trawl)	3309	3309	3309	Murray 2015b

*Sea day needs in sink gillnet gear have since been revised and are estimated to be 887 days for SBRM year 2018, based on estimated loggerhead interactions from 2012-2016.

Table 18. Number of cells (fleet-species group), by Standardized Bycatch Reporting Methodology (SBRM) performance classification ("Not Applicable," "Unknown," "Met (filtered out)," "Not Met (filtered out)," "Met," and "Not Met") for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). The performance classifications corresponding to the associated box number used in Figure 15 are given. CV = coefficient of variation.

	Number of cells (fleet and species group)			Box # used
SBRM Performance Classification	SBRM 2015	SBRM 2016	SBRM 2017	in Figure 15
NOT APPLICABLE: SBRM performance standard was not applicable. Variance of discard estimate was not available. Not considered in annual SBRM analysis.	14		14	1
UNKNOWN: SBRM performance standard was unknown. Variance of discard estimate was not used in annual sample size analysis because of no or insufficient observer coverage. Pilot coverage.	448	378	308	2, 3 ,4
MET (filtered out): SBRM performance standard was met (CV <= 30%). Variance of discard estimate was not used in annual sample size analysis because of the importance filter (filtered out). Nonpilot coverage.	176	221	271	5, 7b
NOT MET (filtered out): SBRM performance standard was not met (CV > 30%). Variance of discard estimate was not used in annual sample size analysis because of the importance filter (filtered out). Nonpilot coverage.	118	151	152	7a
MET: SBRM performance standard was met (CV <= 30%). Variance of discard estimate was used in annual sample size analysis. Nonpilot coverage.	34	41	47	9
NOT MET: SBRM performance standard was not met (CV > 30%). Variance of discard was used in annual sample size analysis. Nonpilot coverage.	8	7	6	8
Total (14 SBRM species groups x 57 fleets)	798	798	798	

Table 19. Number of fleets by Standardized Bycatch Reporting Methodology (SBRM) performance classification and SBRM species groups for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). "NOT APPLICABLE" indicates fleets not considered in annual SBRM analyses; "UNKNOWN" indicates the coefficient of variation (CV) was unknown because of insufficient observer coverage (pilot fleets); "MET" indicates the CV was less than or equal to 30% or discard equal 0; "NOT MET" indicates the CV was greater than 30%. "Filtered out" indicates nonpilot cells where the variance of the discard estimate was not used in the annual SBRM sample size analyses because of the importance filter.

Species Group	SBRM Performance Classification	SBRM 2015	SBRM 2016	SBRM 2017
ATLANTIC SALMON (*Salmo salar*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	23	30	34
	NOT MET (Filtered out)	1	0	0
	MET	0	0	0
	NOT MET	0	0	0
BLUEFISH (*Pomatomus saltatrix*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	15	18	24
	NOT MET (Filtered out)	9	12	10
	MET	0	0	0
	NOT MET	0	0	0
FLUKE (*Paralichthys dentatus*) - SCUP (*Stenotomus chrysops*) - BLACK SEA BASS (*Centropristis striata*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	9	11	14
	NOT MET (Filtered out)	10	14	15
	MET	5	5	5
	NOT MET	0	0	0
HERRING, ATLANTIC (*Clupea harengus*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	16	21	20
	NOT MET (Filtered out)	8	9	14
	MET	0	0	0
	NOT MET	0	0	0
LARGE MESH GROUNDFISH	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	10	9	16
	NOT MET (Filtered out)	7	15	13
	MET	5	6	5
	NOT MET	2	0	0
MONKFISH (*Lophius americanus*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	10	13	14
	NOT MET (Filtered out)	6	10	9
	MET	5	7	10
	NOT MET	3	0	1

Table 19, continued.

Species Group	SBRM Performance Classification	SBRM 2015	SBRM 2016	SBRM 2017
RED DEEPSEA CRAB (*Chaceon quinquedens*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	15	23	26
	NOT MET (Filtered out)	8	6	6
	MET	0	0	0
	NOT MET	1	1	2
SEA SCALLOP (*Placopecten magellanicus*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	14	14	18
	NOT MET (Filtered out)	10	14	13
	MET	0	2	3
	NOT MET	0	0	0
SKATE COMPLEX (Rajidae)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	9	11	16
	NOT MET (Filtered out)	7	8	6
	MET	8	10	12
	NOT MET	0	1	0
SMALL MESH GROUNDFISH	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	9	11	14
	NOT MET (Filtered out)	11	14	16
	MET	4	4	3
	NOT MET	0	1	1
SPINY DOGFISH (*Squalus acanthias*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	6	7	12
	NOT MET (Filtered out)	11	14	13
	MET	6	6	7
	NOT MET	1	3	2
SQUID (*Doryteuthis* [Amerigo] *pealeii, Illex illecebrosus*)-BUTTERFISH (*Peprilus triacanthus*) - MACKEREL (*Scomber scombrus*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	9	13	17
	NOT MET (Filtered out)	13	15	15
	MET	1	1	2
	NOT MET	1	1	0

Table 19, continued.

Species Group	SBRM Performance Classification	SBRM 2015	SBRM 2016	SBRM 2017
SURFCLAM (*Spisula solidissima*) - OCEAN QUAHOG (*Arctica islandica*)				
	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	13	18	18
	NOT MET (Filtered out)	11	12	16
	MET	0	0	0
	NOT MET	0	0	0
TILEFISH (*Lopholatilus chamaeleonticeps*)	NOT APPLICABLE	1	0	1
	UNKNOWN	32	27	22
	MET (Filtered out)	18	22	28
	NOT MET (Filtered out)	6	8	6
	MET	0	0	0
	NOT MET	0	0	0

Table 20. Number of Standardized Bycatch Reporting Methodology (SBRM) species groups by SBRM performance classification [Unknown, Met, and Not Met] by SBRM fleets for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Data shading indicates fleets not considered in annual SBRM analyses ("Not Applicable"); "UNK" indicates the coefficient of variation (CV) was unknown because of insufficient observer coverage (pilot fleets); "MET" indicates the CV was less than or equal to 30% or discard equal 0; "NOT MET" indicates the CV was greater than 30%. "Filtered out" indicates nonpilot cells where the variance of the discard estimate was not used in the annual SBRM sample size analyses because of the importance filter. See Table 3 for fleet stratification abbreviations.

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015				SBRM 2016				SBRM 2017			
						UNK	Not Met	Met	Filtered out	UNK	Not Met	Met	Filtered out	UNK	Not Met	Met	Filtered out
1	Longline	OPEN	all	MA	all	14	0	0	0	0	0	0	14	0	0	0	14
2	Longline	OPEN	all	NE	all	0	0	0	14	0	0	0	14	0	1	0	13
3	Hand Line	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
4	Hand Line	OPEN	all	NE	all	0	1	0	13	0	0	0	14	0	0	0	14
5	Otter Trawl	OPEN	all	MA	sm	0	0	6	8	0	2	3	9	0	1	5	8
6	Otter Trawl	OPEN	all	MA	lg	0	1	4	9	0	0	5	9	0	0	5	9
7	Otter Trawl	OPEN	all	NE	sm	0	1	4	9	0	0	6	8	0	1	6	7
8	Otter Trawl	OPEN	all	NE	lg	0	1	6	7	0	1	6	7	0	1	6	7
9	Scallop Trawl	AA	GEN	MA	all	14	0	0	0	14	0	0	0	0	1	0	13
10	Scallop Trawl	AA	LIM	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
11	Scallop Trawl	OPEN	GEN	MA	all	0	0	0	14	0	0	0	14	0	0	0	14
12	Scallop Trawl	OPEN	LIM	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
13	Otter Trawl, Twin	OPEN	all	MA	all	14	0	0	0	0	1	0	13	14	0	0	0
14	Otter Trawl, Twin	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
15	Otter Trawl, Ruhle	OPEN	all	MA	lg	14	0	0	0	14	0	0	0	14	0	0	0
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	14	0	0	0	14	0	0	0	14	0	0	0
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	14	0	0	0	14	0	0	0	14	0	0	0
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	0	0	0	14	0	0	0	14				
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	0	1	0	13	0	1	3	10	0	0	1	13
20	Shrimp Trawl	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
21	Shrimp Trawl	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
22	Floating Trap	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
23	Floating Trap	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	0	0	0	14	0	1	0	13	0	0	0	14
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	0	0	0	14	0	0	0	14	0	0	1	13
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	0	1	0	13	0	0	0	14	0	0	1	13
27	Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	14	0	0	0	14	0	0	0	14	0	0	0
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	0	0	1	13	0	0	1	13	0	0	1	13
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	0	0	3	11	0	0	3	11	0	0	3	11

Table 20, continued.

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015				SBRM 2016				SBRM 2017			
						UNK	Not Met	Met	Filtered out	UNK	Not Met	Met	Filtered out	UNK	Not Met	Met	Filtered out
30	Purse Seine	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
31	Purse Seine	OPEN	all	NE	all	0	0	0	14	0	0	0	14	0	0	0	14
32	Scallop Dredge	AA	GEN	MA	all	14	0	0	0	0	0	0	14	0	0	0	14
33	Scallop Dredge	AA	GEN	NE	all	0	0	0	14	14	0	0	0	0	0	0	14
34	Scallop Dredge	AA	LIM	MA	all	0	1	0	13	0	0	1	13	0	0	3	11
35	Scallop Dredge	AA	LIM	NE	all	0	0	2	12	0	0	4	10	0	0	3	11
36	Scallop Dredge	OPEN	GEN	MA	all	0	0	1	13	0	0	1	13	0	0	2	12
37	Scallop Dredge	OPEN	GEN	NE	all	0	0	0	14	0	0	0	14	0	0	2	12
38	Scallop Dredge	OPEN	LIM	MA	all	0	0	2	12	0	0	2	12	0	0	2	12
39	Scallop Dredge	OPEN	LIM	NE	all	0	0	5	9	0	0	6	8	0	0	6	8
40	Danish Seine	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
41	Mid-water Paired & Single Trawl	AA	all	NE	all						0	0	14	0	0	0	14
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	0	0	0	14	0	1	0	13	0	0	0	14
44	Pots and Traps, Fish	OPEN	all	MA	all	14	0	0	0	0	0	0	14	0	0	0	14
45	Pots and Traps, Fish	OPEN	all	NE	all	14	0	0	0	14	0	0	0	0	0	0	14
46	Pots and Traps, Conch	OPEN	all	MA	all	14	0	0	0	14	0	0	0	0	0	0	14
47	Pots and Traps, Conch	OPEN	all	NE	all	14	0	0	0	0	0	0	14	0	0	0	14
48	Pots and Traps, Hagfish	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
49	Pots and Traps, Lobster	OPEN	all	MA	all	14	0	0	0	0	0	0	14	0	0	0	14
50	Pots and Traps, Lobster	OPEN	all	NE	all	0	1	0	13	0	0	0	14	0	1	0	13
51	Pots and Traps, Crab	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
52	Pots and Traps, Crab	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
53	Beam Trawl	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
54	Beam Trawl	OPEN	all	NE	all	14	0	0	0	14	0	0	0	14	0	0	0
55	Dredge, Other	OPEN	all	MA	all	14	0	0	0	14	0	0	0	14	0	0	0
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	14	0	0	0	14	0	0	0	0	0	0	14
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	14	0	0	0	14	0	0	0	0	0	0	14
Total						448	8	34	294	378	7	41	372	308	6	47	423

Table 21. Standardized Bycatch Reporting Methodology (SBRM) standard trips needed to achieve a 30% coefficient of variation, Vessel Trip Report (VTR) trips, the percentage of standard trips to the VTR trips, and the determining species group, by fleet and SBRM year. "P" indicates standard trips were based on pilot coverage, Minimum pilot coverage, "MPC," indicates that all cells within the fleet were filtered out and the number of trips is based on pilot coverage to maintain coverage. Dark shading represents fleets not considered in annual analysis. See Table 3 for fleet abbreviations and Table 4 for species group abbreviations. NE = New England; MA = Mid-Atlantic.

	Fleet									Expected Coverage					
		SBRM Standard Trips			VTR TRIPS			Percent of SBRM Standard Trips to VTR Trips			SBRM Species Group (FISH)		
Row	Gear Type Access Area Trip Category Region Mesh Group	2015 SBRM	2016 SBRM	2017 SBRM	2015 SBRM	2016 SBRM	2017 SBRM	2015 SBRM	2016 SBRM	2017 SBRM	2015 SBRM	2016 SBRM	2017 SBRM
1	Longline OPEN all MA all	12	12	12	194	226	163	6%	5%	7%	P	MPC	MPC
2	Longline OPEN all NE all	12	12	44	492	898	852	2%	1%	5%	MPC	MPC	DOG
3	Hand Line OPEN all MA all	64	60	58	3108	2857	2869	2%	2%	2%	P	P	P
4	Hand Line OPEN all NE all	45	12	12	2195	2667	2702	2%	0%	0%	GFL	MPC	MPC
5	Otter Trawl OPEN all MA sm	242	784	475	3839	3088	3311	6%	25%	14%	SBM	SBM	GFS
6	Otter Trawl OPEN all MA lg	340	100	79	4183	3886	4005	8%	3%	2%	MONK	DOG	MONK
7	Otter Trawl OPEN all NE sm	505	305	740	3588	3381	3973	14%	9%	19%	SBM	DOG	MONK
8	Otter Trawl OPEN all NE lg	1,646	1191	1800	6665	5849	5439	25%	20%	33%	RCRAB	RCRAB	RCRAB
9	Scallop Trawl AA GEN MA all	3	6	24	13	86	158	23%	7%	15%	P	P	DOG
10	Scallop Trawl AA LIM MA all	6	0	0	3	2	1	200%	0%	0%	P	MPC	MPC
11	Scallop Trawl OPEN GEN MA all	12	12	9	279	136	64	4%	9%	14%	MPC	MPC	MPC
12	Scallop Trawl OPEN LIM MA all	12	3	6	25	4	8	48%	75%	75%	P	P	P
13	Otter Trawl, Twin OPEN all MA all	12	71	12	49	178	133	24%	40%	9%	P	SKATE	P
14	Otter Trawl, Twin OPEN all NE all	14	6	12	19	15	22	74%	40%	55%	P	P	P
15	Otter Trawl, Ruhle OPEN all MA lg	6	0	3	8	2	4	75%	0%	75%	P	MPC	P
16	Otter Trawl, Ruhle OPEN all NE sm	9	9	6	18	23	27	50%	39%	22%	P	P	P
17	Otter Trawl, Ruhle OPEN all NE lg	9	12	3	9	24	10	100%	50%	30%	P	P	P
18	Otter Trawl, Haddock Separator OPEN all NE sm	3	3		6	5		50%	60%		MPC	MPC	
19	Otter Trawl, Haddock Separator OPEN all NE lg	38	83	26	124	324	171	31%	26%	15%	DOG	DOG	GFL
20	Shrimp Trawl OPEN all MA all	11	12	9	405	130	100	3%	9%	9%	P	P	P
21	Shrimp Trawl OPEN all NE all	9	9	12	131	71	77	7%	13%	16%	P	P	P
22	Floating Trap OPEN all MA all	9	6	6	85	80	76	11%	8%	8%	P	P	P
23	Floating Trap OPEN all NE all	6	3	3	10	17	15	60%	18%	20%	P	P	P
24	Sink, Anchor, Drift Gillnet OPEN all MA sm	12	570	12	1938	2084	1638	1%	27%	1%	MPC	DOG	MPC
25	Sink, Anchor, Drift Gillnet OPEN all MA lg	12	12	112	2015	1854	2212	1%	1%	5%	MPC	MPC	DOG
26	Sink, Anchor, Drift Gillnet OPEN all MA xlg	104	12	28	2120	1828	1707	5%	1%	2%	MONK	MPC	SKATE
27	Sink, Anchor, Drift Gillnet OPEN all NE sm	9	6	0	5	9	4	180%	67%	0%	P	P	MPC
28	Sink, Anchor, Drift Gillnet OPEN all NE lg	69	146	157	3621	3292	2614	2%	4%	6%	DOG	DOG	DOG
29	Sink, Anchor, Drift Gillnet OPEN all NE xlg	161	130	339	2933	3297	3421	5%	4%	10%	DOG	MONK	DOG

Table 21, continued.

Row	Fleet: Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM Standard Trips 2015 SBRM	2016 SBRM	2017 SBRM	VTR TRIPS 2015 SBRM	2016 SBRM	2017 SBRM	Percent of SBRM Standard Trips to VTR Trips 2015 SBRM	2016 SBRM	2017 SBRM	SBRM Species Group (FISH) 2015 SBRM	2016 SBRM	2017 SBRM
30	Purse Seine	OPEN	all	MA	all	6	6	7	229	172	221	3%	3%	3%	P	P	P
31	Purse Seine	OPEN	all	NE	all	12	9	9	296	315	237	4%	3%	4%	MPC	MPC	MPC
32	Scallop Dredge	AA	GEN	MA	all	16	6	12	67	1041	2050	24%	1%	1%	P	MPC	MPC
33	Scallop Dredge	AA	GEN	NE	all	12	12	9	71	24	430	17%	50%	2%	MPC	P	MPC
34	Scallop Dredge	AA	LIM	MA	all	19	28	21	200	416	547	10%	7%	4%	MONK	MONK	SCAL
35	Scallop Dredge	AA	LIM	NE	all	15	33	24	328	446	625	5%	7%	4%	SKATE	GFL	SCAL
36	Scallop Dredge	OPEN	GEN	MA	all	16	12	26	2226	1906	1878	1%	1%	1%	SKATE	SKATE	MONK
37	Scallop Dredge	OPEN	GEN	NE	all	12	12	40	3597	3190	2906	0%	0%	1%	MPC	MPC	SKATE
38	Scallop Dredge	OPEN	LIM	MA	all	14	13	5	449	350	449	3%	4%	1%	MONK	MONK	MONK
39	Scallop Dredge	OPEN	LIM	NE	all	64	55	59	1043	869	933	6%	6%	6%	GFS	FSB	FSB
40	Danish Seine	OPEN	all	MA	all	6	6	6	85	56	45	7%	11%	13%	P	P	P
41	Mid-water Paired & Single Trawl	AA	all	NE	all		6	6		20	8		30%	75%		MPC	MPC
42	Mid-water Paired & Single Trawl	OPEN	all	MA	all	6	6	3	13	26	11	46%	23%	27%	P	P	P
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	12	134	12	439	363	364	3%	37%	3%	MPC	DOG	MPC
44	Pots and Traps, Fish	OPEN	all	MA	all	21	12	12	971	947	677	2%	1%	2%	P	MPC	MPC
45	Pots and Traps, Fish	OPEN	all	NE	all	23	16	9	923	623	597	2%	3%	2%	P	P	MPC
46	Pots and Traps, Conch	OPEN	all	MA	all	25	21	12	1107	958	1149	2%	2%	1%	P	P	MPC
47	Pots and Traps, Conch	OPEN	all	NE	all	22	9	9	1119	1087	1297	2%	1%	1%	P	MPC	MPC
48	Pots and Traps, Hagfish	OPEN	all	NE	all	12	12	12	47	69	39	26%	17%	31%	P	P	P
49	Pots and Traps, Lobster	OPEN	all	MA	all	31	12	12	1692	1487	1484	2%	1%	1%	P	MPC	MPC
50	Pots and Traps, Lobster	OPEN	all	NE	all	435	12	463	26168	26106	27956	2%	0%	2%	GFL	MPC	RCRAB
51	Pots and Traps, Crab	OPEN	all	MA	all	12	9	9	54	86	52	22%	10%	17%	P	P	P
52	Pots and Traps, Crab	OPEN	all	NE	all	12	12	12	81	63	49	15%	19%	24%	P	P	P
53	Beam Trawl	OPEN	all	MA	all	12	12	12	114	81	109	11%	15%	11%	P	P	P
54	Beam Trawl	OPEN	all	NE	all	9	6	12	47	20	102	19%	30%	12%	P	P	P
55	Dredge, Other	OPEN	all	MA	all	10	9	10	288	255	305	3%	4%	3%	P	P	P
56	Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	36	32	12	1824	1591	1758	2%	2%	1%	P	P	MPC
57	Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	55	35	12	2726	1744	2175	2%	2%	1%	P	P	MPC
	Total					4,317	4,134	4,846	84,284	80,624	84,229	5%	5%	6%			

Table 22. Number of observed (OB) trips and adjusted OB trips, by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data), for fleets that would have had a change in number of trips in at least 1 year. Fleet status "P" indicates fleets for which pilot coverage was assigned and "F" indicates all species groups were filtered out in the fleet. Species groups in fleets with "P" or "F" are associated with "UNKNOWN", MET (filtered out) and NOT MET (filtered out) performance classifications (see Table 18 and Figure 15). See Table 3 for fleet stratification abbreviations.

Fleet					SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	OB Trips	Adjusted OB Trips	Fleet Status	OB Trips	Adjusted OB Trips	Fleet Status	OB Trips	Adjusted OB Trips	Fleet Status
2	Longline	OPEN	all	NE	all	30	12	F	8	4	F	9	4	
4	Hand Line	OPEN	all	NE	all	12	4		16	12	F	30	17	F
5	Otter Trawl	OPEN	all	MA	sm	357	272		360	311		387	283	
6	Otter Trawl	OPEN	all	MA	lg	179	133		227	189		172	143	
7	Otter Trawl	OPEN	all	NE	sm	279	246		319	300		325	294	
8	Otter Trawl	OPEN	all	NE	lg	998	446		1046	414		734	290	
13	Otter Trawl, Twin	OPEN	all	MA	all	1	1	P	22	7		5	5	P
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	2	1	P	5	1	P	1	1	P
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	1	0	P	4	3	P	0	0	P
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	28	12		60	19		28	15	
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	10	10	F	70	67	F	237	237	
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	34	20		132	122	F	152	151	
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	715	305		745	206		460	161	
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	393	160		539	164		408	136	

Number of fleets in the annual SBRM analysis that would have had adjusted OB trips (excluding fleets with "P" and "F" designations)	9	8	10
Number of fleets with 1 or more species groups that would have had a changed in performance classification	2	3	3
Number of species groups that would have changed performance classification from "MET" to "NOT MET"	2	4	3

Table 23. Number of trips needed to achieve a 30% coefficient of variation of the discard estimate, number of observed (OB) trips, number of adjusted OB trips, and if a change would have occurred in the performance classification had the adjusted OB trips been used, by fleet and species group for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data). Performance classification would have changed from "MET" to "NOT MET" when the needed trips are between the OB trips and the adjusted OB trips. See Table 3 for fleet stratification abbreviations and Table 4 for species group abbreviations.

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Species Group	SBRM Trips Needed	OB Trips	Adjusted OB Trips	Change to Performance Classification
4	Hand Line	OPEN	all	NE	all	GFL	45	12	4	N
5	Otter Trawl	OPEN	all	MA	sm	SBM	242	357	272	N
						GFS	231			N
						FSB	214			N
						DOG	175			N
						GFL	146			N
						SKATE	128			N
6	Otter Trawl	OPEN	all	MA	lg	MONK	340	179	133	N
						DOG	100			N
						FSB	96			N
						SKATE	40			N
						GFL	33			N
7	Otter Trawl	OPEN	all	NE	sm	SBM	505	279	246	N
						FSB	277			Y
						DOG	220			N
						GFS	177			N
						GFL	120			N
8	Otter Trawl	OPEN	all	NE	lg	RCRAB	1,646	998	446	N
						FSB	259			N
						GFL	124			N
						SKATE	112			N
						GFS	82			N
						MONK	81			N
						DOG	68			N
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	DOG	38	28	12	N
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	MONK	104	34	20	N
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	DOG	69	715	305	N
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	DOG	161	393	160	Y
						MONK	102			N
						SKATE	49			N

Table 24. Number of trips needed to achieve a 30% coefficient of variation of the discard estimate, number of observed (OB) trips, number of adjusted OB trips, and if a change would have occurred in the performance classification had the adjusted OB trips been used, by fleet and species group for Standardized Bycatch Reporting Methodology (SBRM) 2016 (July 2014 through June 2015 data). Performance classification would have changed from "MET" to "NOT MET" when the needed trips are between OB trips and adjusted OB trips. See Table 4 for species group abbreviations. See Table 3 for fleet stratification abbreviations and Table 4 for species group abbreviations.

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Species Group	SBRM Trips Needed	OB Trips	Adjusted OB Trips	Change to Performance Classification
5	Otter Trawl	OPEN	all	MA	sm	SBM	784	360	311	N
						GFS	463			N
						SKATE	317			Y
						DOG	309			N
						FSB	294			N
6	Otter Trawl	OPEN	all	MA	lg	DOG	100	227	189	N
						MONK	95			N
						FSB	90			N
						GFL	53			N
						SKATE	32			N
7	Otter Trawl	OPEN	all	NE	sm	DOG	305	319	300	Y
						FSB	276			N
						GFL	204			N
						SKATE	178			N
						GFS	172			N
						SBM	145			N
8	Otter Trawl	OPEN	all	NE	lg	RCRAB	1,191	1,046	414	N
						FSB	256			N
						DOG	103			N
						MONK	97			N
						SKATE	96			N
						GFS	72			N
						GFL	49			N
13	Otter Trawl, Twin	OPEN	all	MA	all	SKATE	71	22	7	N
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	DOG	83	60	19	N
						GFS	38			Y
						SKATE	23			Y
						GFL	14			N
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	DOG	146	745	206	N
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	MONK	130	539	164	N
						DOG	91			N
						SKATE	61			N

Table 25. Number of trips needed to achieve a 30% coefficient of variation of the discard estimate, number of observed (OB) trips, number of adjusted OB trips, and if a change would have occurred in the performance classification had the adjusted OB trips been used, by fleet and species group for Standardized Bycatch Reporting Methodology 2017 (July 2015 through June 2016 data). Performance classification would have changed from "MET" to "NOT MET" when the needed trips are between OB trips and adjusted OB trips. See Table 4 for species group abbreviations. See Table 3 for fleet stratification abbreviations and Table 4 for species group abbreviations.

Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Species Group	SBRM Trips Needed	OB Trips	Adjusted OB Trips	Change to Performance Classification
2	Longline	OPEN	all	NE	all	DOG	44	9	4	N
5	Otter Trawl	OPEN	all	MA	sm	GFS	475	387	283	N
						SBM	338			Y
						MONK	212			N
						DOG	152			N
						SKATE	89			N
						FSB	61			N
6	Otter Trawl	OPEN	all	MA	lg	MONK	79	172	143	N
						FSB	74			N
						DOG	72			N
						GFL	54			N
						SKATE	34			N
7	Otter Trawl	OPEN	all	NE	sm	MONK	740	325	294	N
						GFS	198			N
						GFL	187			N
						DOG	178			N
						SKATE	170			N
						FSB	149			N
						SBM	126			N
8	Otter Trawl	OPEN	all	NE	lg	RCRAB	1,800	734	290	N
						FSB	273			N
						GFS	205			N
						GFL	121			N
						SKATE	117			N
						MONK	108			N
						DOG	103			N
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	GFL	26	28	15	Y
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	DOG	112	237	237	N
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	SKATE	28	152	151	N
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	DOG	157	460	161	N
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	DOG	339	408	136	Y
						SKATE	132			N
						MONK	108			N

Table 26. Number of unobserved (Unobs) and observed (Obs) Vessel Trip Report (VTR) – trips, mean trip duration (in days), and mean kept weight of all species (lb, live weight) and difference of means for each metric (DIFF), and maximum observed trips with the p-value for each metric derived from the results of the randomization tests between unobserved and observed VTR trips for fleets with 30 or more observed trips in Standardized Bycatch Reporting Method (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Table 3 for fleet stratification abbreviations.

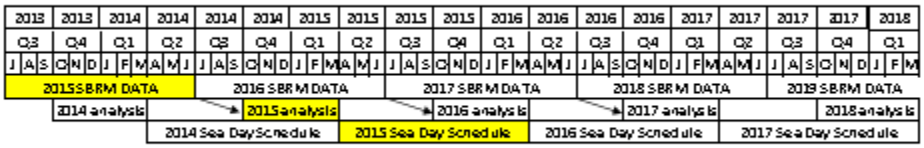
FLEET	Gear Type	Access	Trip	Region	Mesh		Number of Trips		Mean Trip Duration (days)				Mean Kept Weight of all species (lb)				Maximum Observed Trips	
Row		Area	Cat.		Group	SBRM Year	Unobs	Obs	Unobs	Obs	Diff	p_value	Unobs	Obs	Diff	p_value	Trips	p_value
5	Otter Trawl	OPEN	all	MA	sm	2015	3603	236	2.26	2.94	-0.68	0.000	10019	13901	-3881	0.056	12	0.290
						2016	2896	192	2.10	3.49	-1.39	0.000	8542	22615	-14072	0.000	11	0.151
						2017	3097	214	2.08	2.78	-0.70	0.000	7503	10121	-2617	0.045	14	0.101
6	Otter Trawl	OPEN	all	MA	lg	2015	3901	282	2.18	2.38	-0.20	0.130	3399	4218	-818	0.010	14	0.013
						2016	3530	356	2.40	2.50	-0.10	0.426	3611	4254	-643	0.043	17	0.156
						2017	3712	293	2.31	2.46	-0.14	0.297	4085	3802	283	0.471	17	0.045
7	Otter Trawl	OPEN	all	NE	sm	2015	3366	222	2.57	3.03	-0.46	0.005	14583	30329	-15746	0.000	14	0.058
						2016	3131	250	2.56	3.36	-0.80	0.000	14390	36510	-22119	0.000	14	0.070
						2017	3714	259	2.57	3.42	-0.85	0.000	12350	28540	-16191	0.000	11	0.353
8	Otter Trawl	OPEN	all	NE	lg	2015	5591	1074	2.64	3.76	-1.12	0.000	8109	11874	-3764	0.000	29	0.496
						2016	4770	1079	2.84	3.51	-0.66	0.000	8523	10276	-1754	0.000	38	0.051
						2017	4654	785	2.85	3.32	-0.47	0.000	9075	10612	-1537	0.010	25	0.335
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	2015	90	34	7.99	7.97	0.02	0.962	19464	19595	-132	0.969	9	0.098
						2016	247	77	7.76	7.03	0.74	0.018	21054	16817	4237	0.092	8	0.620
						2017	136	35	8.59	8.37	0.22	0.516	24127	24913	-786	0.849	9	0.067
24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	2015	1871	67	1.03	1.04	-0.02	0.278	1869	1712	158	0.539	6	0.241
						2016	2042	42	1.04	1.05	-0.01	0.755	2381	2886	-504	0.189	6	0.071
						2017	1509	129	1.01	1.02	-0.01	0.613	2300	2537	-237	0.250	19	0.002
25	Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	2015	1942	73	1.05	1.11	-0.06	0.080	2543	3709	-1166	0.001	13	0.000
						2016	1773	81	1.03	1.04	0.00	0.776	2748	3229	-482	0.091	11	0.029
						2017	1996	216	1.03	1.04	0.00	0.710	3024	3094	-70	0.710	24	0.014
26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	2015	2032	88	1.17	1.24	-0.07	0.110	3227	3528	-300	0.204	11	0.000
						2016	1695	133	1.22	1.29	-0.08	0.096	3334	3649	-316	0.134	7	0.704
						2017	1568	139	1.17	1.26	-0.09	0.022	3290	3743	-453	0.023	7	0.962
28	Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	2015	2913	708	1.48	1.52	-0.04	0.509	2193	2403	-211	0.040	47	0.286
						2016	2580	712	1.54	1.55	-0.01	0.873	2864	3143	-279	0.026	58	0.000
						2017	2096	518	1.55	1.45	0.10	0.210	2822	2873	-51	0.736	65	0.000
29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	2015	2530	404	1.50	1.42	0.08	0.078	5199	5118	81	0.630	30	0.003
						2016	2772	525	1.48	1.35	0.13	0.001	5934	5890	44	0.791	31	0.012
						2017	2915	506	1.51	1.41	0.10	0.039	5620	4901	720	0.000	52	0.000
31	Purse Seine	OPEN	all	NE	all	2015	235	61	2.08	2.13	-0.05	0.341	162314	169764	-7450	0.662	20	0.053
32	Scallop Dredge	AA	GEN	MA	all	2017	1980	70	1.85	1.93	-0.08	0.191	5296	6658	-1362	0.063	6	0.081
33	Scallop Dredge	AA	GEN	NE	all	2017	395	35	1.98	1.91	0.07	0.332	5553	6042	-489	0.535	4	0.150
34	Scallop Dredge	AA	LIM	MA	all	2016	355	61	6.88	7.43	-0.55	0.045	101180	111962	-10782	0.029	3	0.032
						2017	486	61	7.23	7.97	-0.74	0.009	102118	113289	-11171	0.056	2	0.613
35	Scallop Dredge	AA	LIM	NE	all	2016	372	74	7.97	8.32	-0.35	0.168	101258	111603	-10345	0.024	2	0.613
						2017	543	82	7.63	7.74	-0.11	0.631	114793	122669	-7876	0.043	2	0.839
36	Scallop Dredge	OPEN	GEN	MA	all	2015	2127	99	1.72	1.69	0.03	0.602	4423	5248	-825	0.001	7	0.329
						2016	1810	96	1.82	1.84	-0.02	0.652	4469	5160	-691	0.011	7	0.255
						2017	1775	103	2.10	1.99	0.11	0.113	3603	4324	-721	0.004	7	0.422
37	Scallop Dredge	OPEN	GEN	NE	all	2015	3479	118	1.29	1.47	-0.18	0.000	2453	4089	-1636	0.010	11	0.001
						2016	3060	130	1.34	1.56	-0.23	0.000	2306	3471	-1166	0.003	10	0.031
						2017	2811	95	1.45	1.86	-0.42	0.000	2335	3534	-1199	0.031	9	0.008
38	Scallop Dredge	OPEN	LIM	MA	all	2015	398	51	9.01	9.20	-0.19	0.690	124198	115492	8705	0.495	3	0.129
						2016	315	35	8.98	9.66	-0.67	0.279	92449	101731	-9281	0.379	2	0.331
						2017	404	45	8.76	10.16	-1.40	0.010	84930	115976	-31047	0.004	2	0.462
39	Scallop Dredge	OPEN	LIM	NE	all	2015	912	131	9.86	9.96	-0.10	0.722	160374	165243	-4869	0.573	2	0.984
						2016	758	111	10.30	10.29	0.02	0.953	130755	130993	-238	0.976	3	0.272
						2017	825	108	9.51	9.58	-0.07	0.837	109509	118884	-9375	0.170	3	0.464
43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	2015	309	130	3.03	3.78	-0.75	0.000	311549	398117	-86568	0.004	18	0.363
						2016	296	67	3.32	3.07	0.25	0.236	339821	325072	14749	0.691	12	0.371
50	Pots and Traps, Lobster	OPEN	all	NE	all	2016	26040	66	1.31	3.06	-1.75	0.000	1157	3648	-2491	0.000	5	0.000
						2017	27749	207	1.29	2.48	-1.19	0.000	1094	3676	-2581	0.000	11	0.000

Table 27. The coefficient of variation (CV) of total discards for individual stocks assessed during 2015 and 2017, as available from stock assessment reports or supporting documents, for fish and invertebrate species in the Standardized Bycatch Reporting Methodology. MA = Mid-Atlantic; SAW = Stock Assessment Workshop; GM = Gulf of Maine' GB = Georges Bank; SNEMA = Southern New England/Mid-Atlantic; CCGM = Cape Cod/Gulf of Maine; MAFMC = Mid-Atlantic Fishery Management Council; SSC = Science and Statistical Committee.

Assessment/Stock	Discard CVs of the 3 most recent years			Source
Bluefish	no discards estimated			2017 MA Data Update; MAFMC SSC Meeting webpage
Black Sea Bass (north unit; 2013-2015)	0.34	0.2	0.31	2016 SAW Benchmark assessment (Center Reference Document 17-03)
Black Sea Bass (south unit; 2013-2015)	0.19	0.14	0.12	2016 SAW Benchmark assessment (Center Reference Document 17-03)
Fluke (2013-2015)	0.09	0.06	0.08	2016 Assessment Update (Center Reference Document 16-15)
Scup (2014-2016)	0.07	0.10	0.10	2017 MA Data Update; MAFMC SSC Meeting webpage
Atlantic herring	only total catch reported			2015 Operational Assessment (Center Reference Document 15-16)
American plaice, GM (2014-2016)	0.07	0.03	0.12	2017 Groundfish Operational Assessment Data Portal
American plaice, GB (2014-2016)	0.09	0.11	0.19	2017 Groundfish Operational Assessment Data Portal
Atlantic cod, GM (2014-2016)	0.14	0.17	0.11	2017 Groundfish Operational Assessment Data Portal
Atlantic cod, GB (2014-2016)	0.09	0.12	0.26	2017 Groundfish Operational Assessment Data Portal
Atlantic halibut	time period not applicable			2015 Groundfish Operational Assessment Data Portal;
Atlantic wolffish	CVs not reported in tables			2017 Groundfish Operational Assessment Data Portal
Haddock, GM (2014-2016)	0.11	0.11	0.14	2017 Groundfish Operational Assessment Data Portal
Haddock, GB (2014-2016)	0.15	0.28	0.28	2017 Groundfish Operational Assessment Data Portal
Ocean pout (2014-2016)	0.23	0.16	0.26	2017 Groundfish Operational Assessment Data Portal
Pollock	CVs not reported in tables			2017 Groundfish Operational Assessment Data Portal
Redfish (2014-2016)	0.26	0.19	0.14	2017 Groundfish Operational Assessment Data Portal
White hake (2014-2016)	0.15	0.17	0.20	2017 Groundfish Operational Assessment Data Portal
Windowpane flounder, Northern	CVs not reported in tables			2017 Groundfish Operational Assessment Data Portal
Windowpane flounder, Southern	CVs not reported in tables			2017 Groundfish Operational Assessment Data Portal
Winter flounder, GM (2014-2016)	0.27	0.17	0.26	2017 Groundfish Operational Assessment Data Portal
Winter flounder, GB (2014-2016)	0.09	0.1	0.09	2017 Groundfish Operational Assessment Data Portal
Winter flounder, SNEMA (2014-2016)	CVs not reported in tables			2017 Groundfish Operational Assessment Data Portal
Witch flounder (2014-2016)	0.12	0.11	0.10	2017 Groundfish Operational Assessment Data Portal
Yellowtail flounder, CCGM (2014-2016)	0.18	0.11	0.27	2017 Groundfish Operational Assessment Data Portal
Yellowtail flounder, GB (2014-2016)	0.12	0.17	0.83	2017 Groundfish Operational Assessment Data Portal
Yellowtail flounder, SNEMA (2014-	0.10	0.06	0.16	2017 Groundfish Operational Assessment Data Portal
Monkfish, Northern (2013-2015)	0.09	0.07	0.07	Center Reference Document 16-09
Monkfish, Southern (2013-2015)	0.09	0.07	0.07	Center Reference Document 16-09
Skate Complex	time period not applicable			2008 Data Poor Workshop
Offshore hake	time period not applicable			Center Reference Document 11-02
Red hake	time period not applicable			Center Reference Document 11-02

Table 27, continued.

Assessment/Stock	Discard CVs of the 3 most recent years			Source
Silver hake	time period not applicable			Center Reference Document 11-02
Spiny dogfish	time period not applicable			Transboundary Resource Assessment Committee 2010
Atlantic mackerel (2014-2016)	0.35	0.30	0.17	2018 SAW Benchmark assessment (Center Reference Document18-03)
Butterfish (2014-2016)	0.19	0.18	0.17	2018 MA Data Update (Center Reference Document 18-05)
Northern shortfin squid	no discards estimated			2017 MA Data Update; MAFMC SSC Meeting webpage
Longfin inshore squid (2011-2016)	CVs averaged 30% for small mesh			2017 MA Data Update; MAFMC SSC Meeting webpage
Surfclam	no discards estimated			2017 MA Data Update; MAFMC SSC Meeting webpage
Ocean quahog	no discards estimated			2017 MA Data Update; MAFMC SSC Meeting webpage
Tilefish, Golden	no discards estimated			2017 MA Data Update; MAFMC SSC Meeting webpage
Sea Scallops	time period not applicable			Center Reference Document 14-09



2015 SBRM time frames (data used, analysis conducted, sea day schedule) indicated in yellow.

Figure 1. Time frames of data used, analyses, and sea day schedules for 2015, 2016, and 2017 Standardized Bycatch Reporting Methodology (SBRM). The 2015 SBRM data used, analysis, and sea day schedule are highlighted in yellow.

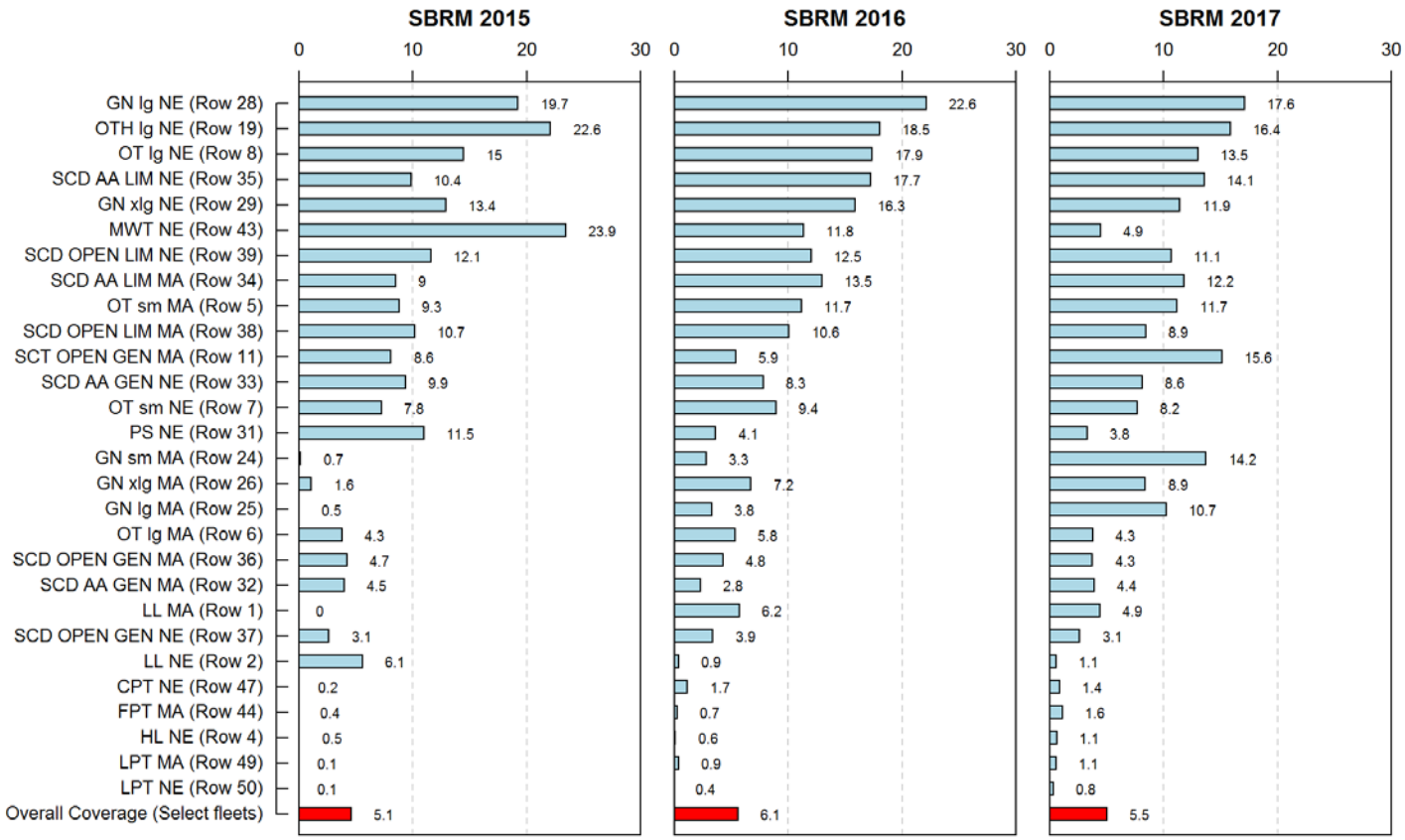


Figure 2. Percentage of Vessel Trip Report (VTR) trips observed for 28 selected fleets for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Selected fleets represent fleets for which discards were estimated in 2 of the 3 SBRM years. Bars represent the ration of total observed trips over total VTR trips for each fleet. See Appendix Table 1 for fleet name abbreviations.

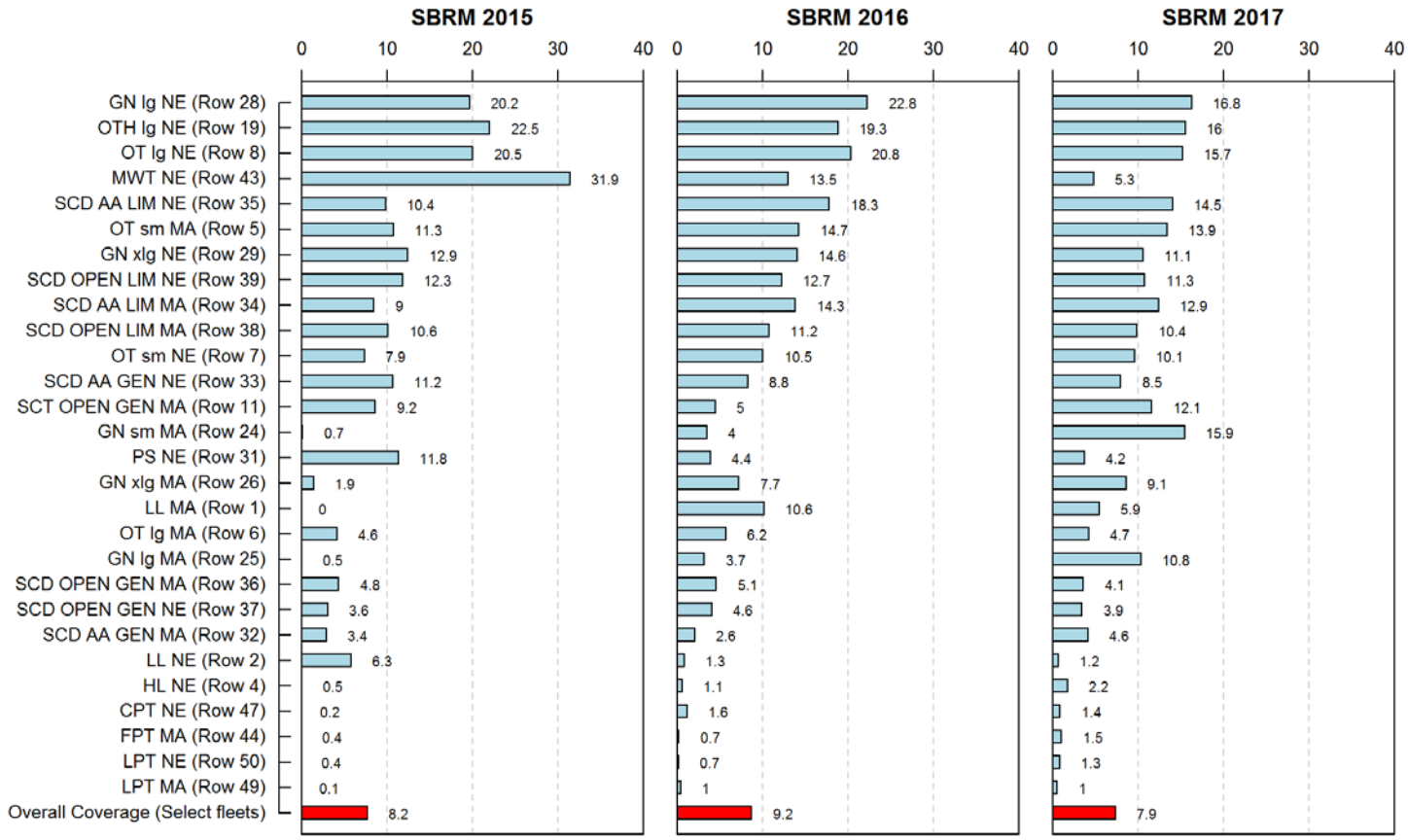


Figure 3. Percentage of Vessel Trip Report (VTR) sea days observed for 28 selected fleets for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Selected fleets represent fleets for which discards were estimated in 2 of the 3 SBRM years. Bars represent the ratio of total observed sea days over total VTR sea days for each fleet. See Appendix Table 1 for fleet name abbreviations.

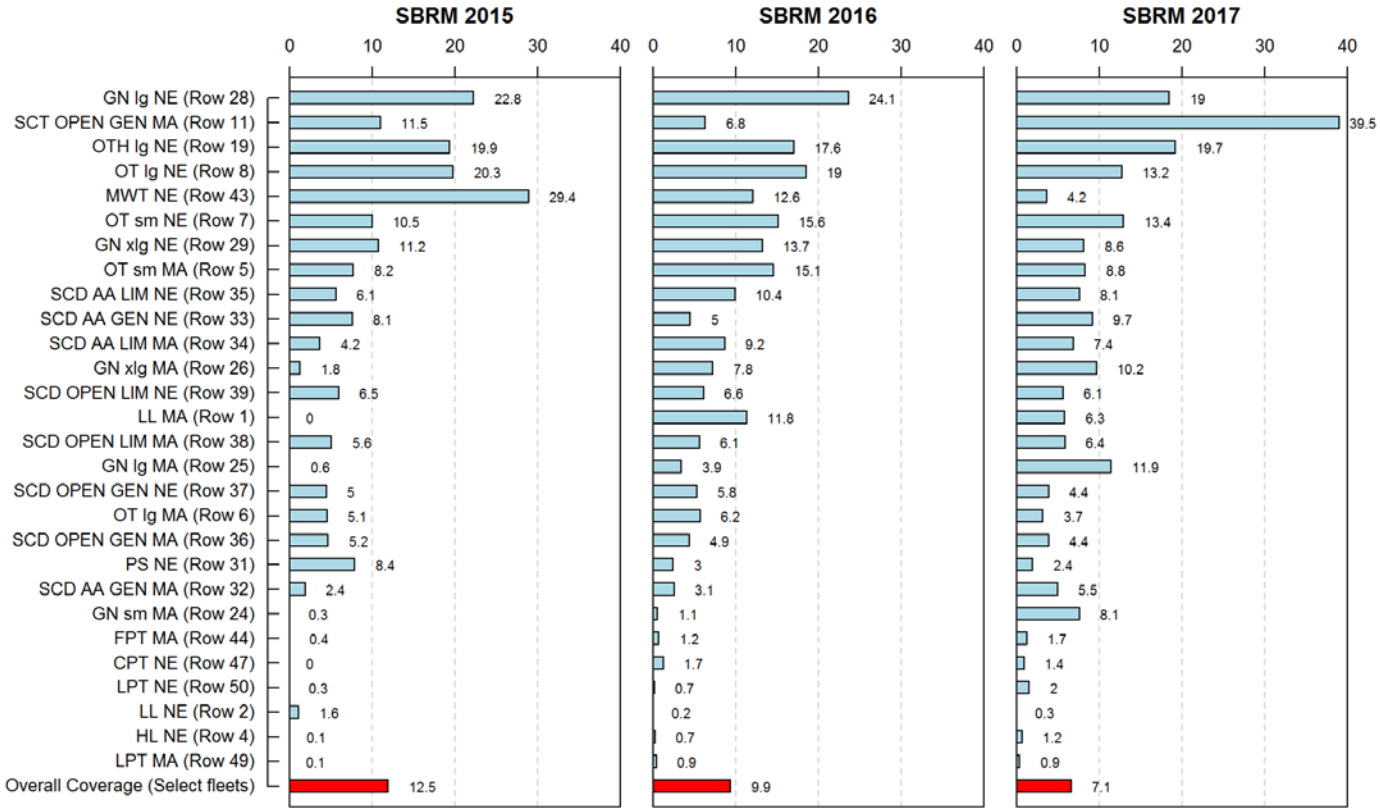


Figure 4. Percentage of Vessel Trip Report (VTR) landings observed by Northeast Fisheries Observer Program (NEFOP) for 28 selected fleets for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Selected fleets represent fleets for which discards were estimated in 2 of the 3 SBRM years. Bars represent the ratio of total observed landings over total VTR landings for each fleet. See Appendix Table 1 for fleet name abbreviations.

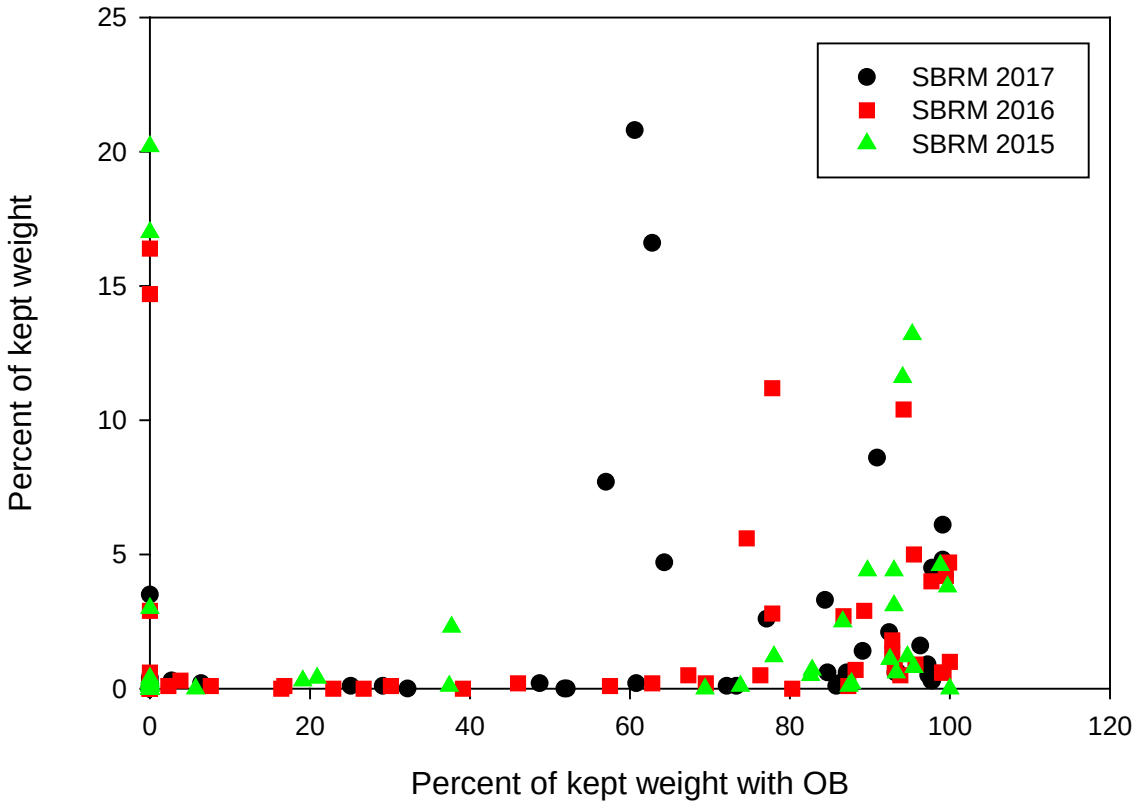


Figure 5. Percentage of Vessel Trip Report kept weight of all species with observer (OB) coverage and the percentages of kept weight of all species across all fleets, by fleet and Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data).

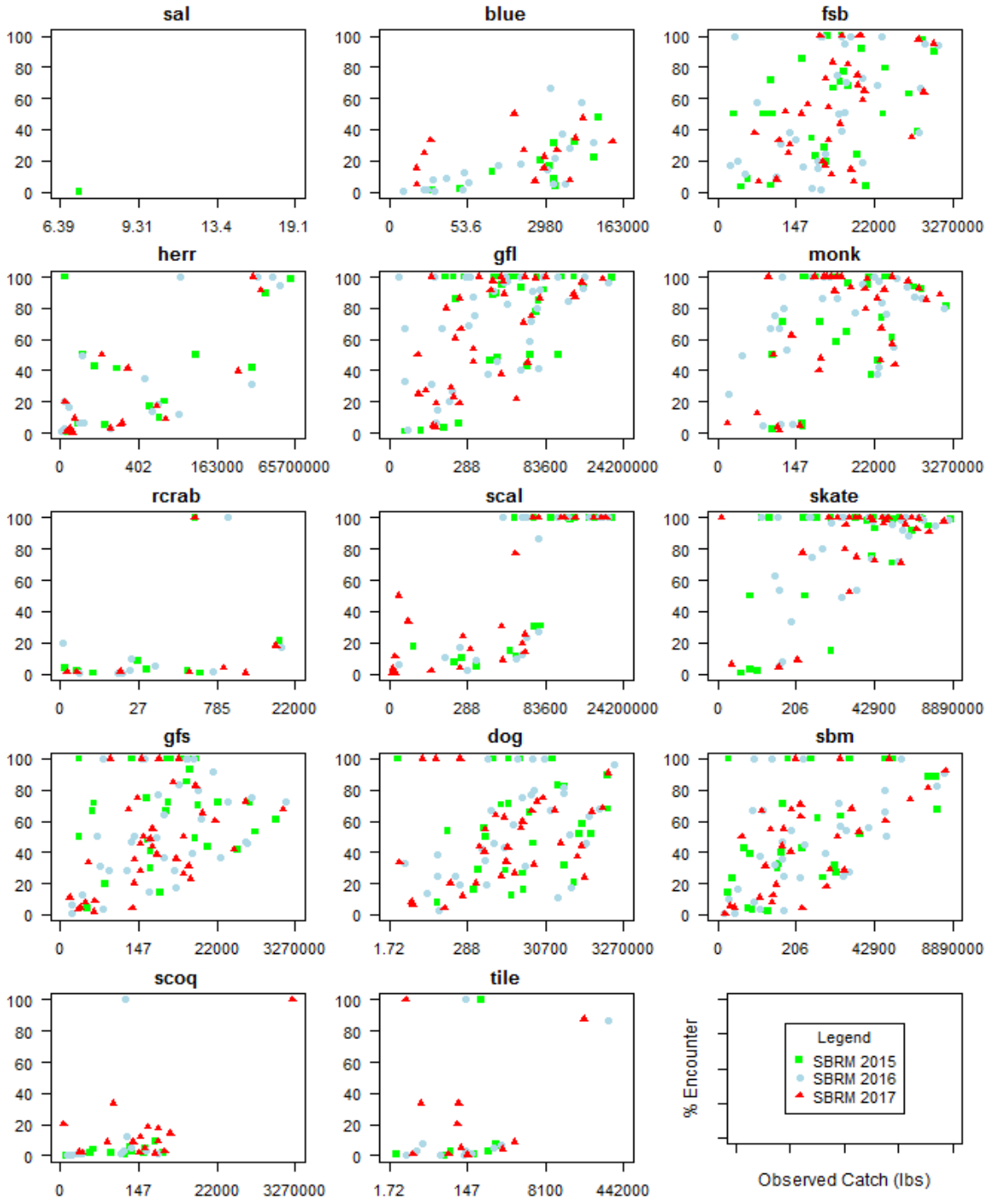


Figure 6. Percentage of observed trips, which encountered each species group and observed catch weight (kept and discarded; live weight, lb) on observed trips by Standardized Bycatch Reporting Methodology (SBRM) species group for SBRM 2015 (July 2013 through June 2014 data; green square), SBRM 2016 (July 2014 through June 2015 data; blue circle), and SBRM 2017 (July 2015 through June 2016 data; red triable). Each symbol represents a year and fleet. See Table 4 for species group abbreviations.

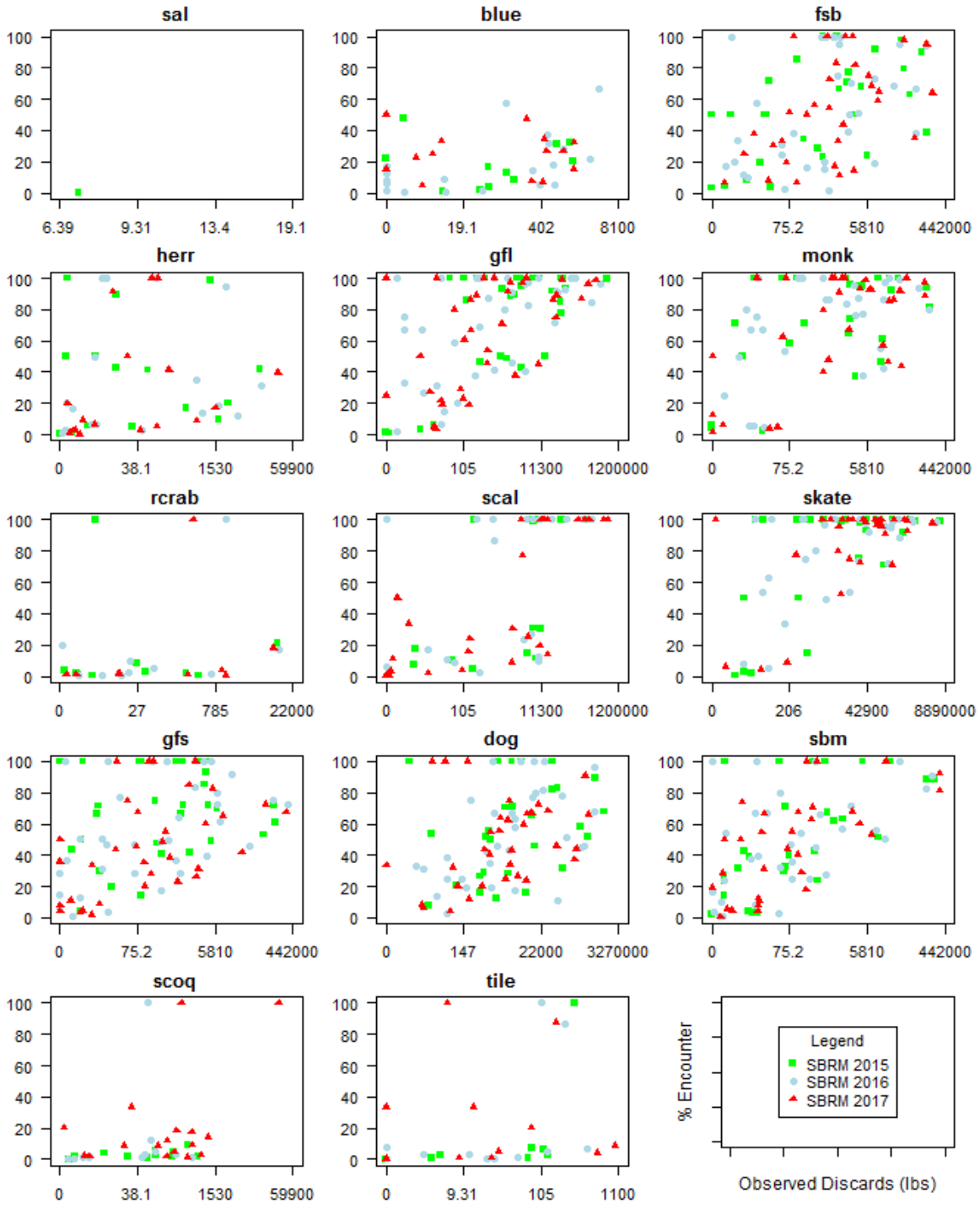


Figure 7. Percentage of observed trips which encountered each species group and observed discards weight (live weight, lb) on observed trips by Standardized Bycatch Reporting Methodology (SBRM) species group for SBRM 2015 (July 2013 through June 2014 data; green square), SBRM 2016 (July 2014 through June 2015 data; blue circle), and SBRM 2017 (July 2015 through June 2016 data; red triangle). Each symbol represents a year and fleet. See Table 4 for species group abbreviations.

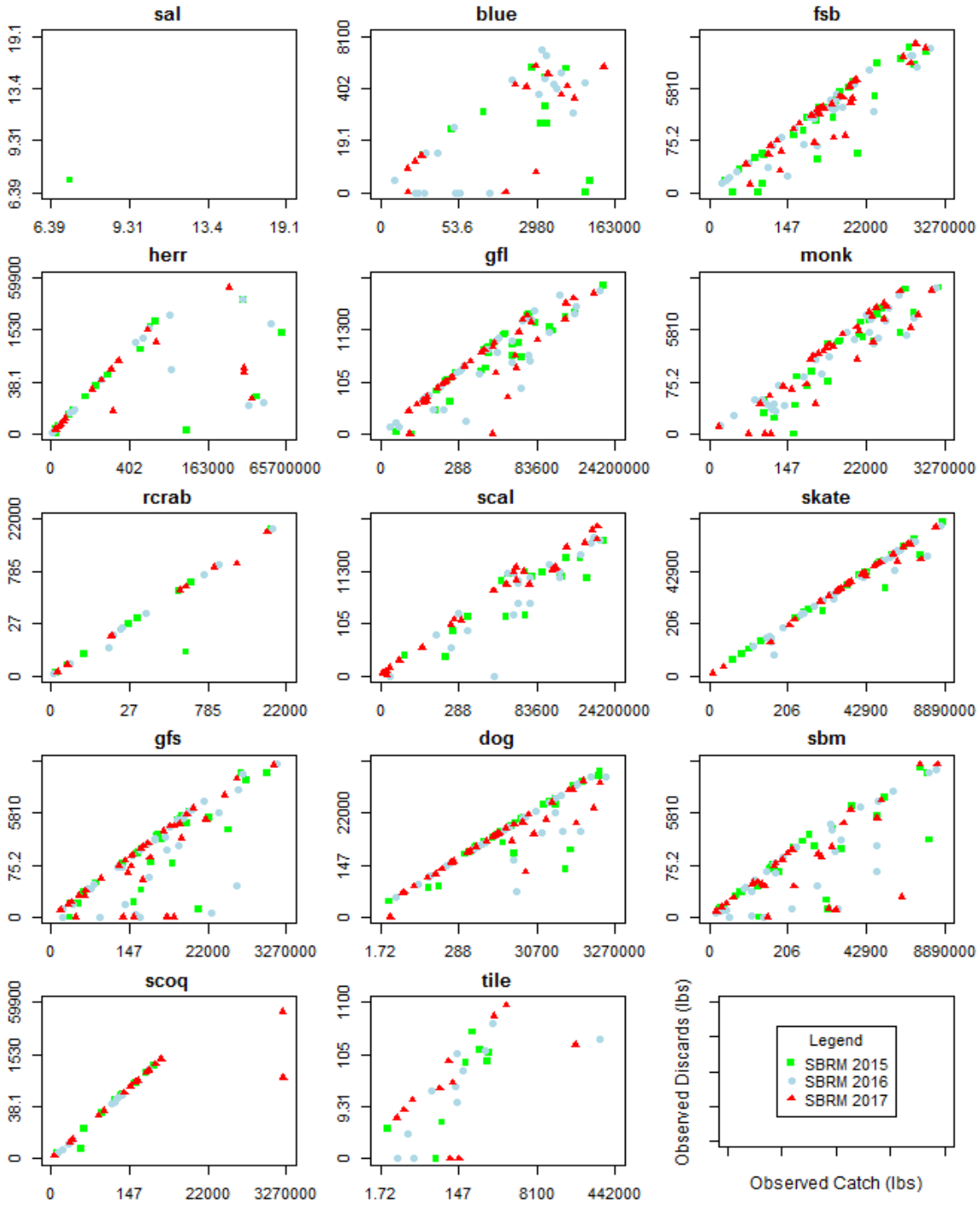


Figure 8. Observed discards (live weight, lb) and observed catch weight (kept and discard live weight, pounds) on observed trips by Standardized Bycatch Reporting Methodology (SBRM) species group for SBRM 2015 (July 2013 through June 2014 data; green square), SBRM 2016 (July 2014 through June 2015 data; blue circle), and SBRM 2017 (July 2015 through June 2016 data; red triangle). Each symbol represents a year and fleet. See Table 4 for species group abbreviations.

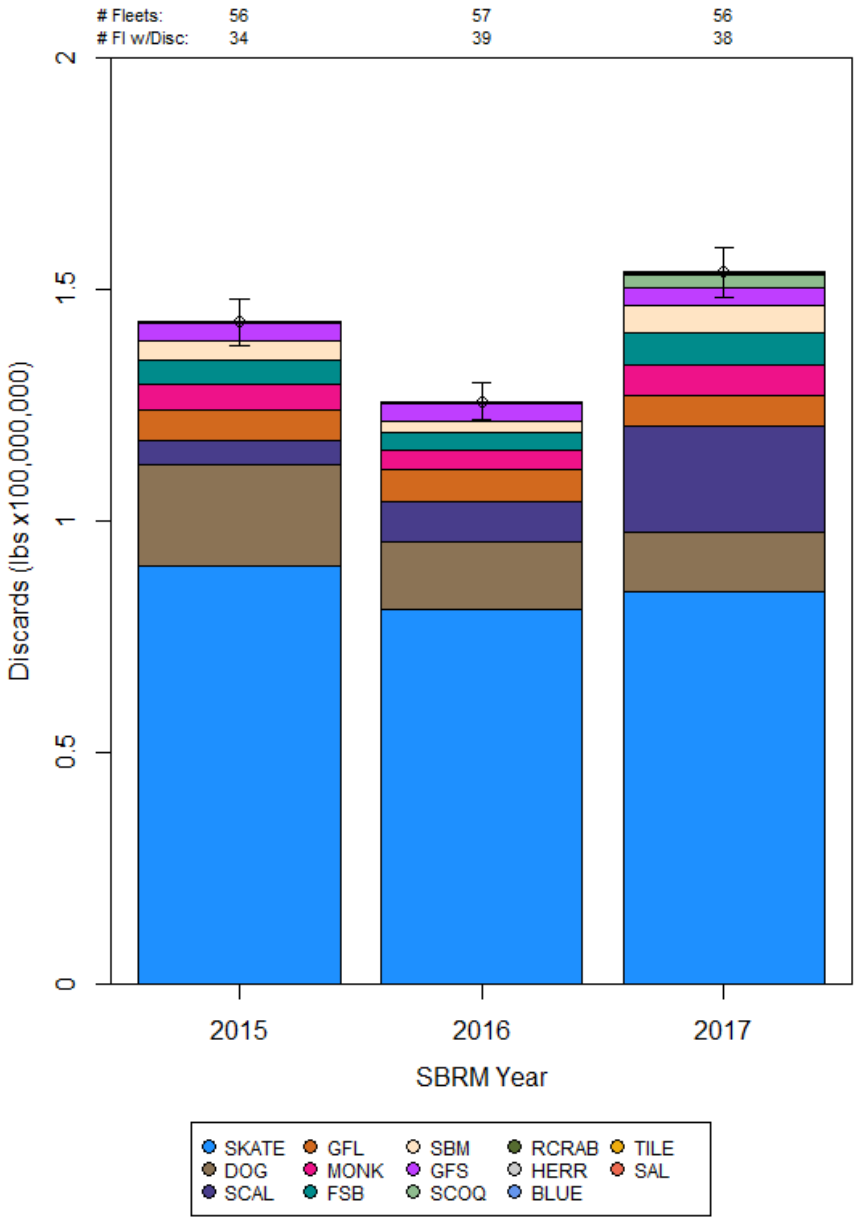


Figure 9. Estimated discards (live weight, lb) for the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups by fleet for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). One standard error of the annual total estimated discard is given. The number of fleets (# Fleets) and number of fleets with estimated discards (#Fl w/Disc) is also given. See Table 4 for species group abbreviations.

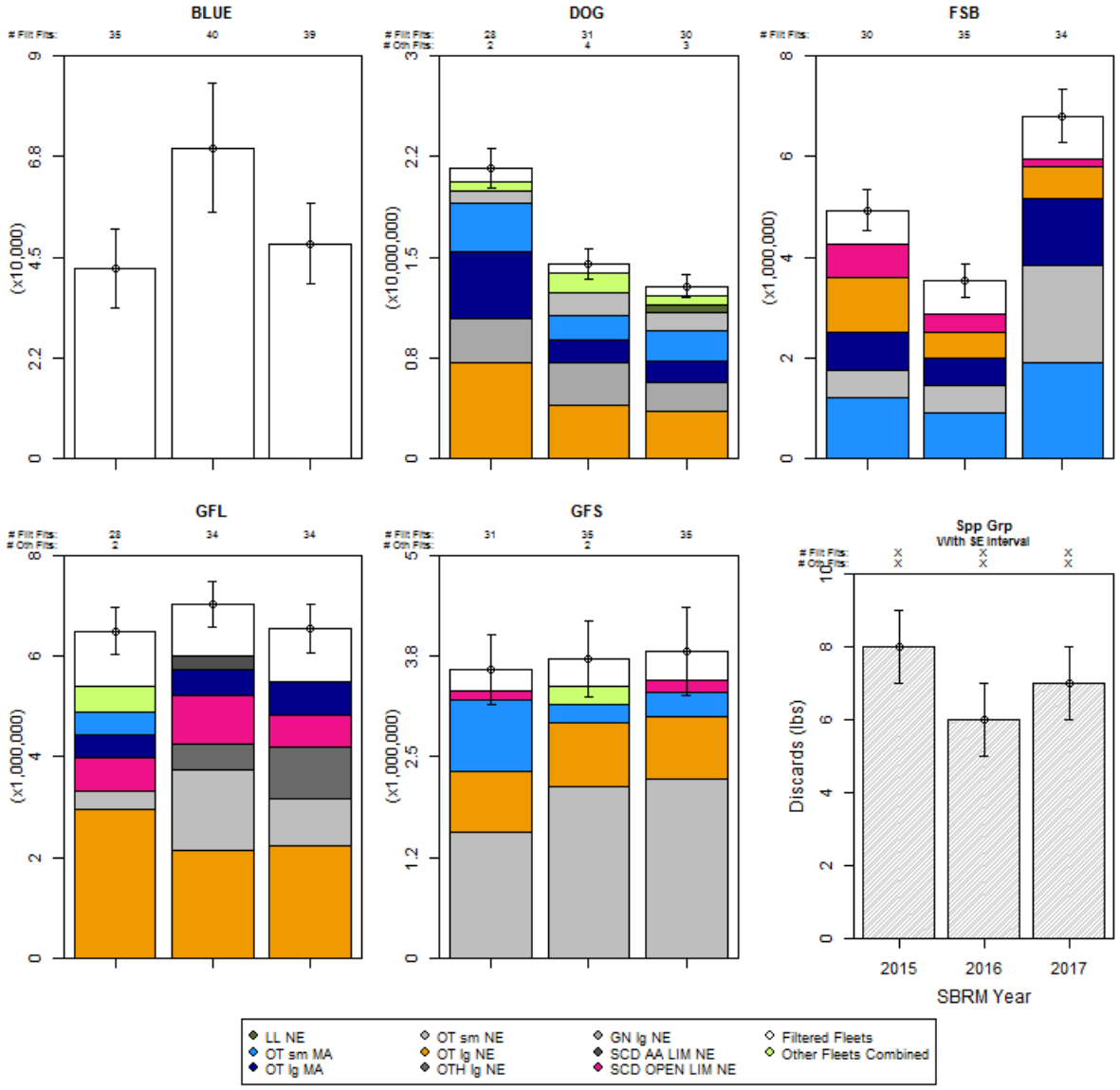


Figure 10. Estimated discards (live weight, lb) for each of the 14 Standardized Bycatch Reporting Methodology (SBRM) species group, by fleet, for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). One standard error of the annual total estimated discard is given. The number of fleets that have been aggregated into the group of fleets that were filtered out "Filtered Fleets" (# Filt Flts) and the number of fleets that have been grouped into "Other Fleets Combined" (# Oth Flts; fleets that were not filtered out yet individual comprised a relatively small amount of total estimated discards) are also given. See Table 4 for species group abbreviations and Appendix Table 1 for fleet name abbreviations.

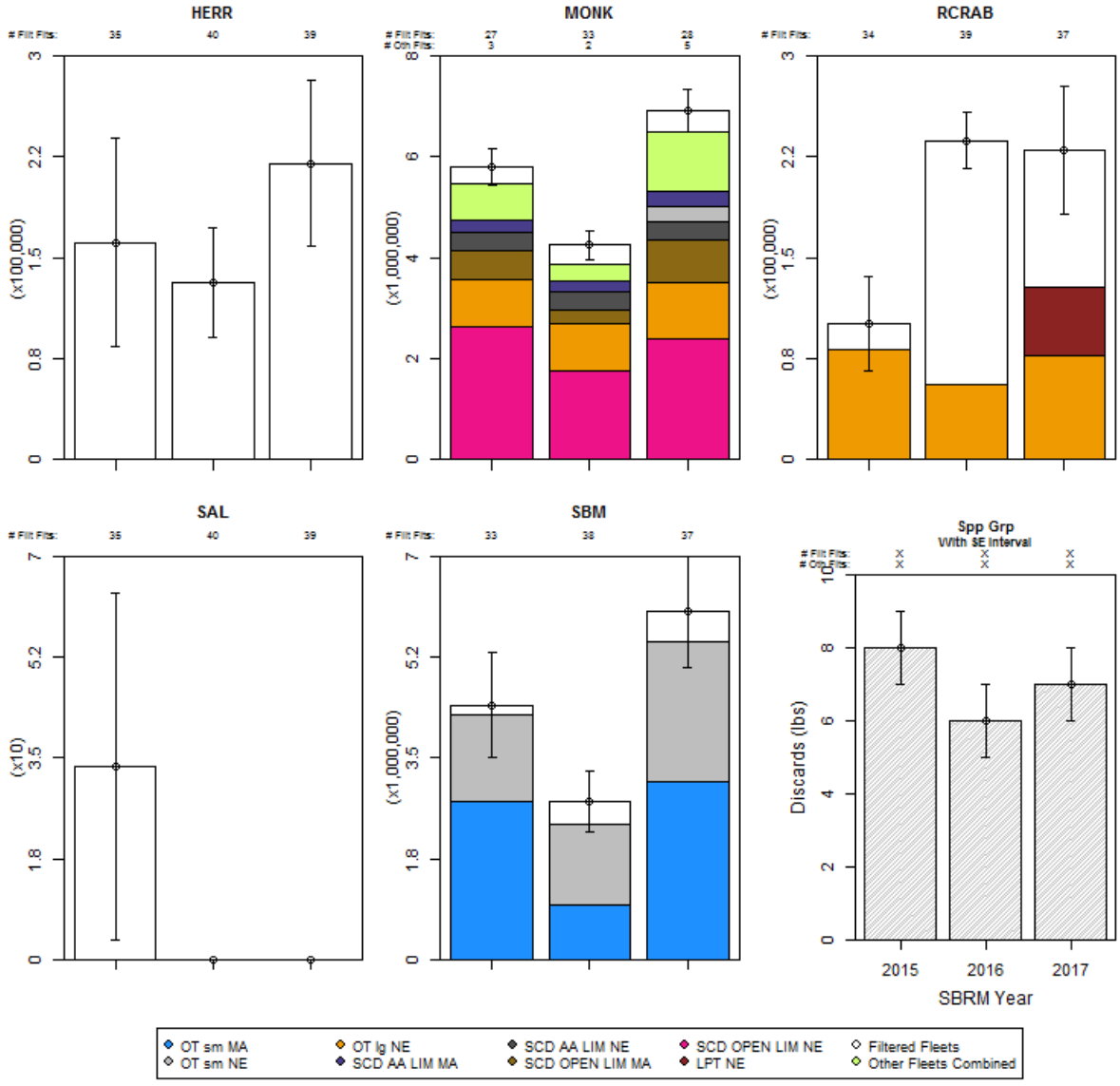


Figure 10, continued. Estimated discards (live weight, lb) for each of the 14 Standardized Bycatch Reporting Methodology (SBRM) species group, by fleet, for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). One standard error of the annual total estimated discard is given. The number of fleets that have been aggregated into the group of fleets that were filtered out "Filtered Fleets" (# Filt Flts) and the number of fleets that have been grouped into "Other Fleets Combined" (# Oth Flts; fleets that were not filtered out yet individual comprised a relatively small amount of total estimated discards) are also given. See Table 4 for species group abbreviations and Appendix Table 1 for fleet name abbreviations.

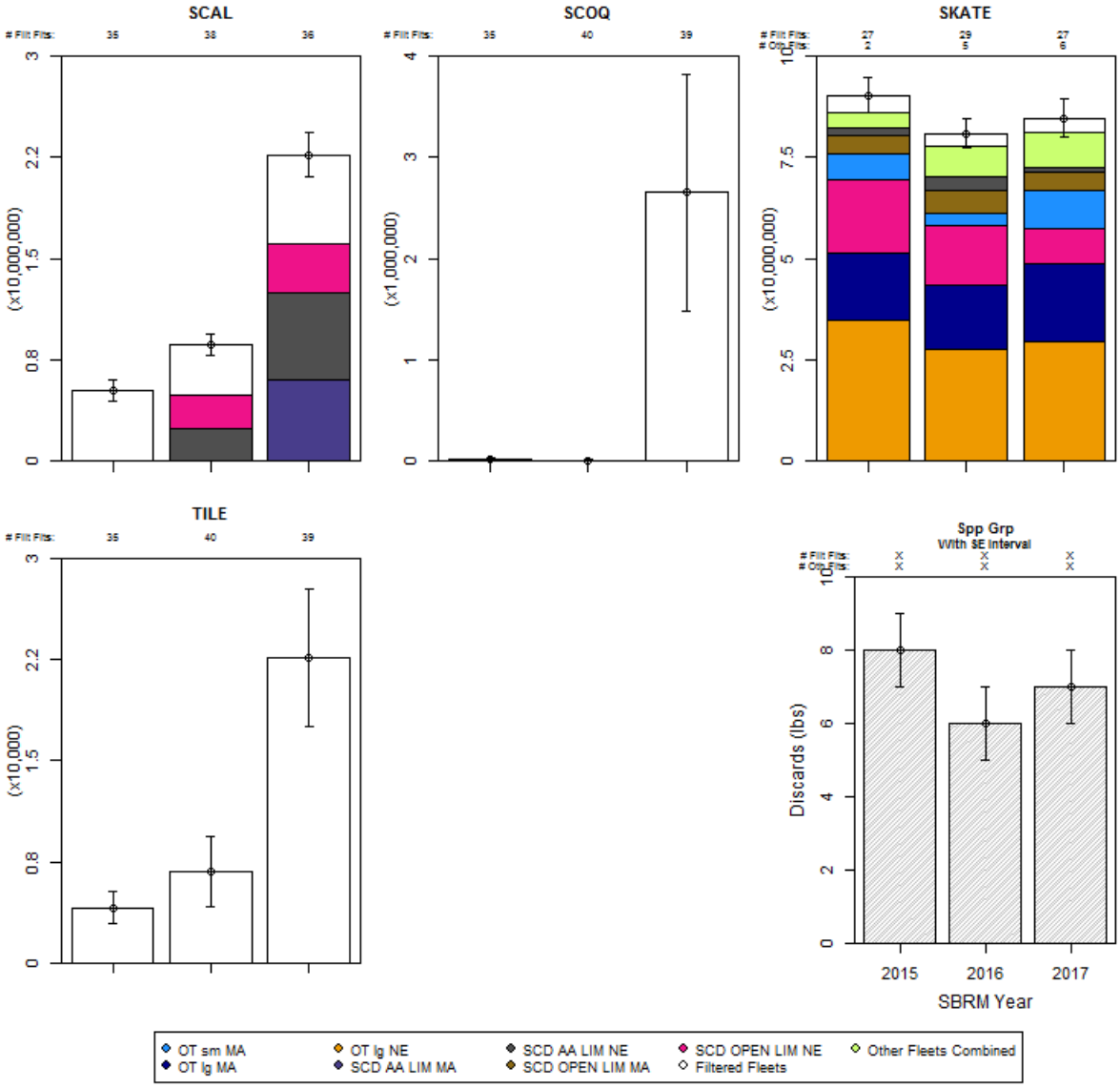


Figure 10, continued. Estimated discards (live weight, lb) for each of the 14 Standardized Bycatch Reporting Methodology (SBRM) species group, by fleet, for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). One standard error of the annual total estimated discard is given. The number of fleets that have been aggregated into the group of fleets that were filtered out "Filtered Fleets" (# Filt Flts) and the number of fleets that have been grouped into "Other Fleets Combined" (# Oth Flts; fleets that were not filtered out yet individual comprised a relatively small amount of total estimated discards) are also given. See Table 4 for species group abbreviations and Appendix Table 1 for fleet name abbreviations.

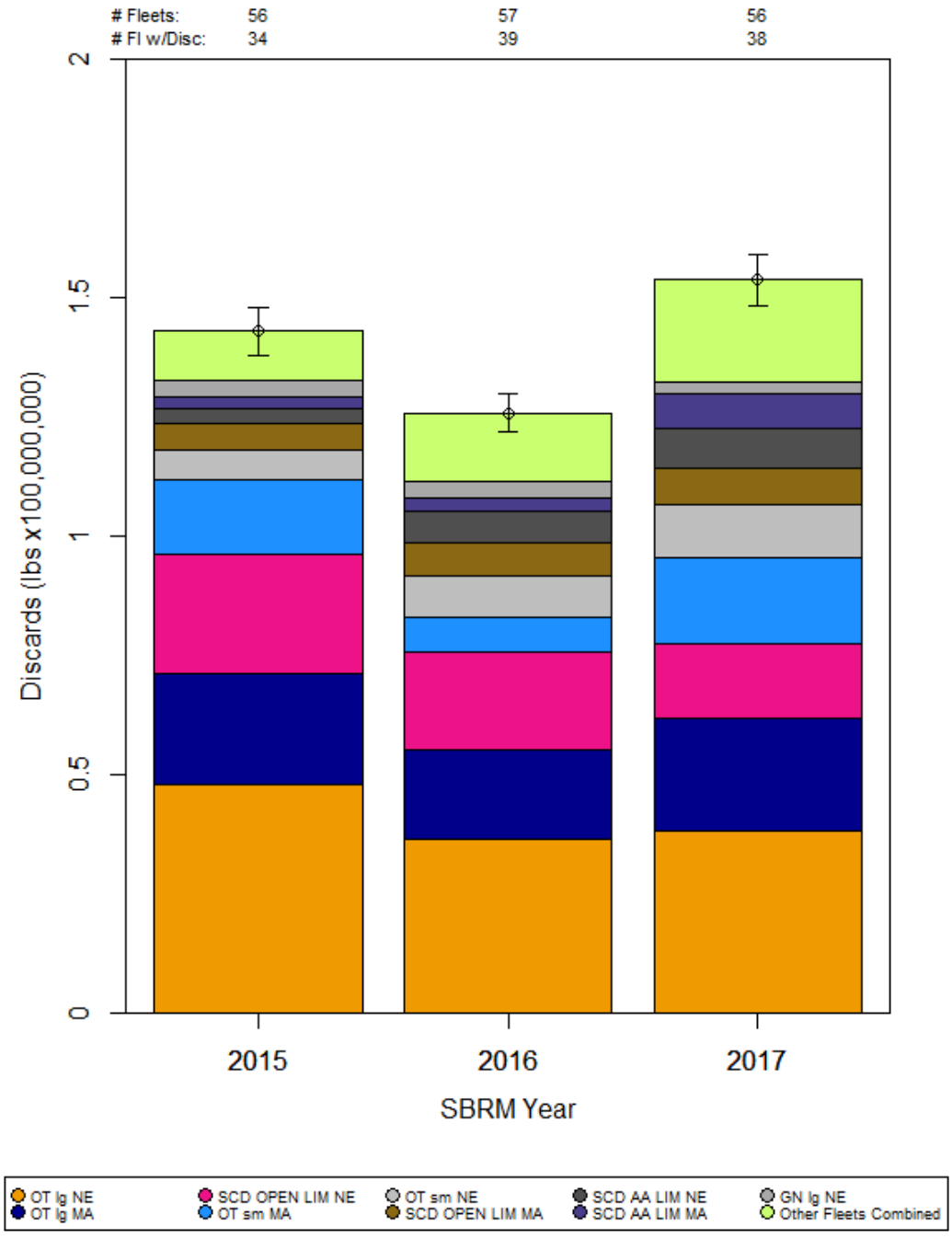


Figure 11. Estimated discards (live weight, lb) for the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups (COMBINED) by fleet for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016). Fleets that comprise a relatively small amount of total discards have been grouped in "Other Fleets Combined." One standard error of the annual total estimated discard is given. The number of fleets in the annual analysis and number of fleets with estimated discards (# F1 w/Disc) is also given. See Appendix Table 1 for fleet name abbreviations.

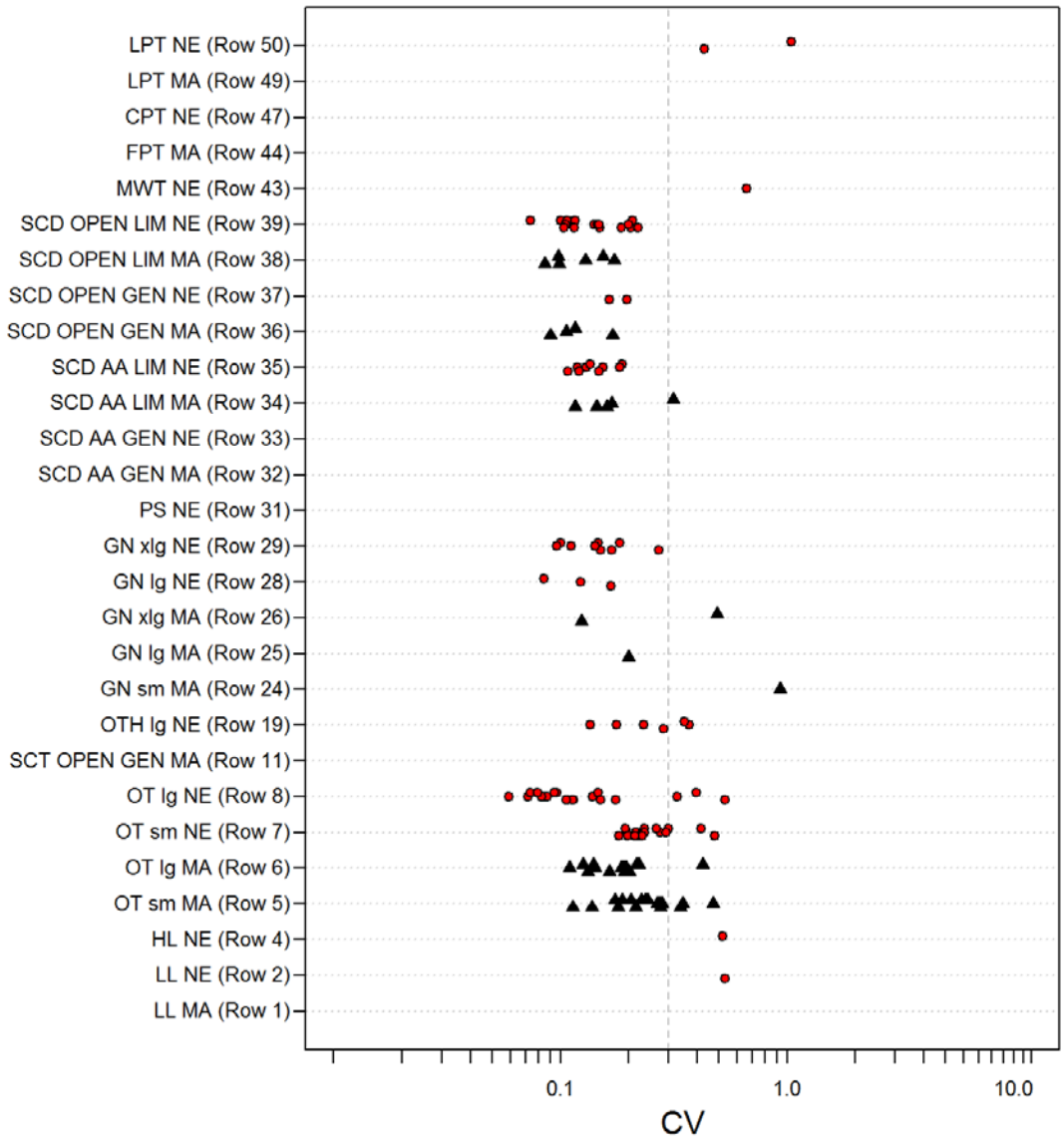


Figure 12. Precision (coefficient of variation, CV) of estimated discards for each of the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups by selected fleet for 3 SBRM years (2015 through 2017). The 28 selected fleets are: Rows 1, 2, 4-8, 11, 19, 24-26, 28, 29, 31-39, 43, 44, 47, 49, and 50. Each point represents a separate species group and SBRM year. Red circles denote New England fleets and black triangles denote Mid-Atlantic fleets. Dashed line represents 30% CV. See Appendix Table 1 for fleet name abbreviations. See Appendix Table 5 for a listing of the species groups, fleet and SBRM year that had CV greater than 30%.

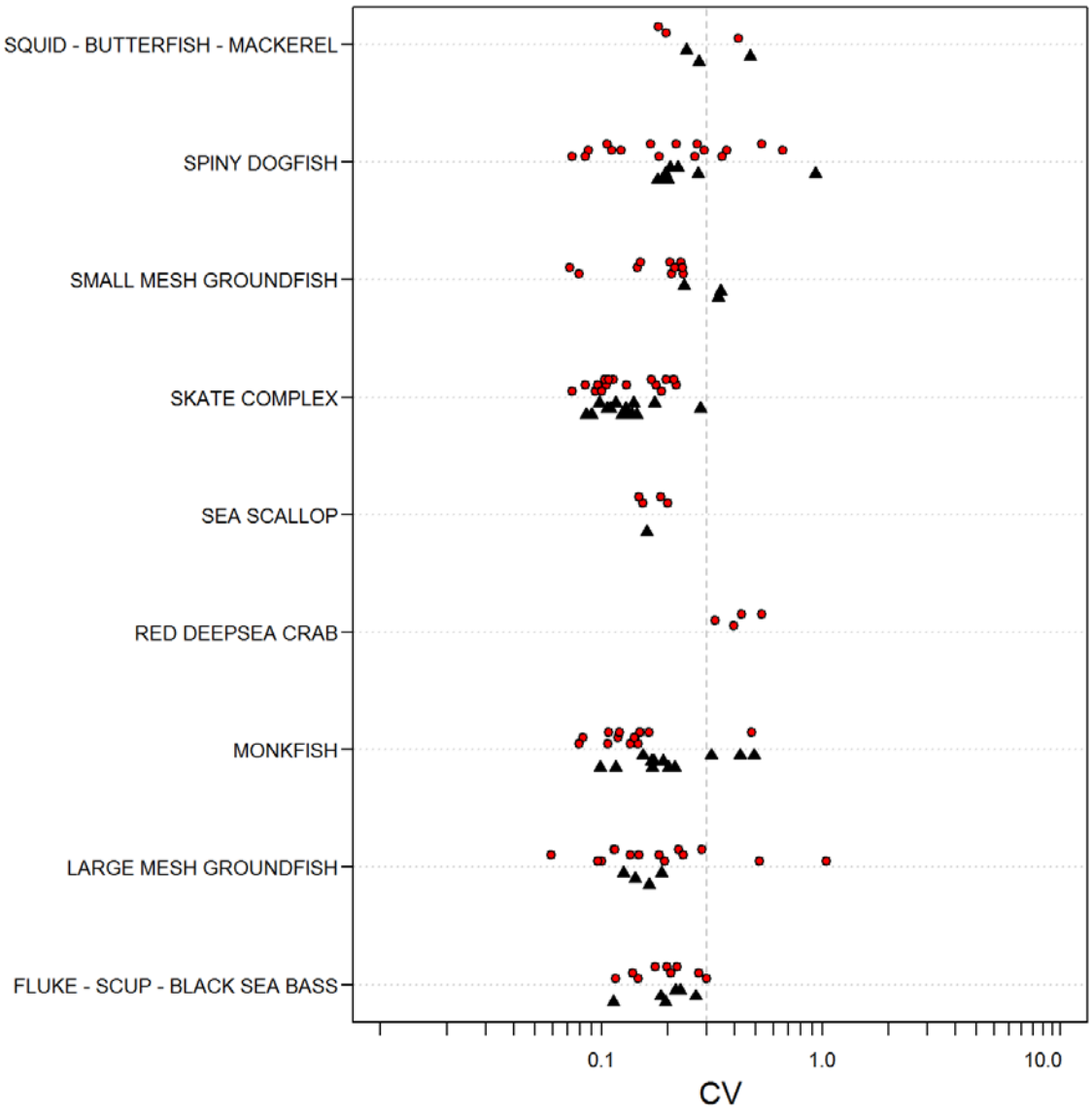


Figure 13. Precision (coefficient of variation, CV) of estimated discards for 9 of the 14 Standardized Bycatch Reporting Methodology (SBRM) species groups by selected fleet for 3 SBRM years (2015 through 2017). The 28 selected fleets are: Rows 1, 2, 4-8, 11, 19, 24-26, 28, 29, 31-39, 43, 44, 47, 49, and 50. Each point represents a separate fleet and SBRM year. Red circles denote New England fleets and black triangles denote Mid-Atlantic fleets. Dashed line represents 30% CV.

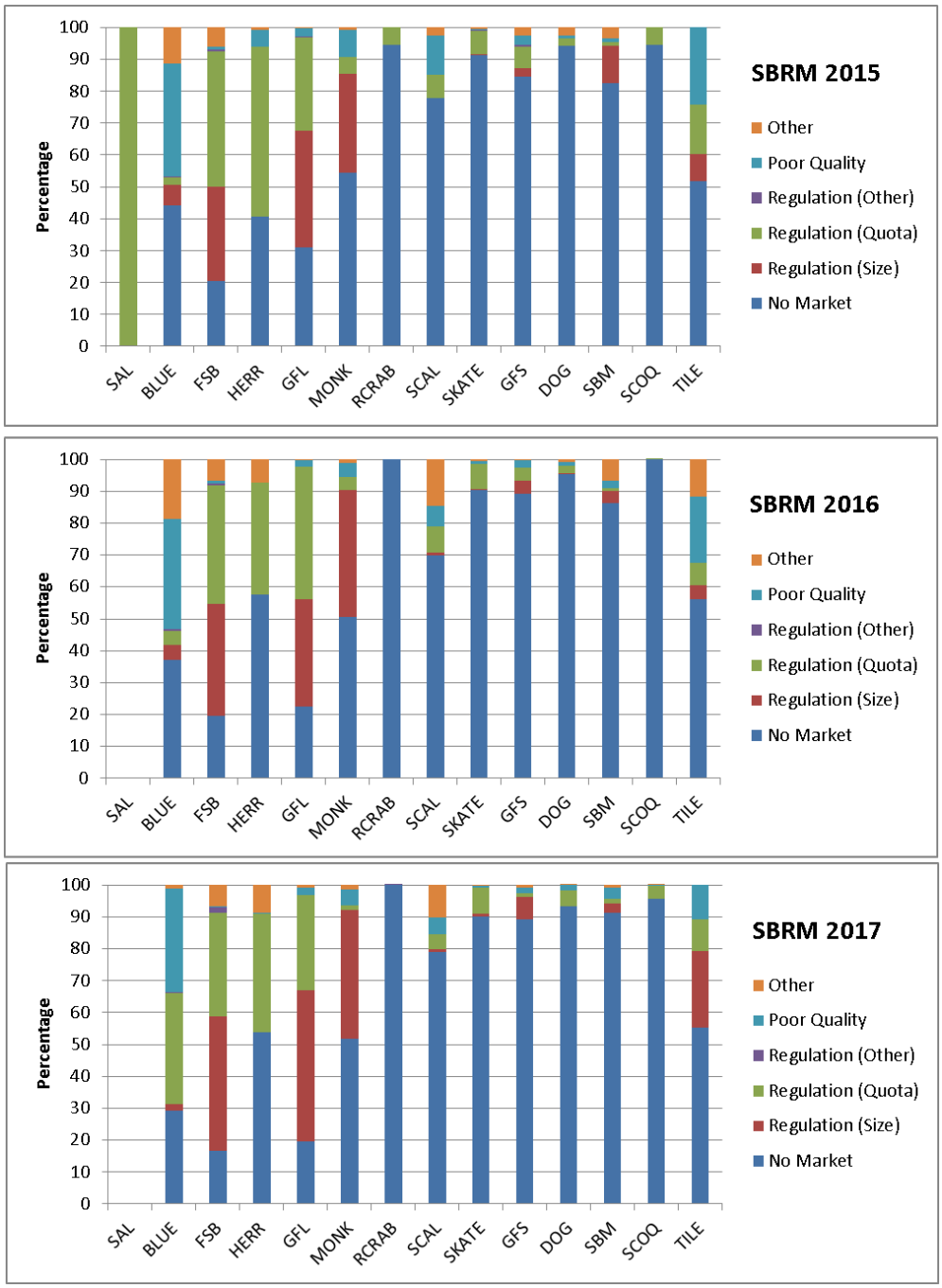


Figure 14. Percentage of discards by 6 discard reasons for 14 Standardized Bycatch Reporting Methodology (SBRM) species groups for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Table 4 for species group abbreviations; see Appendix Table 4 for discard reasons associated with each discard reason group.

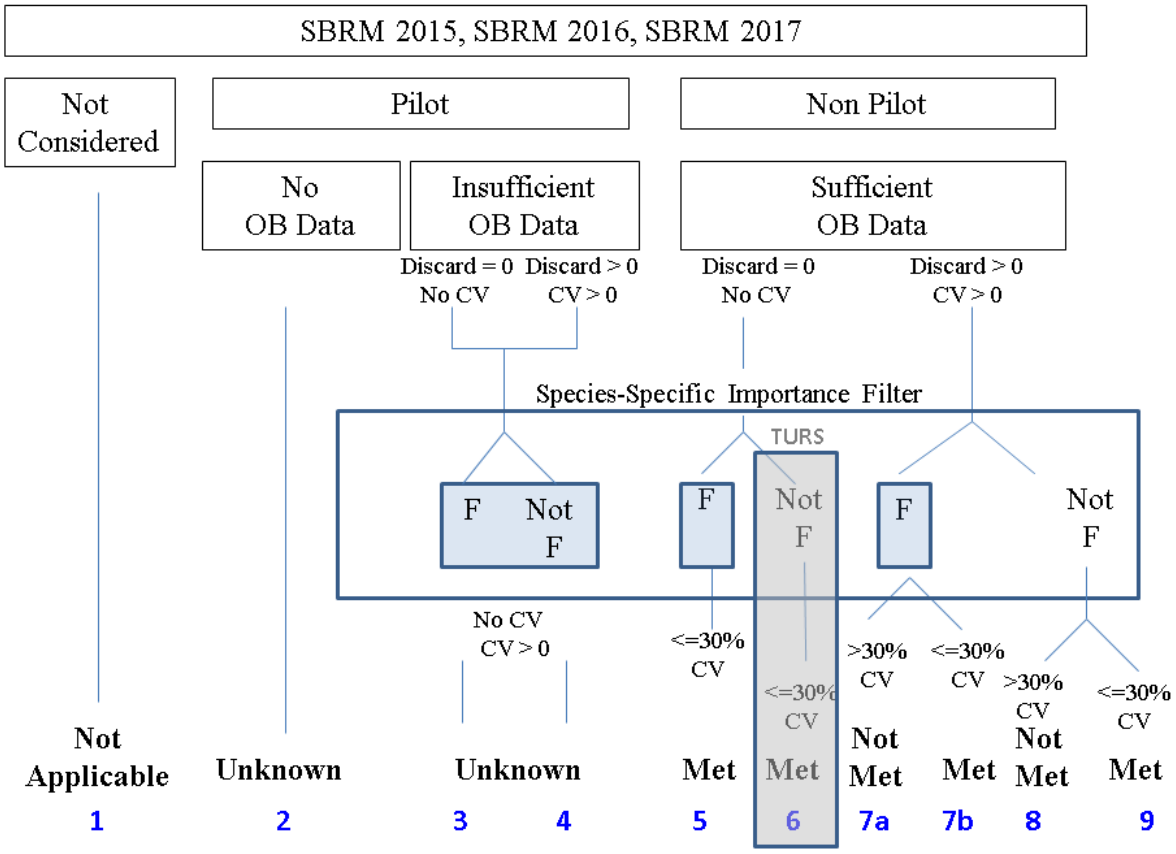


Figure 15. Standardized Bycatch Reporting Methodology (SBRM) performance classifications ("Not Applicable," "Unknown," "Not Met," and "Met") and the associated characteristics of the SBRM fleets and species groups (cells) for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). "F" represents the cells that were filtered out through the importance filter; "Not F" represents cells that were not filtered out through the importance filter. The blue shaded boxes indicate cells that were not used in the annual sample size analysis because of pilot coverage or the importance filter (filtered out); "OB" represents observer data: "CV" represents coefficient of variation. The blue numbers correspond to the SBRM performance classification boxes presented in Table 18. Box 6 is no longer used because turtles are not filtered via fish analyses. *This diagram is a modification of Figure 1 in the 2011 SBRM 3-year Review Report (Wigley et al. 2012).*

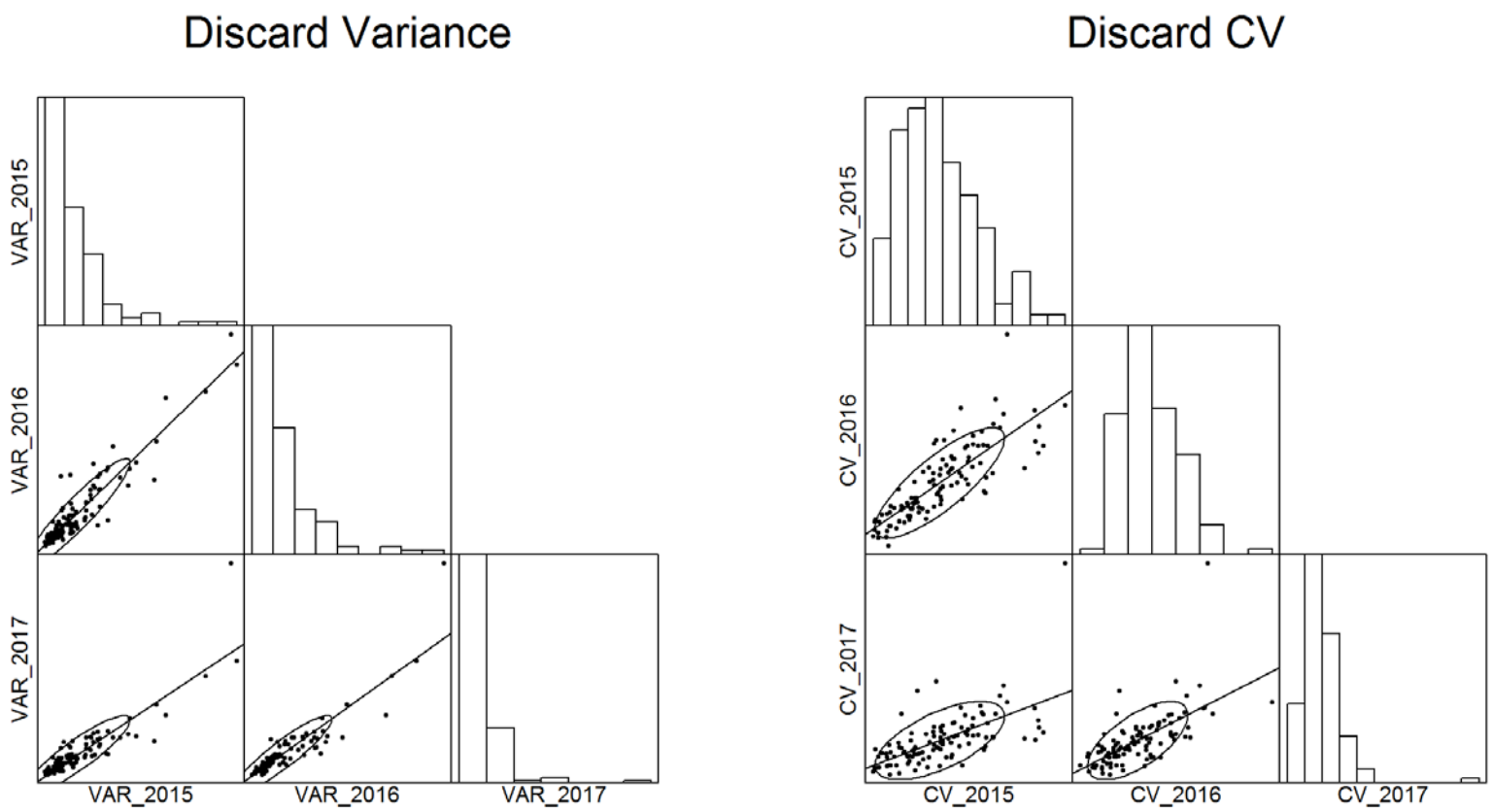


Figure 16. Comparisons of the discard variance and comparisons of the coefficient of variation (CV) of discards by Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Each dot represents an individual fleet and species group for fleets and species groups (cells) used in the sample size analysis (Boxes 8 and 9; Table 15). A fourth root transformation was used; regression line with 68% confidence interval is shown.

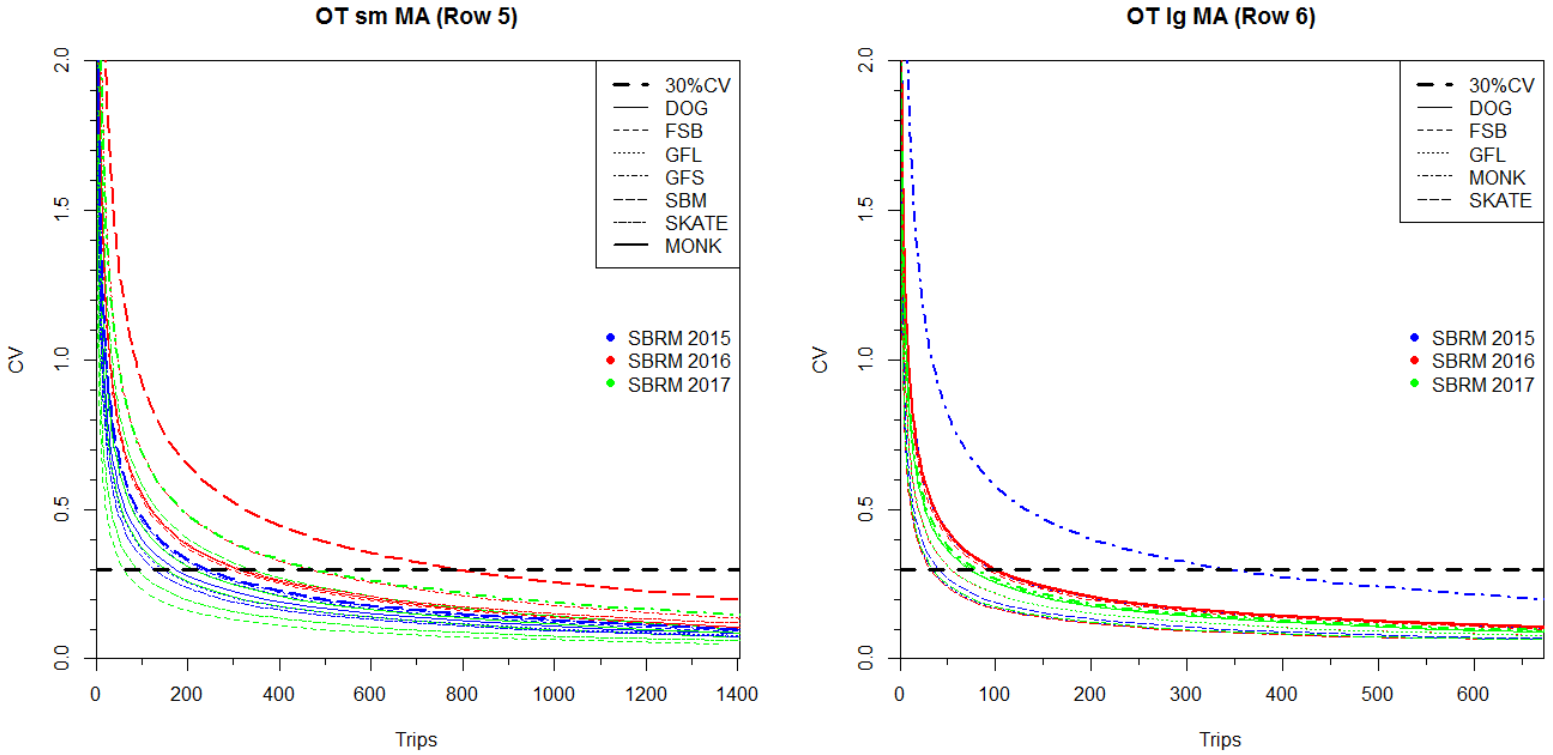


Figure 17. Number of trips needed by fish/invertebrate species groups, fleet and Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015, 2016, and 2017, for 10 selected fleets. Information compiled from the annual analyses (Figure 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). See Table 4 for species group abbreviations. CV = coefficient of variation.

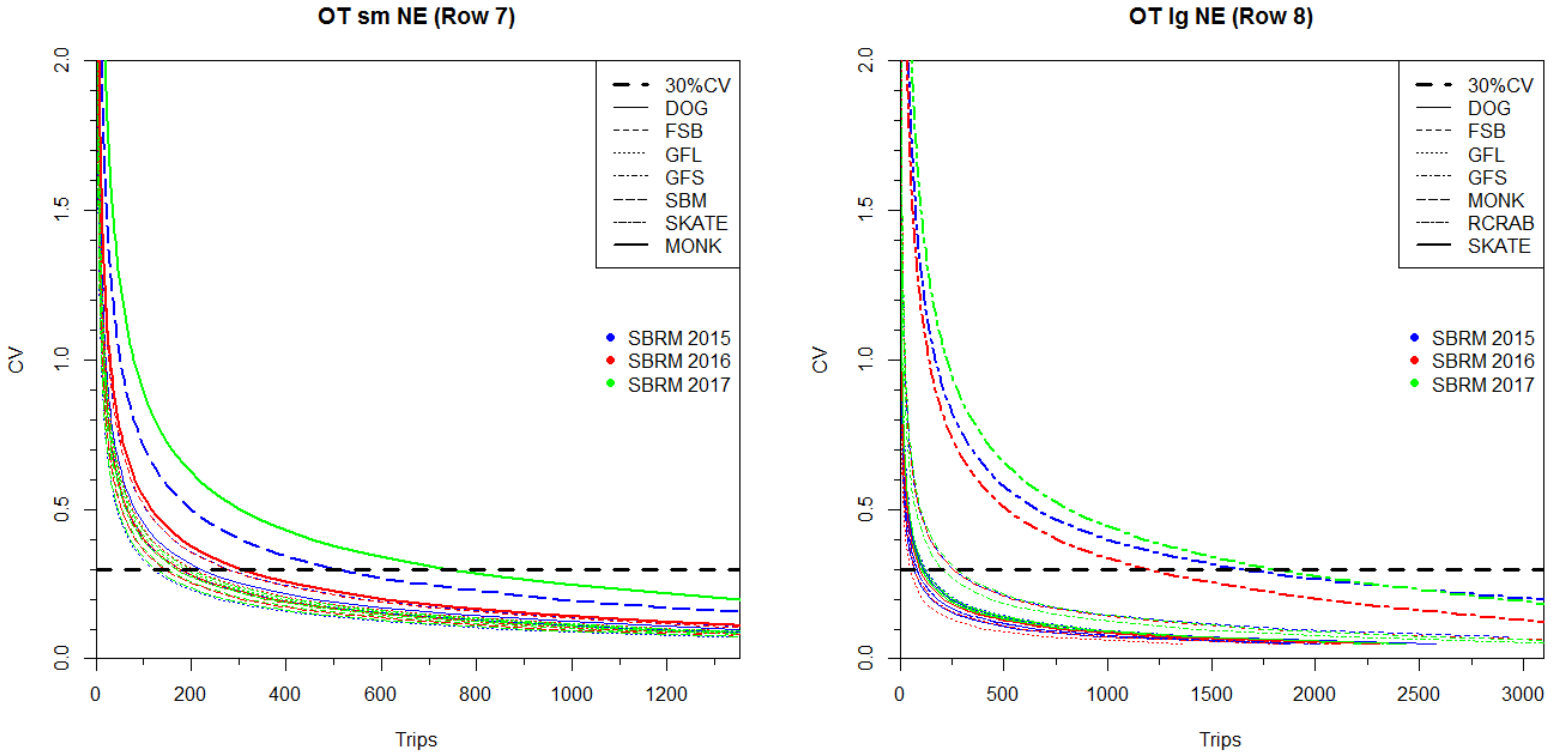


Figure 17, continued. Number of trips needed by fish/invertebrate species groups, fleet and Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015, 2016, and 2017, for 10 selected fleets. Information compiled from the annual analyses (Figure 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). See Table 4 for species group abbreviations. CV =coefficient of variation.

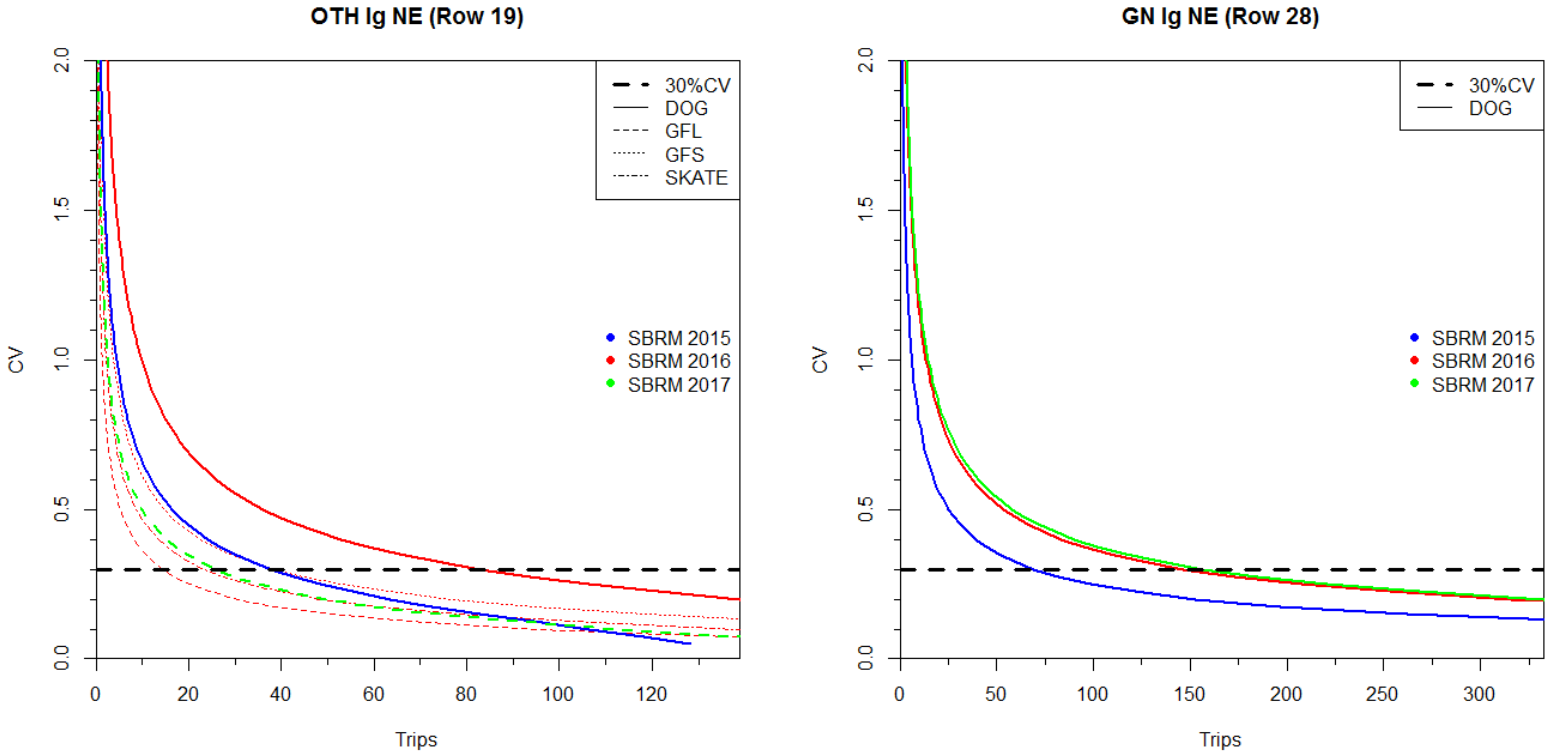


Figure 17, continued. Number of trips needed by fish/invertebrate species groups, fleet and Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015, 2016, and 2017, for 10 selected fleets. Information compiled from the annual analyses (Figure 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). See Table 4 for species group abbreviations. CV =coefficient of variation.

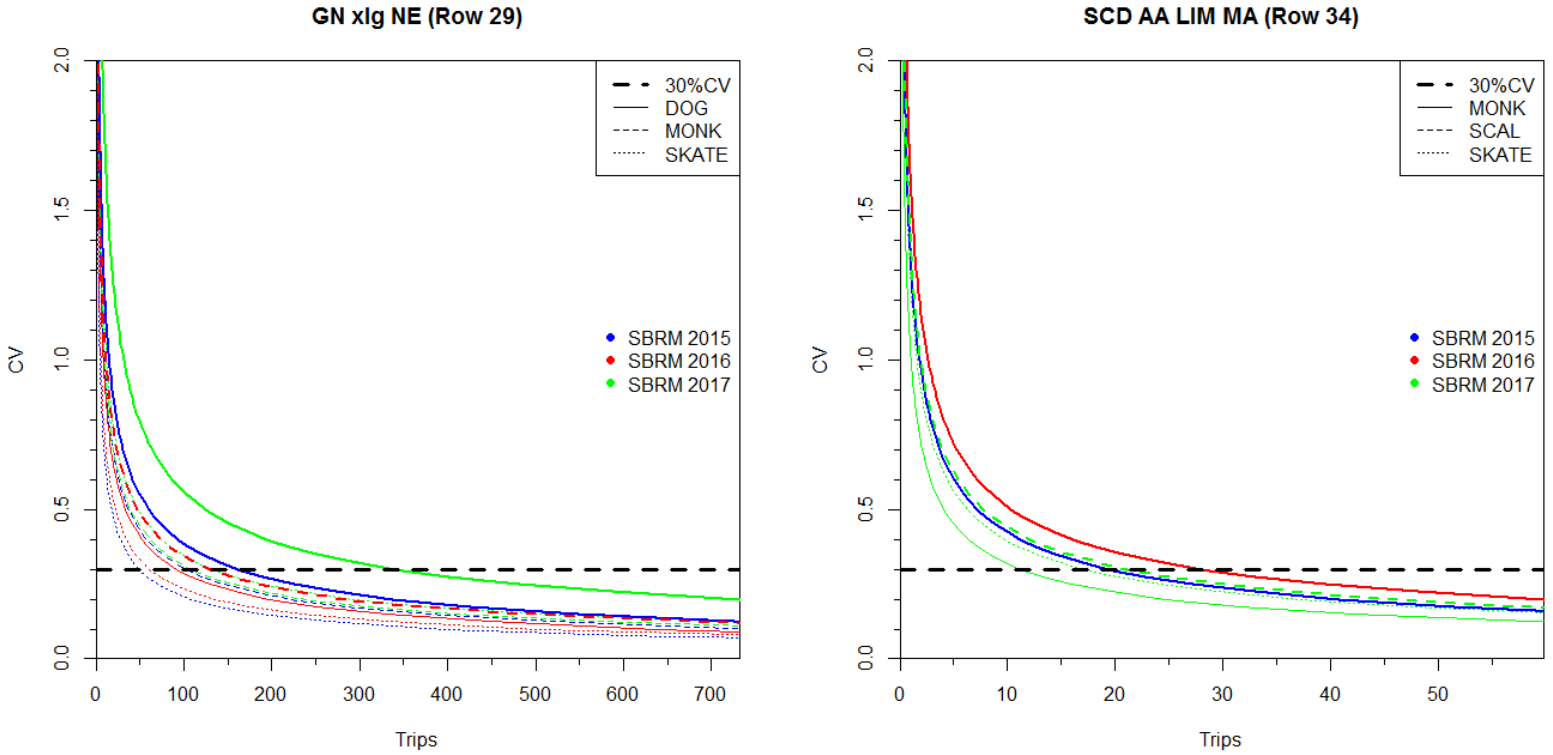


Figure 17, continued. Number of trips needed by fish/invertebrate species groups, fleet and Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015, 2016, and 2017, for 10 selected fleets. Information compiled from the annual analyses (Figure 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). See Table 4 for species group abbreviations. CV =coefficient of variation.

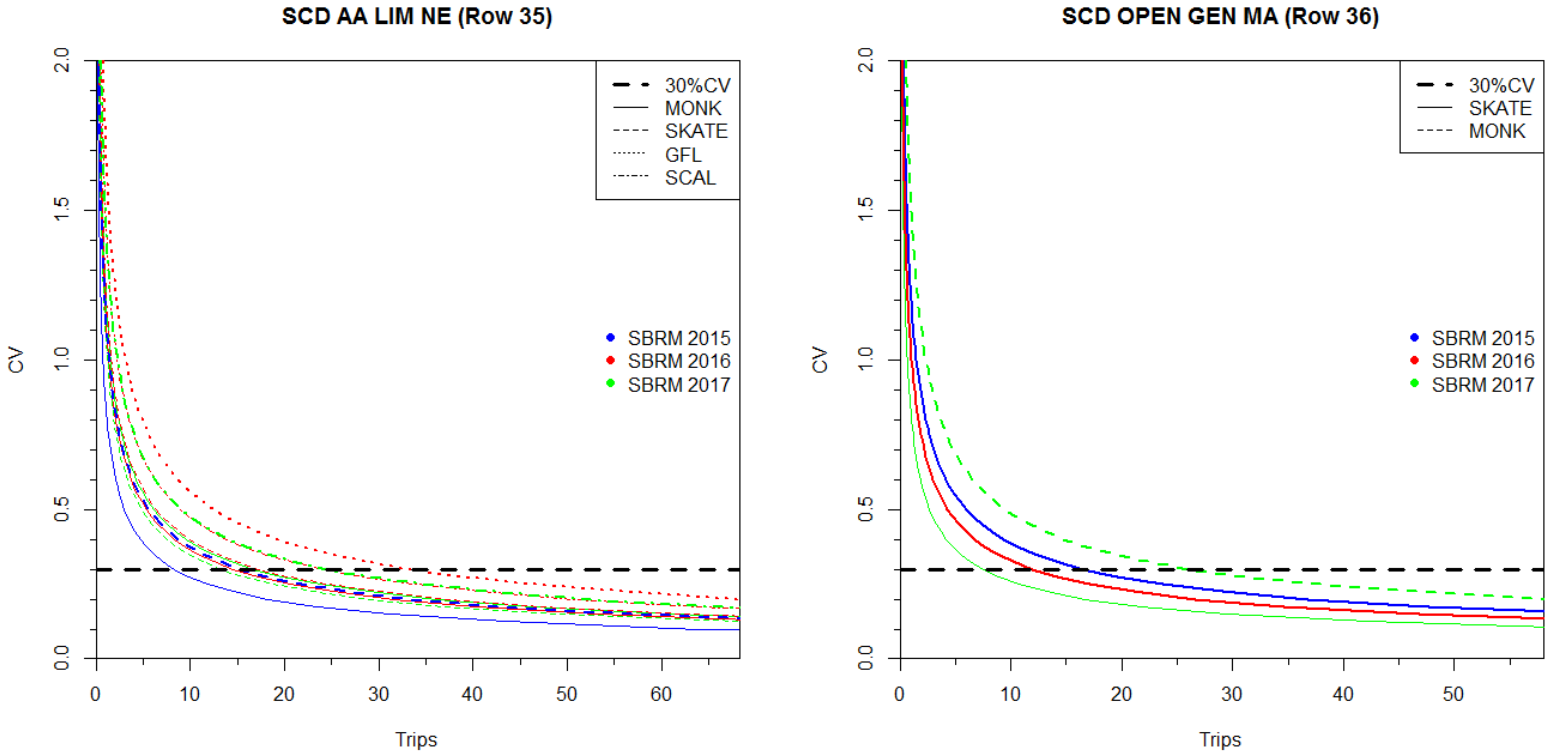


Figure 17, continued. Number of trips needed by fish/invertebrate species groups, fleet and Standardized Bycatch Reporting Methodology (SBRM) year for SBRM 2015, 2016, and 2017, for 10 selected fleets. Information compiled from the annual analyses (Figure 3 in Wigley et al. 2015, 2016; Wigley and Tholke 2017). See Table 4 for species group abbreviations. CV =coefficient of variation.

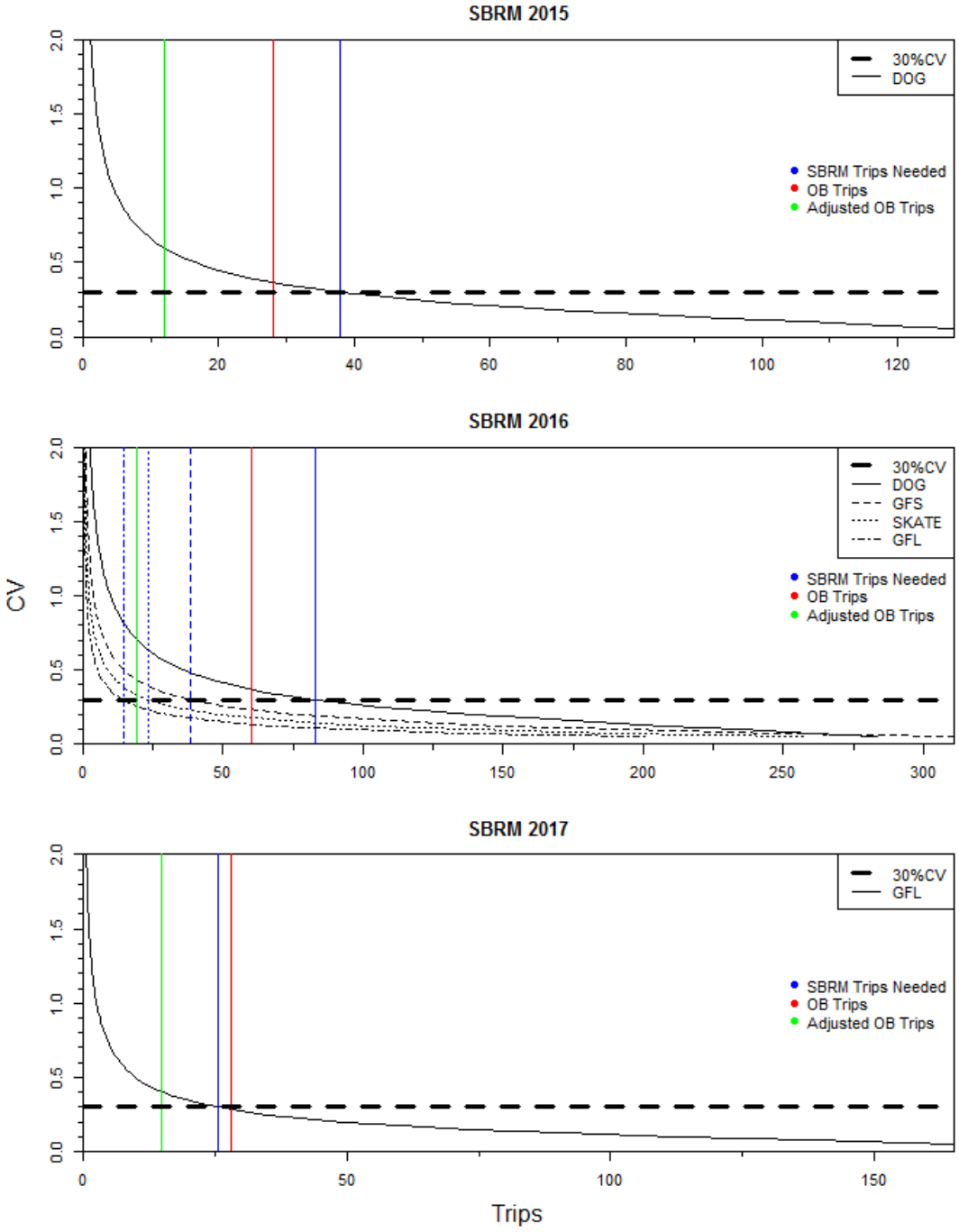


Figure 18. Results from the annual sample size analysis for New England large mesh haddock separator trawl (Row 19) for Standardized Bycatch Reporting Methodology (SBRM) 2015, 2016, and 2017. The curves represent the relationship between the coefficient of variation (CV) and the sample size (Number of trips) for each of the species groups that was not filtered out. The dash horizontal line is the 30% CV; the number of SBRM trips needed (blue line), the number of observed (OB) trips used in the analysis (red line), and the number of adjusted OB trips (green line)) are also given. See Table 4 for species group abbreviations.

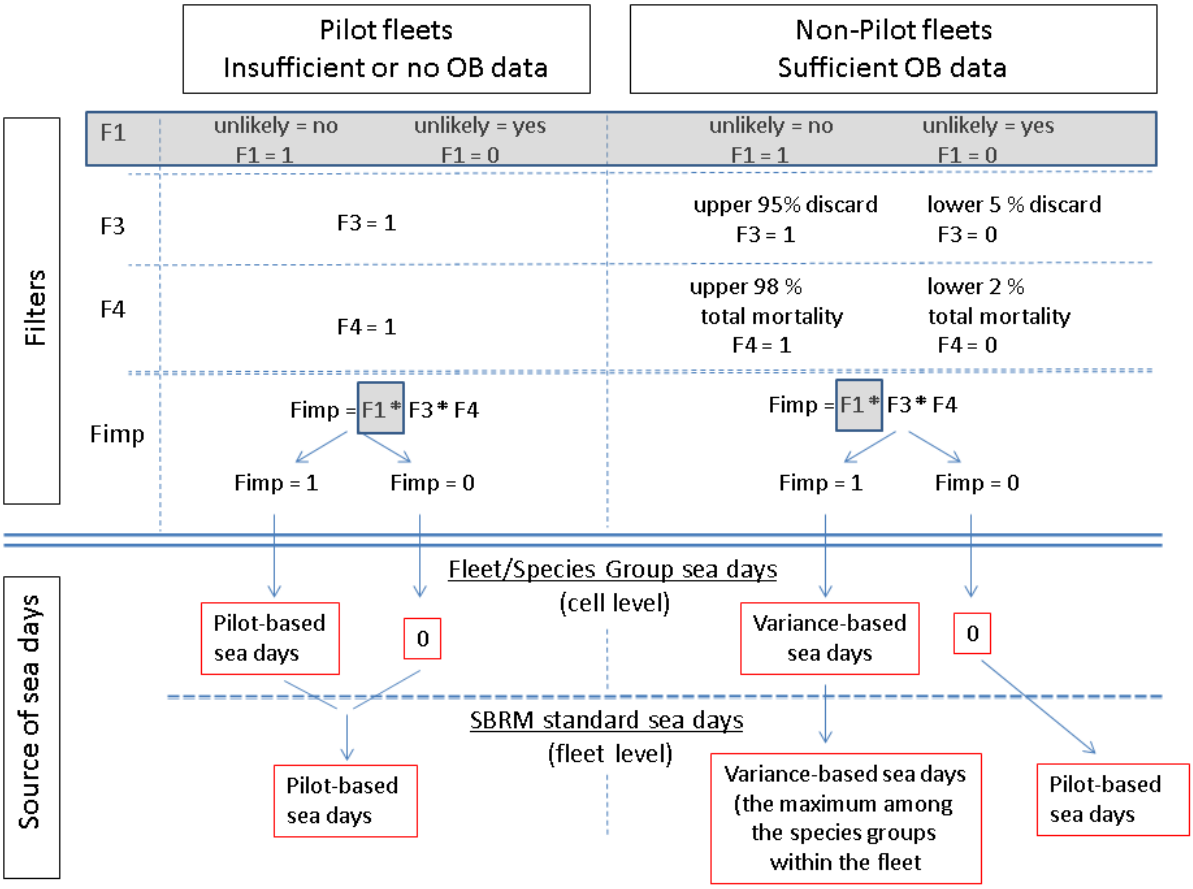


Figure 19. Diagram depicting the Standardized Bycatch Reporting Methodology (SBRM) filters (fraction of discard filter [F3], fraction of total mortality filter [F4], and importance filter [Fimp]) and the resultant source (variance-based, pilot-based, or zero) of sea days by fleet type (pilot and nonpilot fleets) for fleet and species groups (cell level) and the SBRM standard sea days (fleet-level). OB – observer data. The unlikely filter, F1 (gray shaded boxes) has not been used in the importance filter since 2012. *This diagram is a modification of Figure 4 in 2011 SBRM 3-year Review Report (Wigley et al. 2012).*

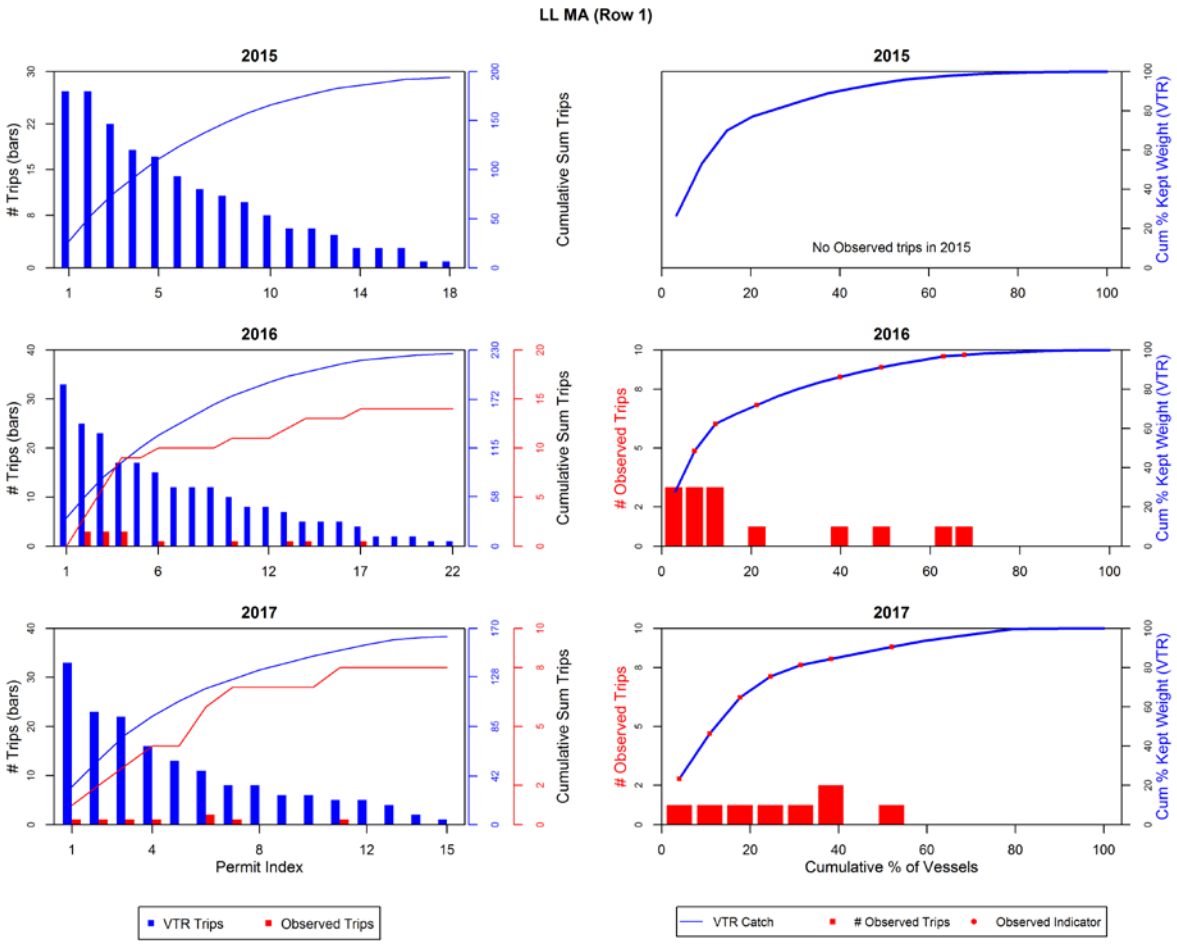


Figure 20. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

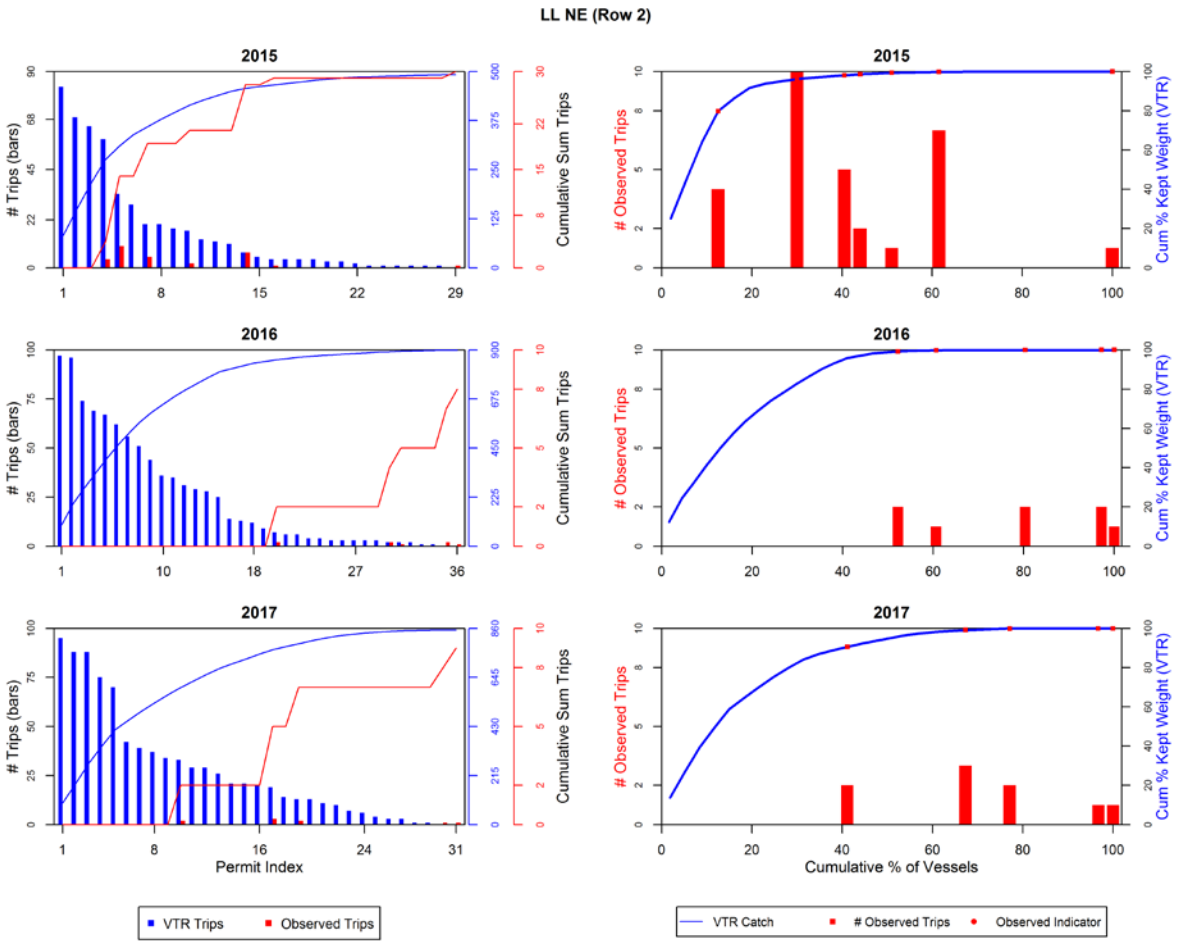


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

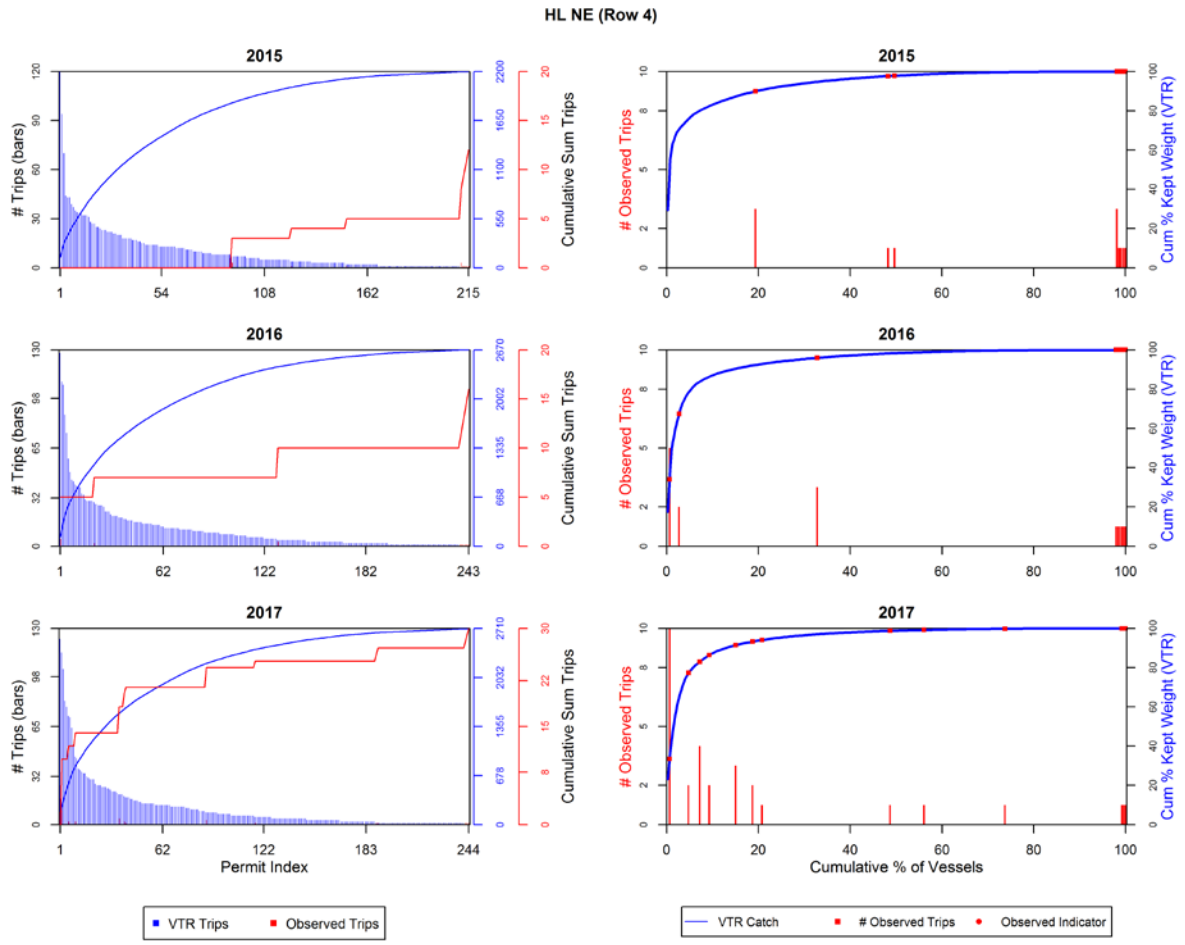


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

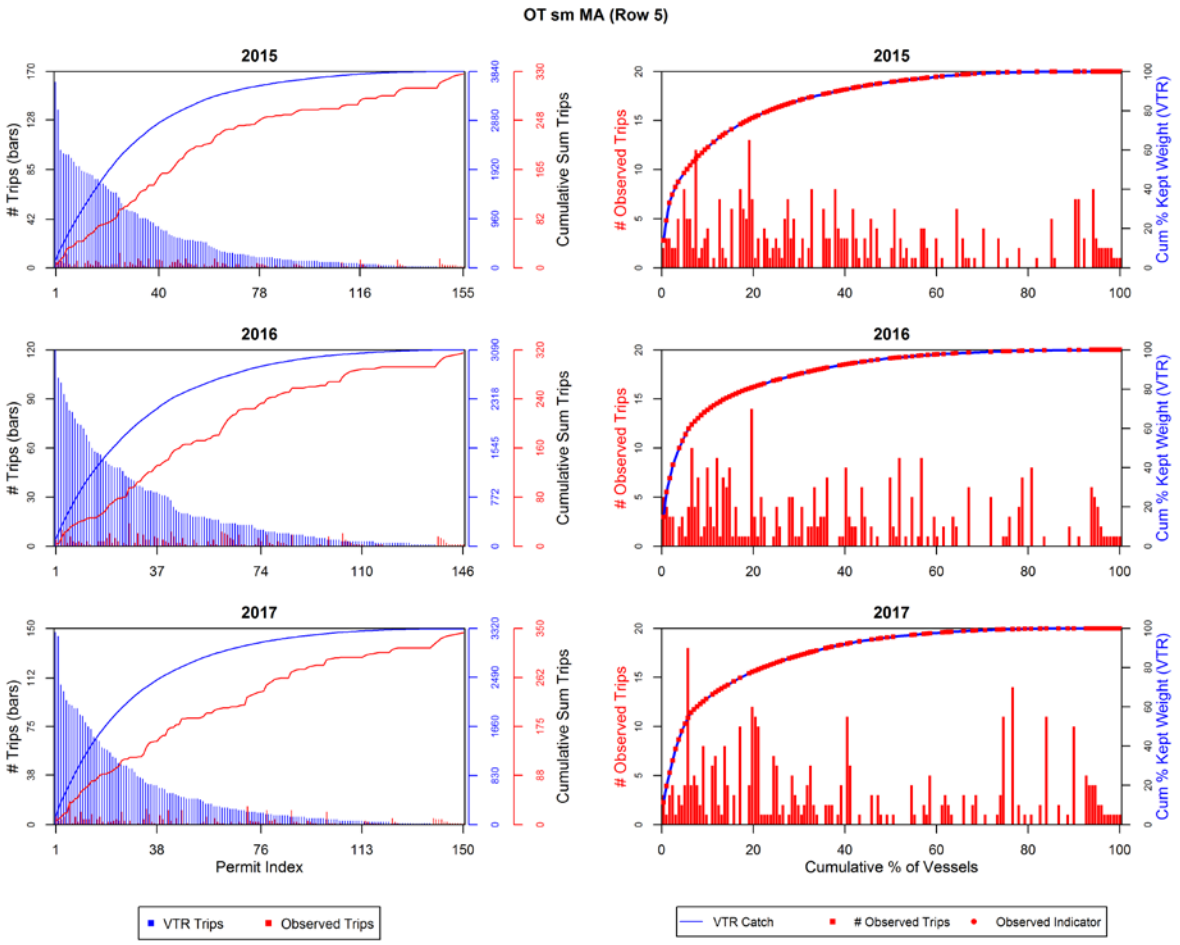


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

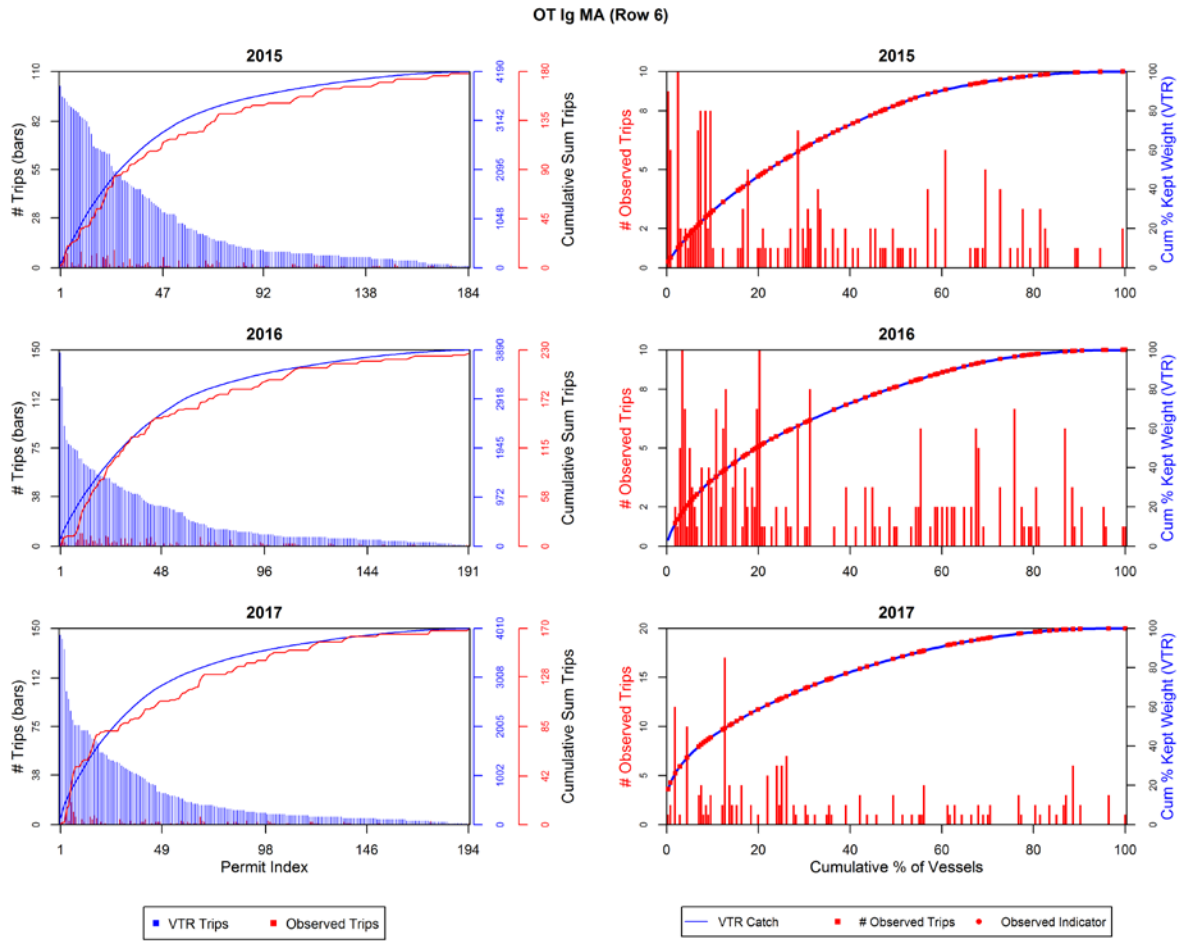


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

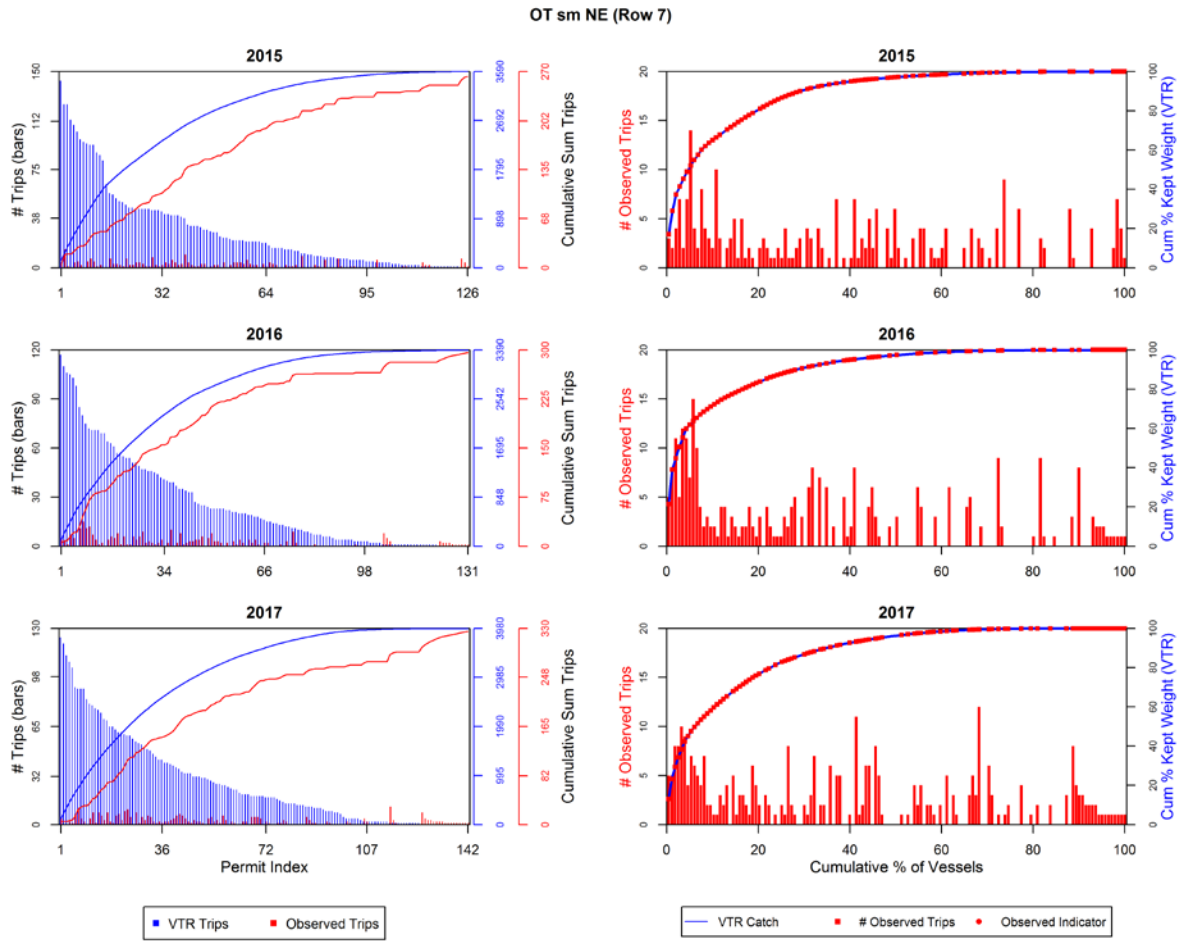


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

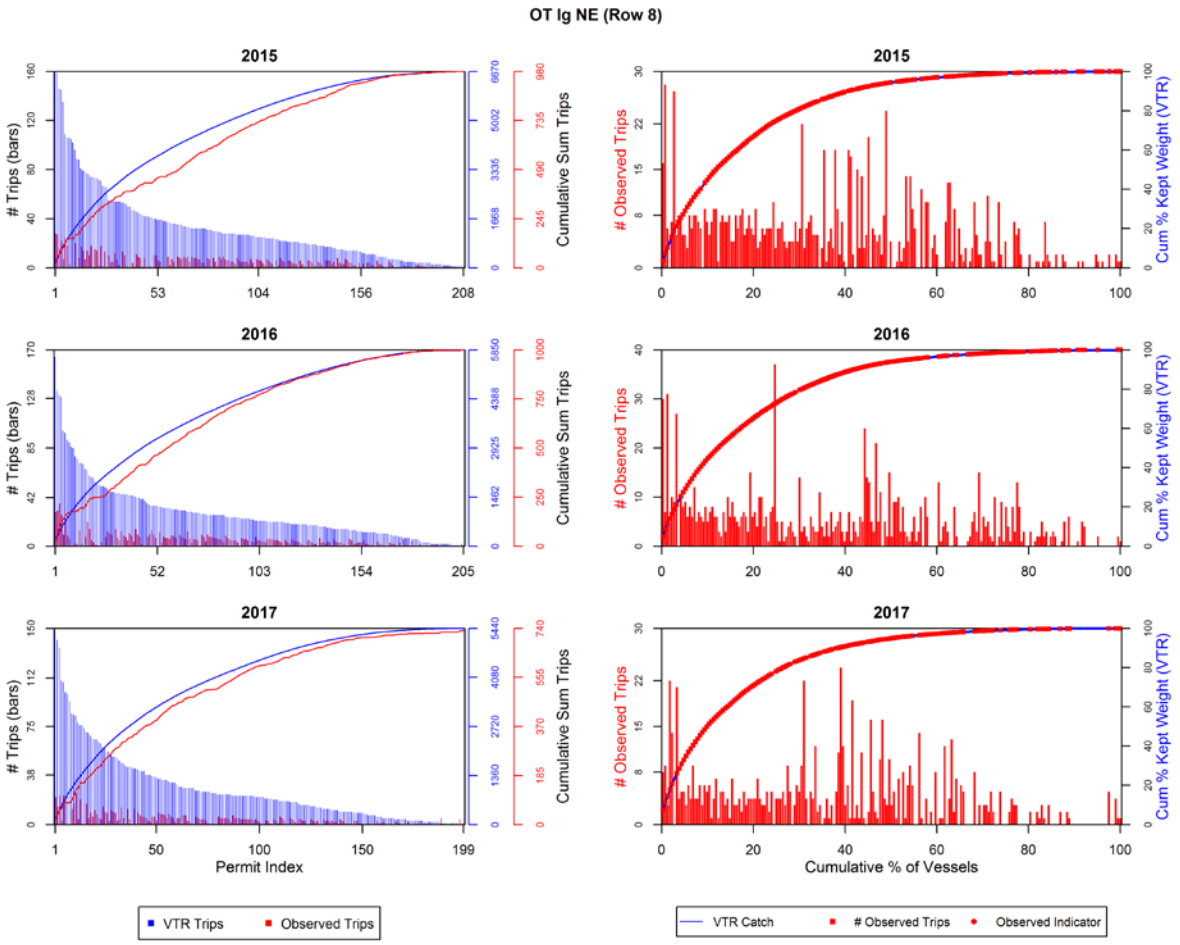


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

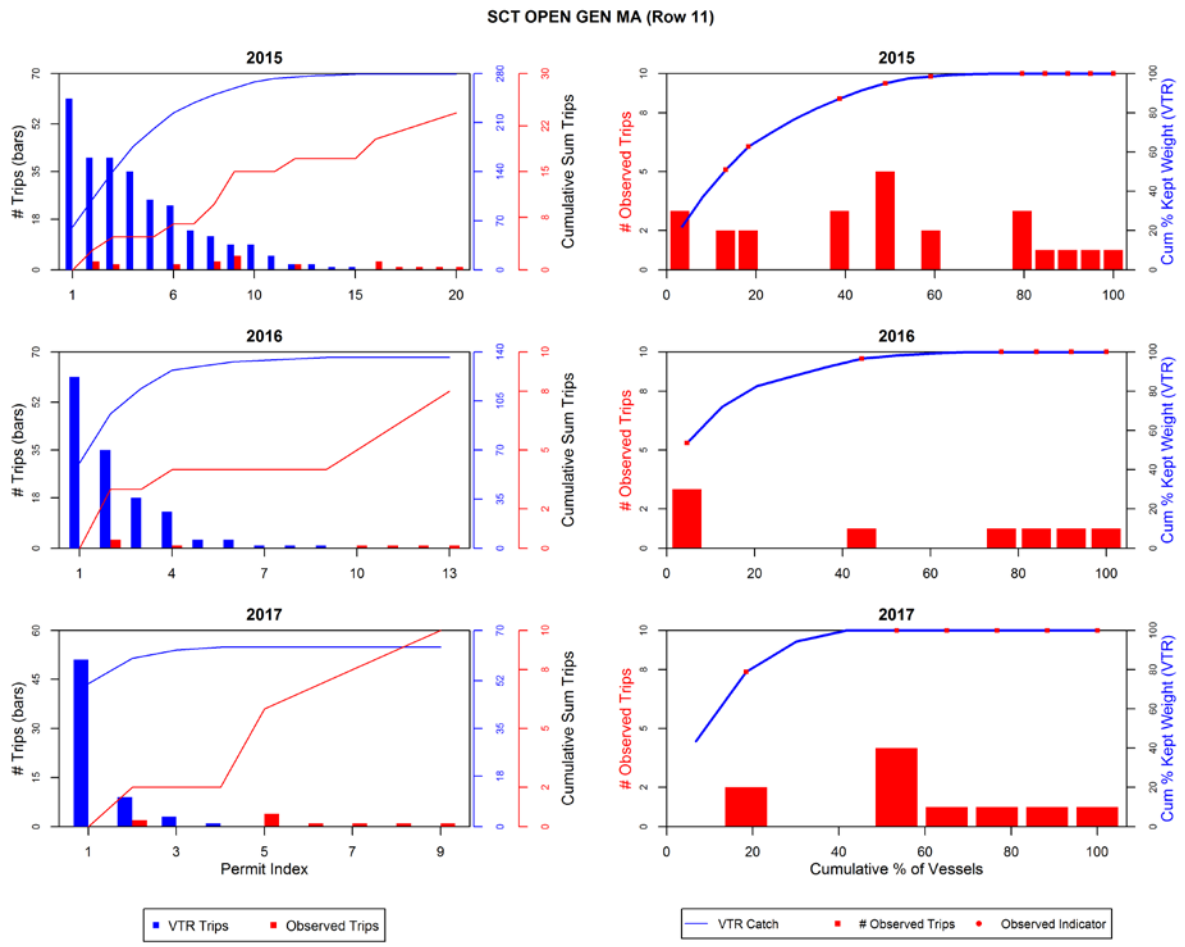


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

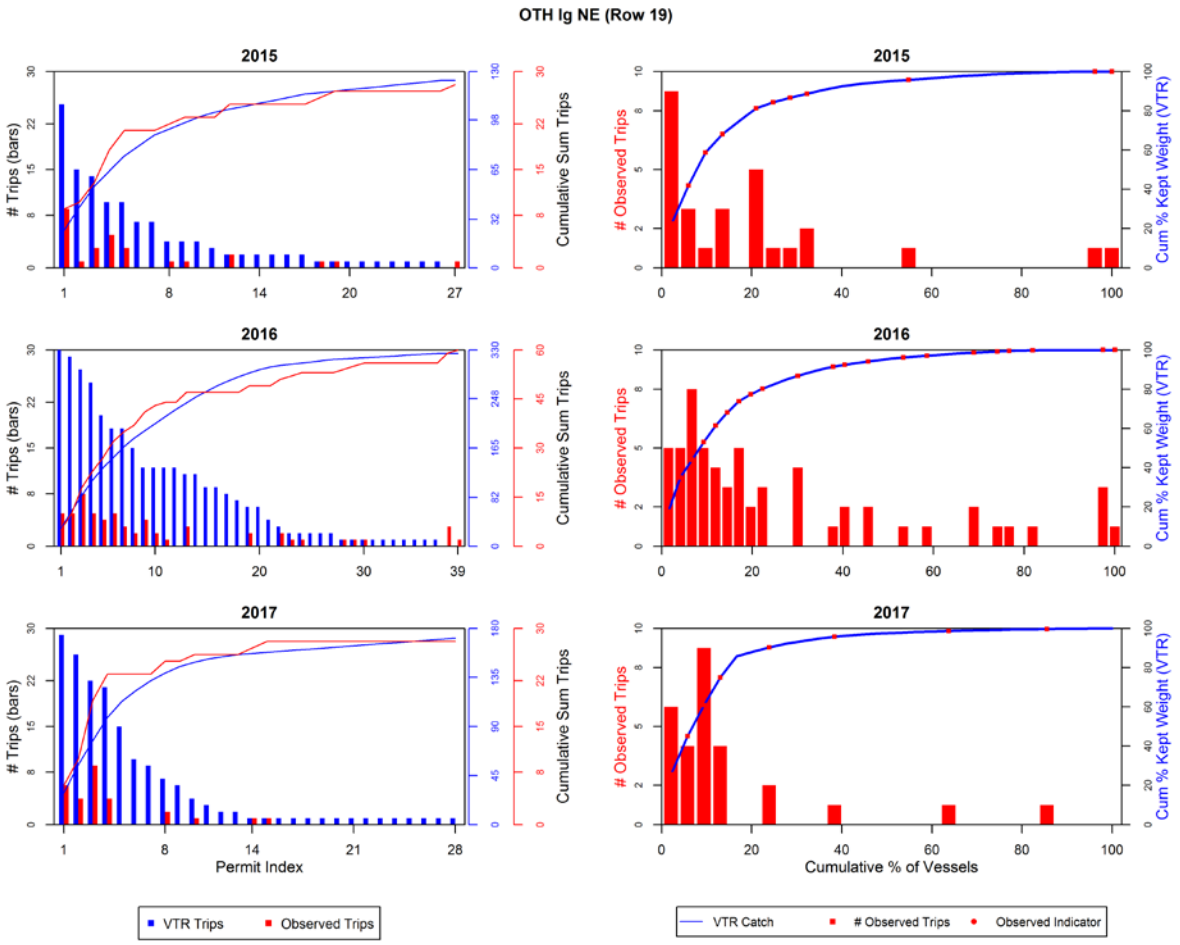


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

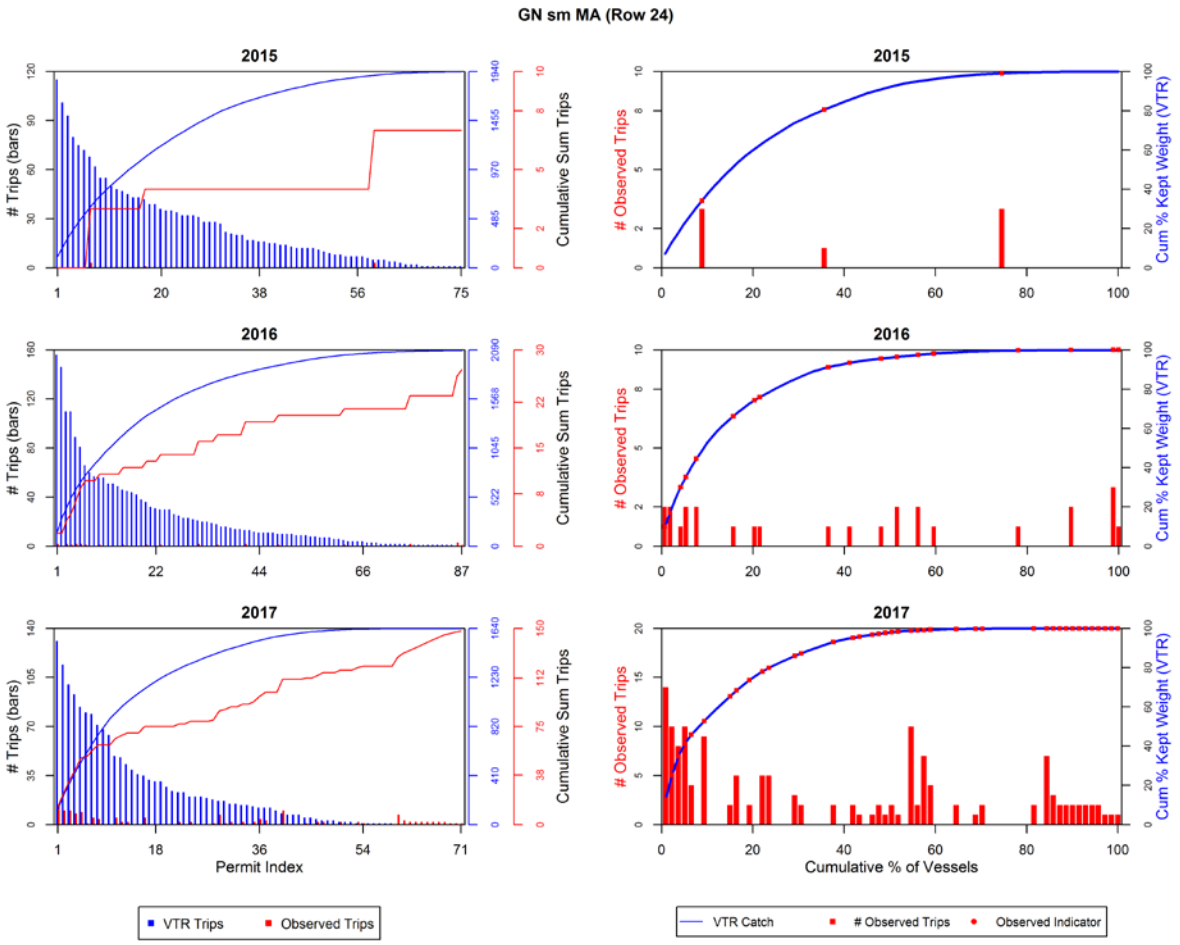


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

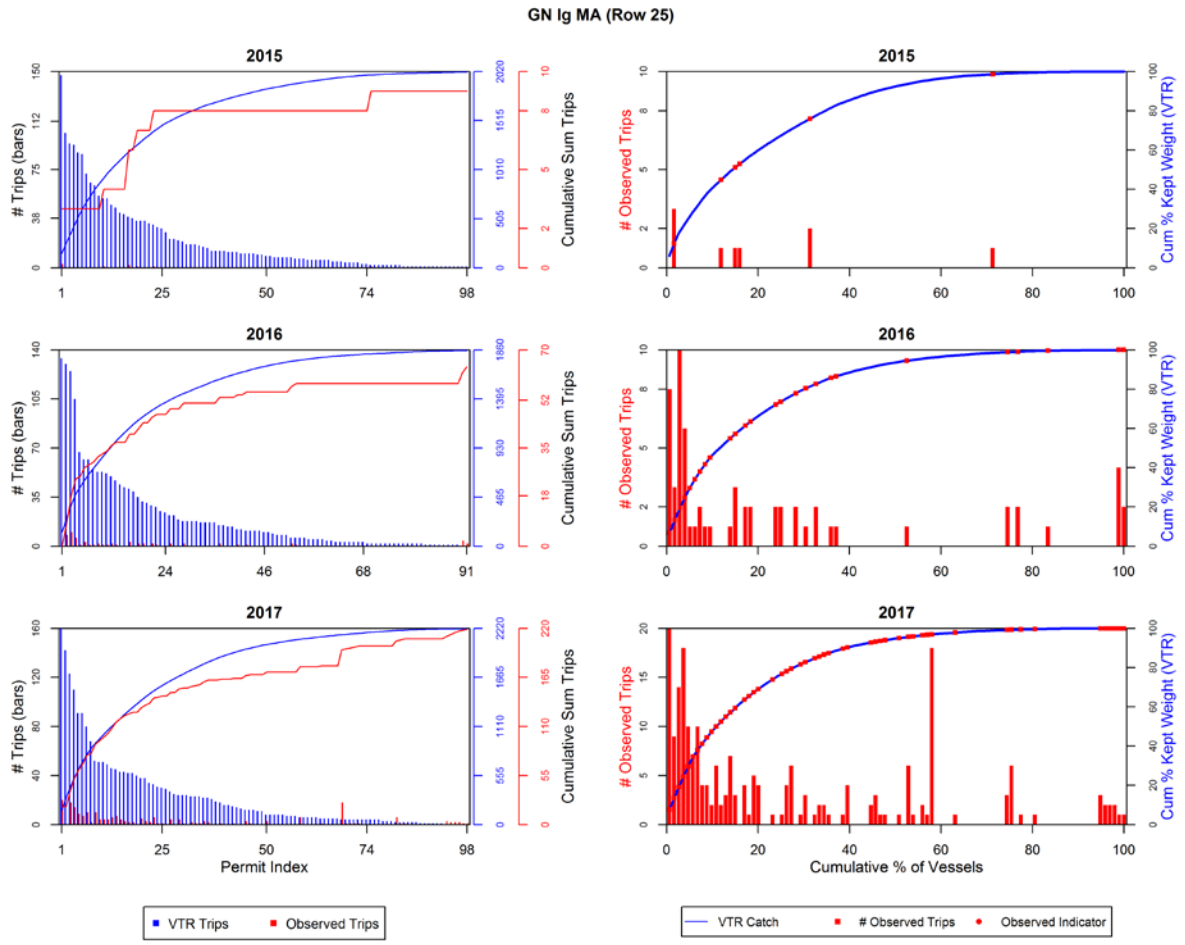


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

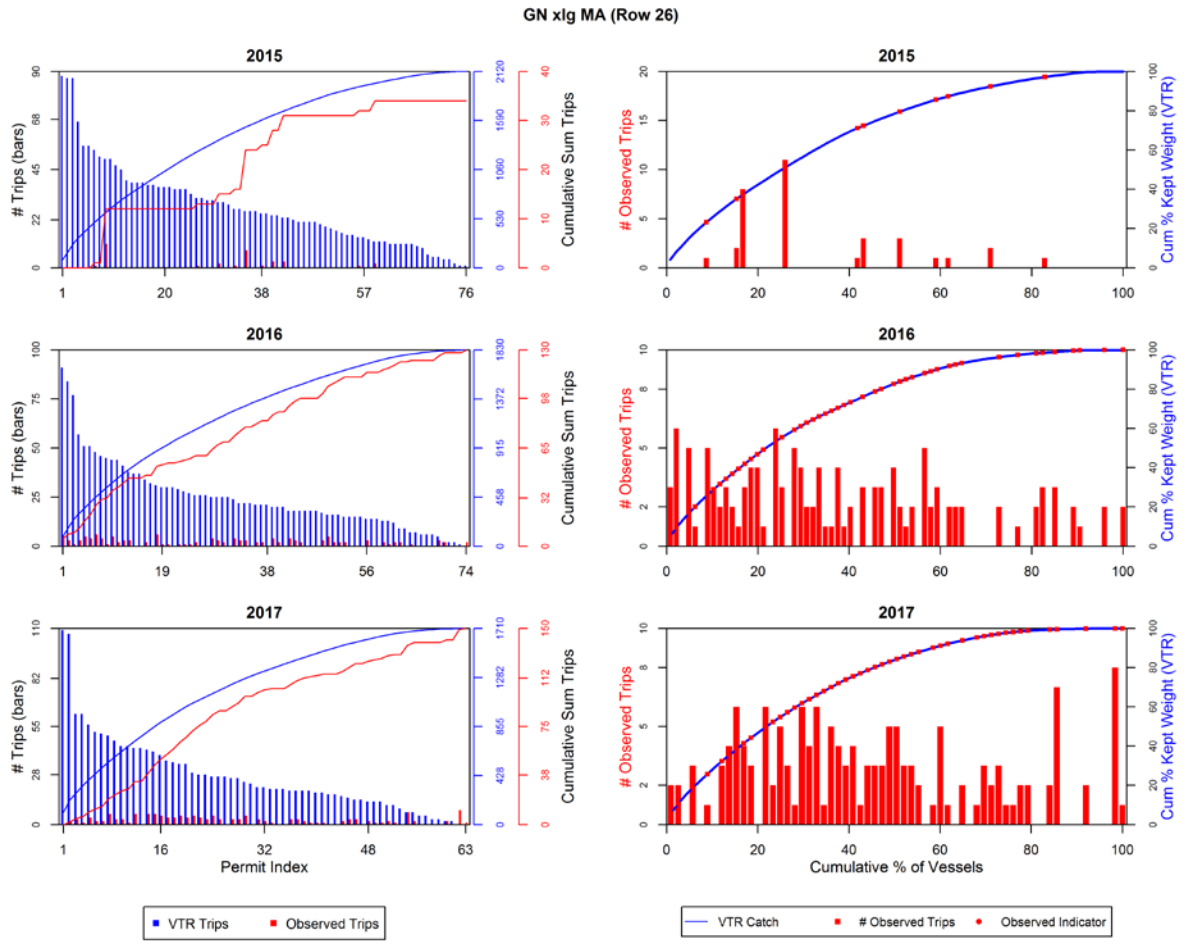
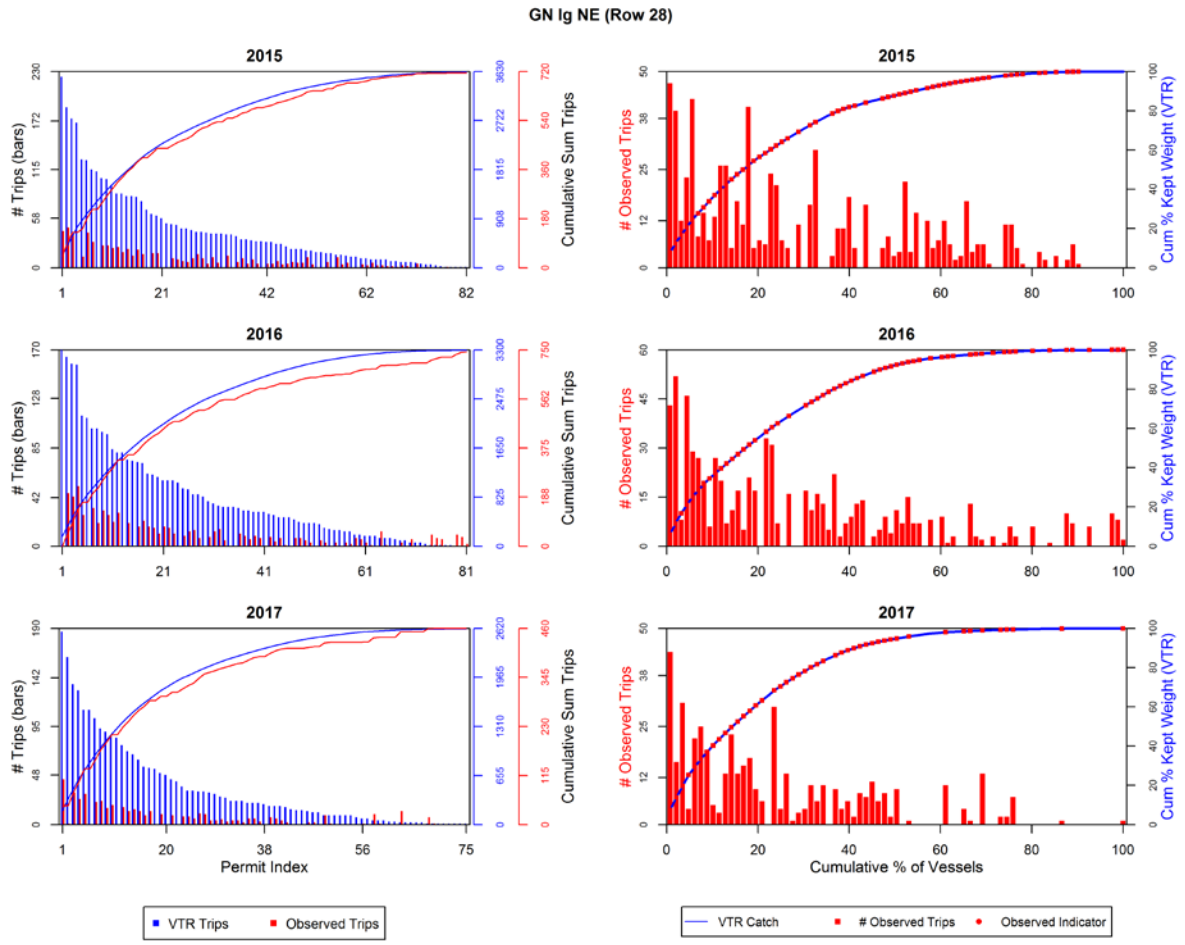


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.



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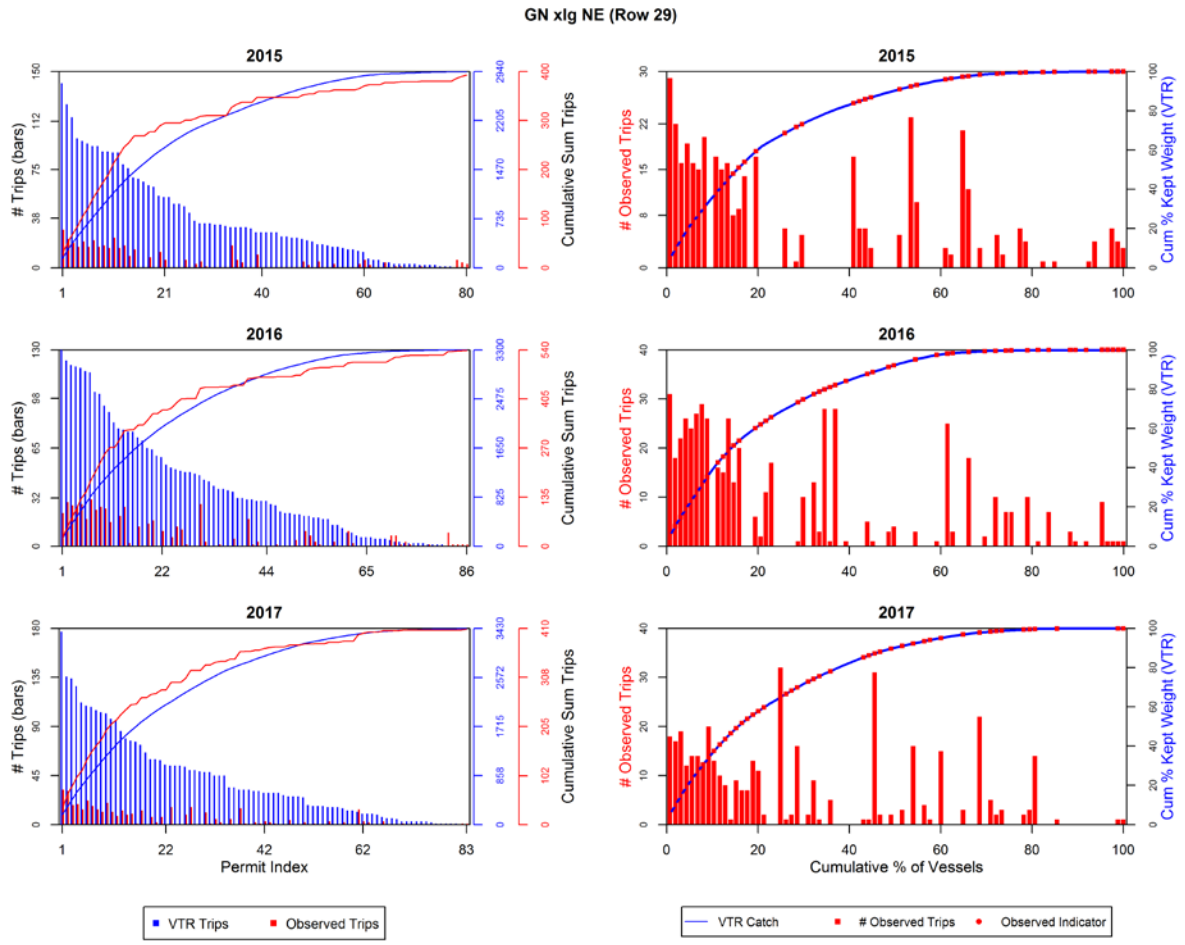


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

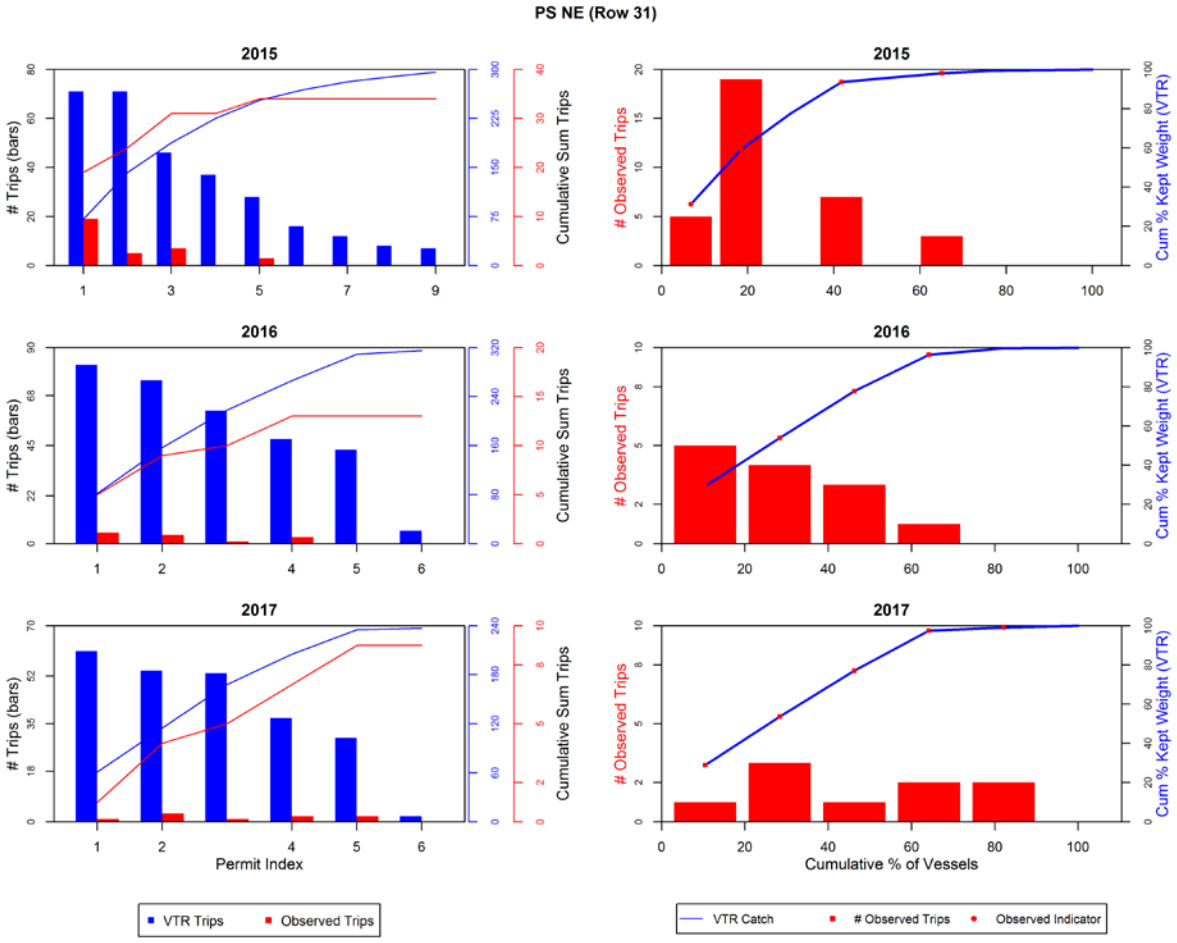


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

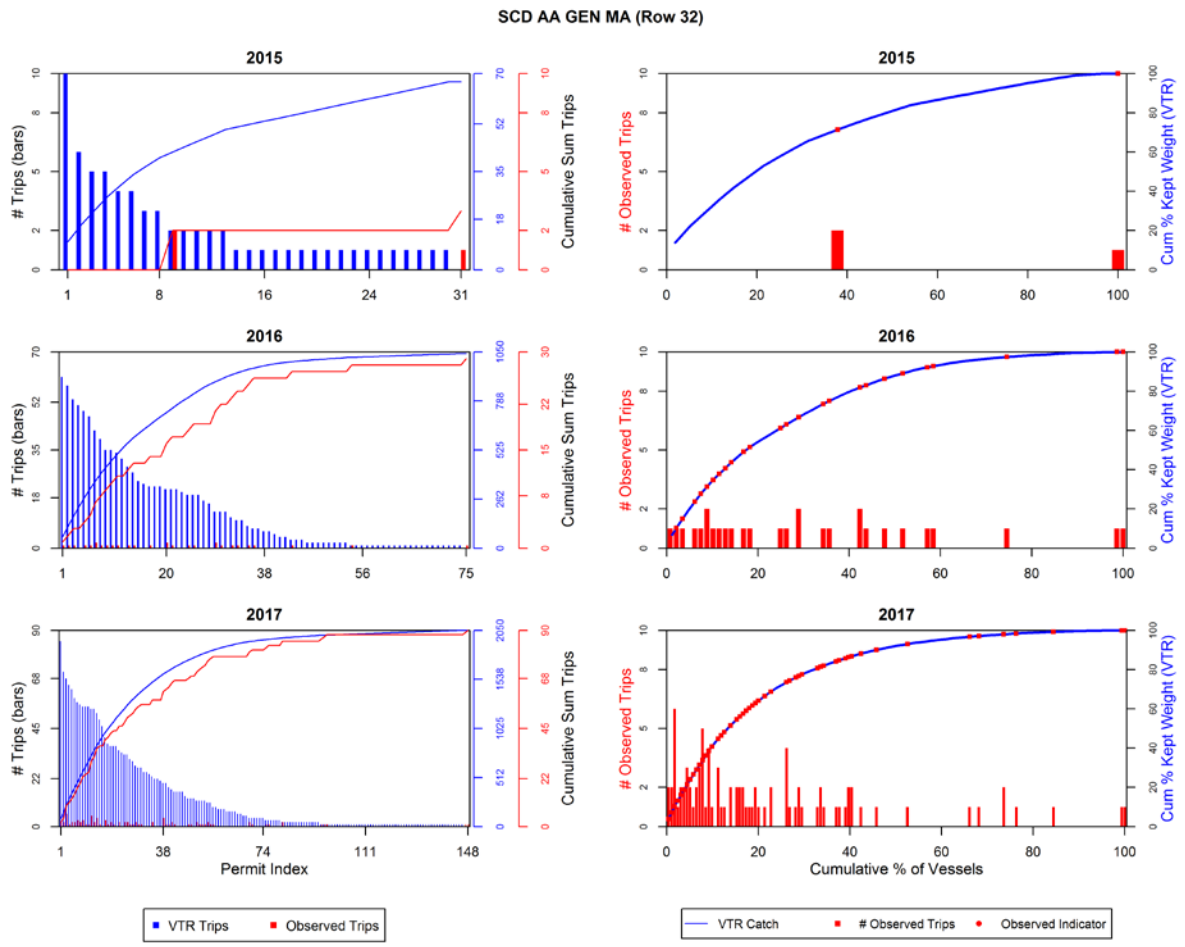
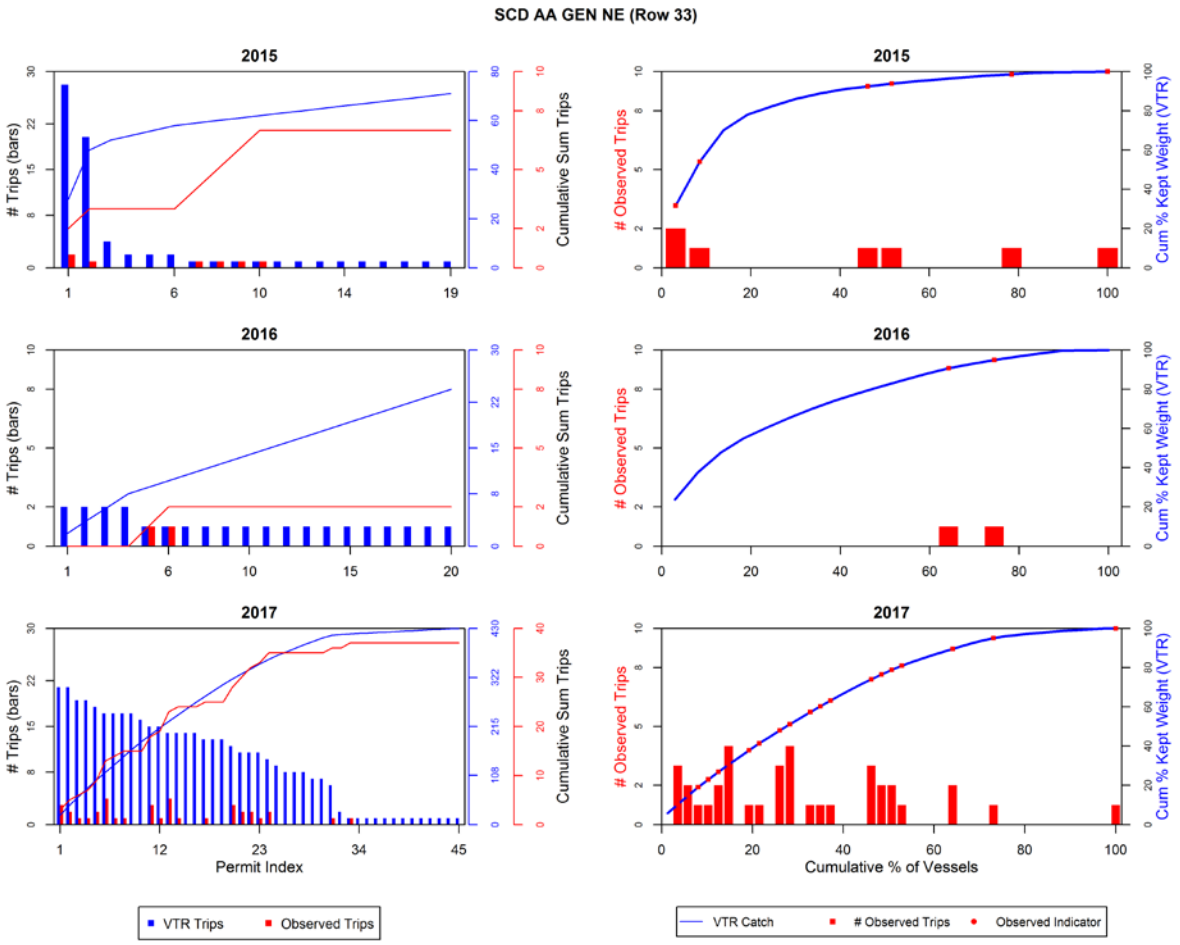


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.



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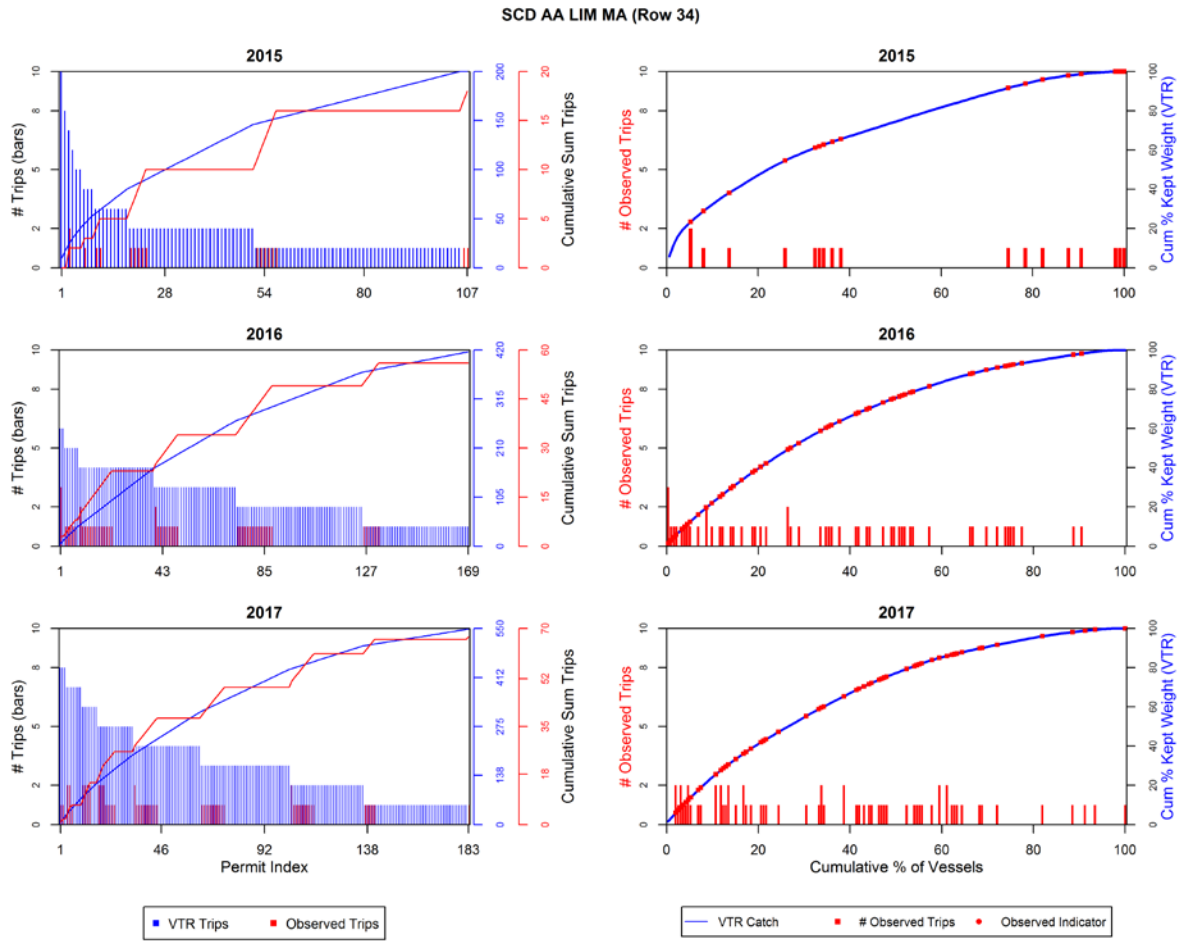

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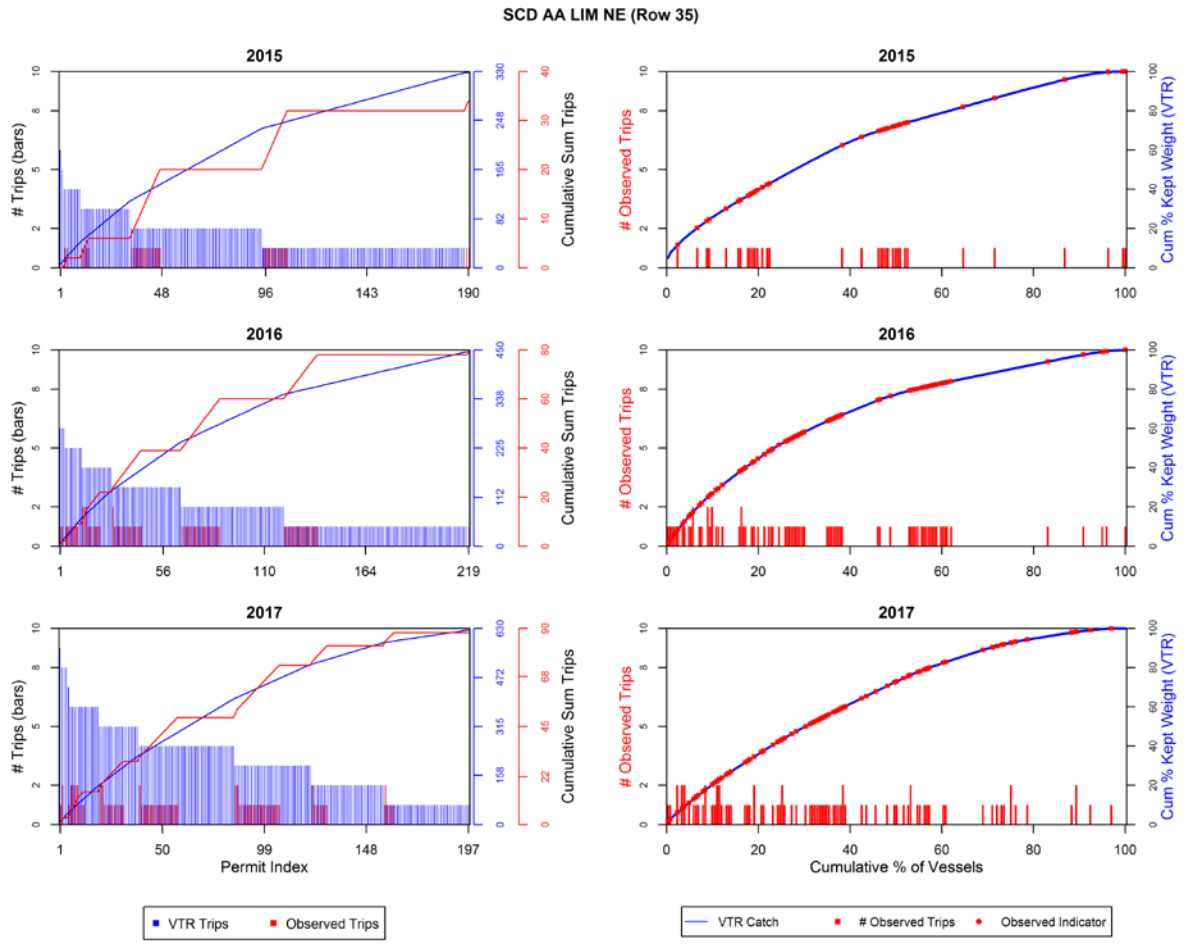


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

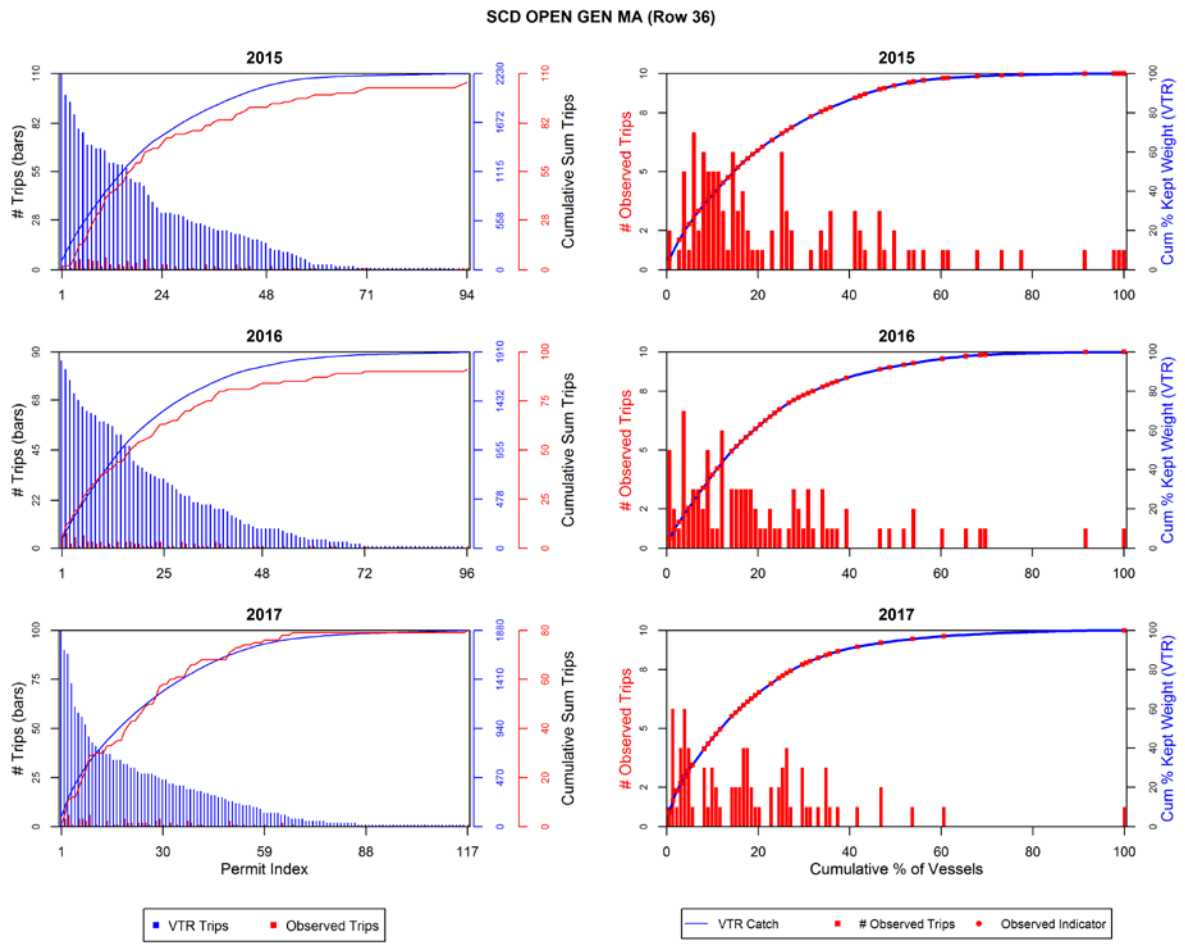


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

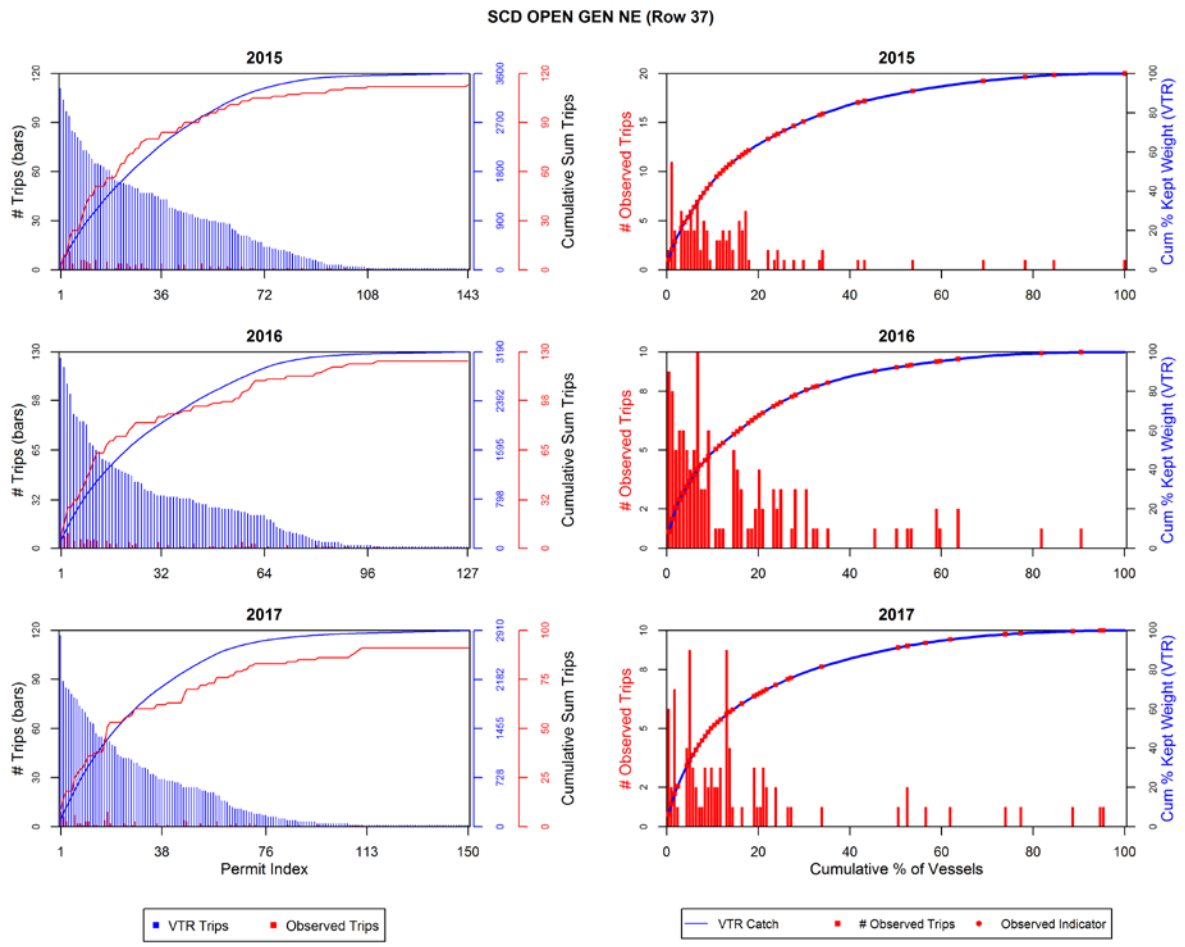
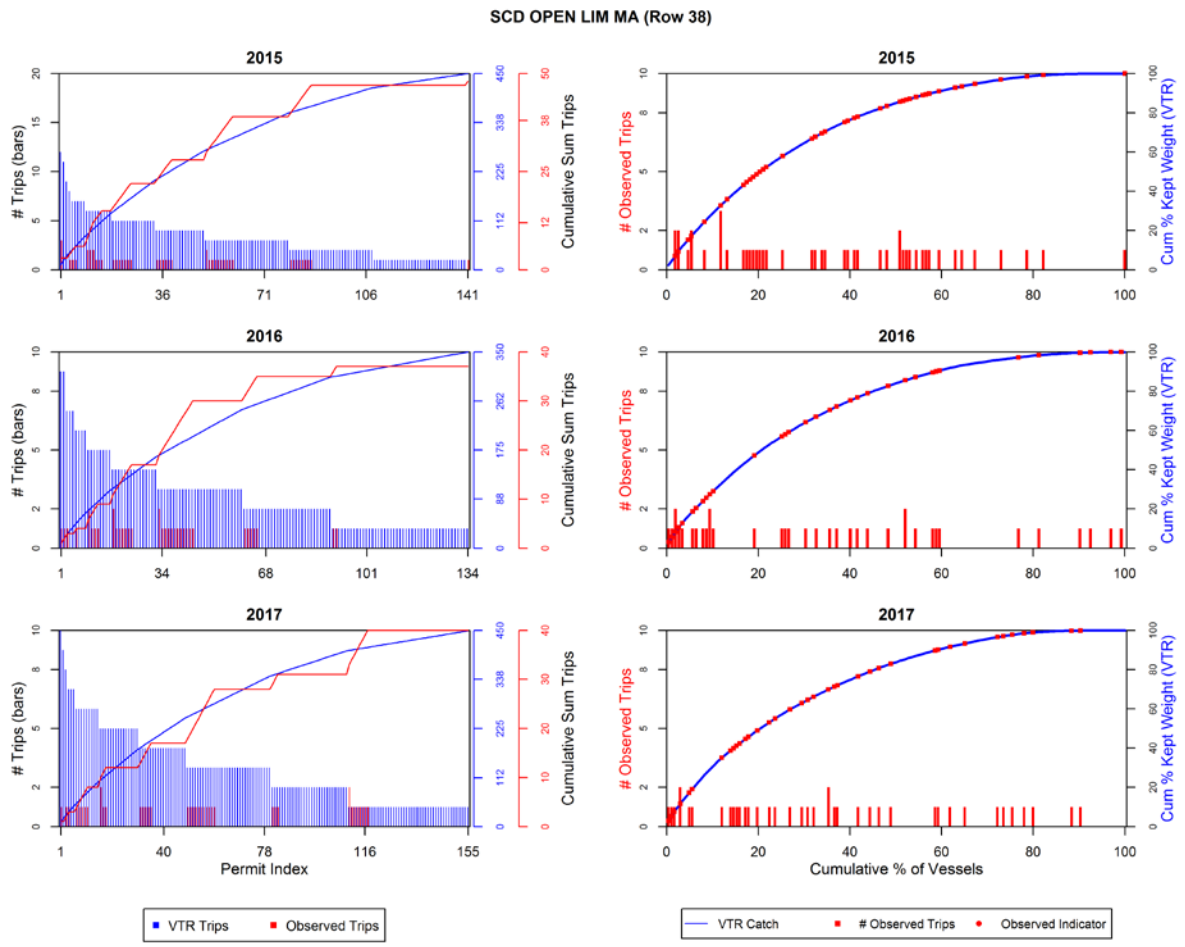


Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.



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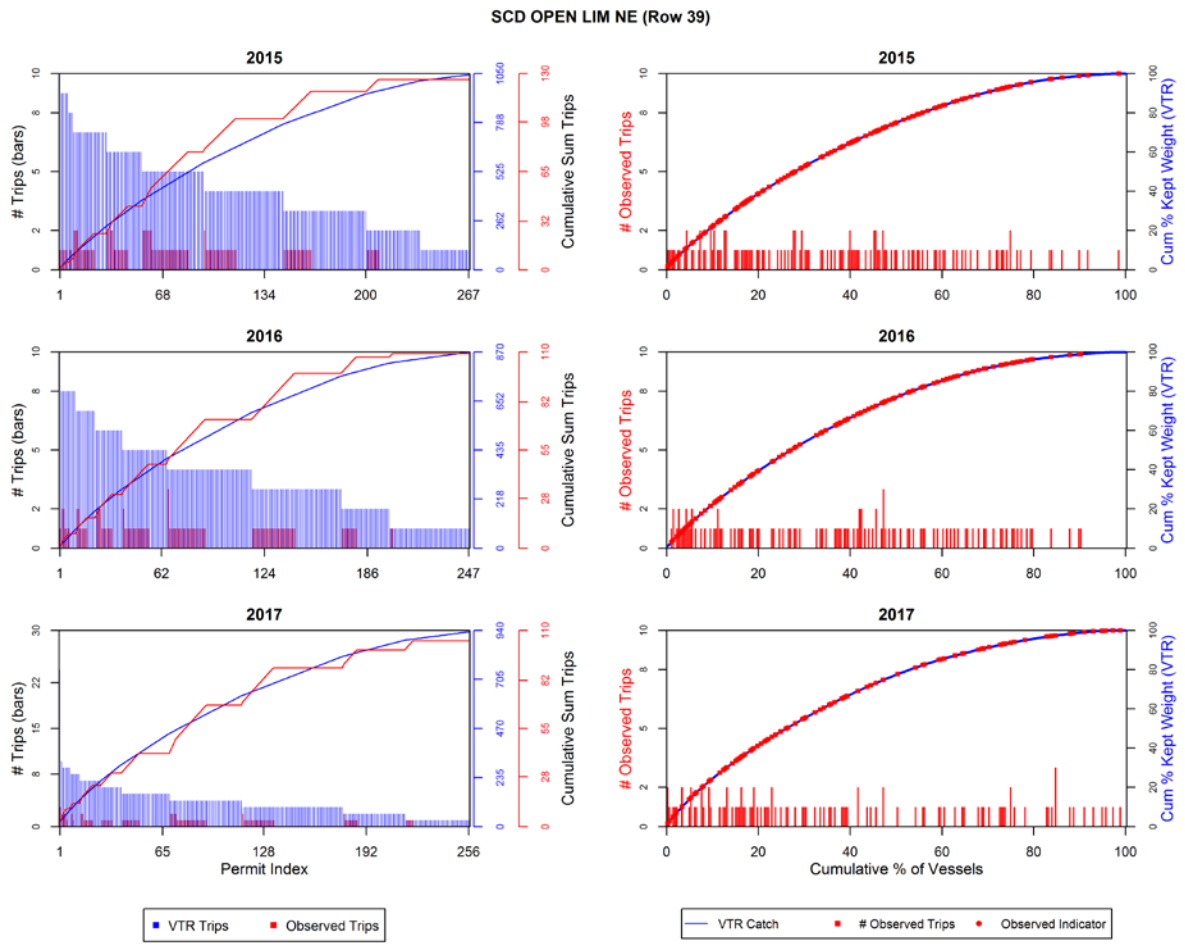

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

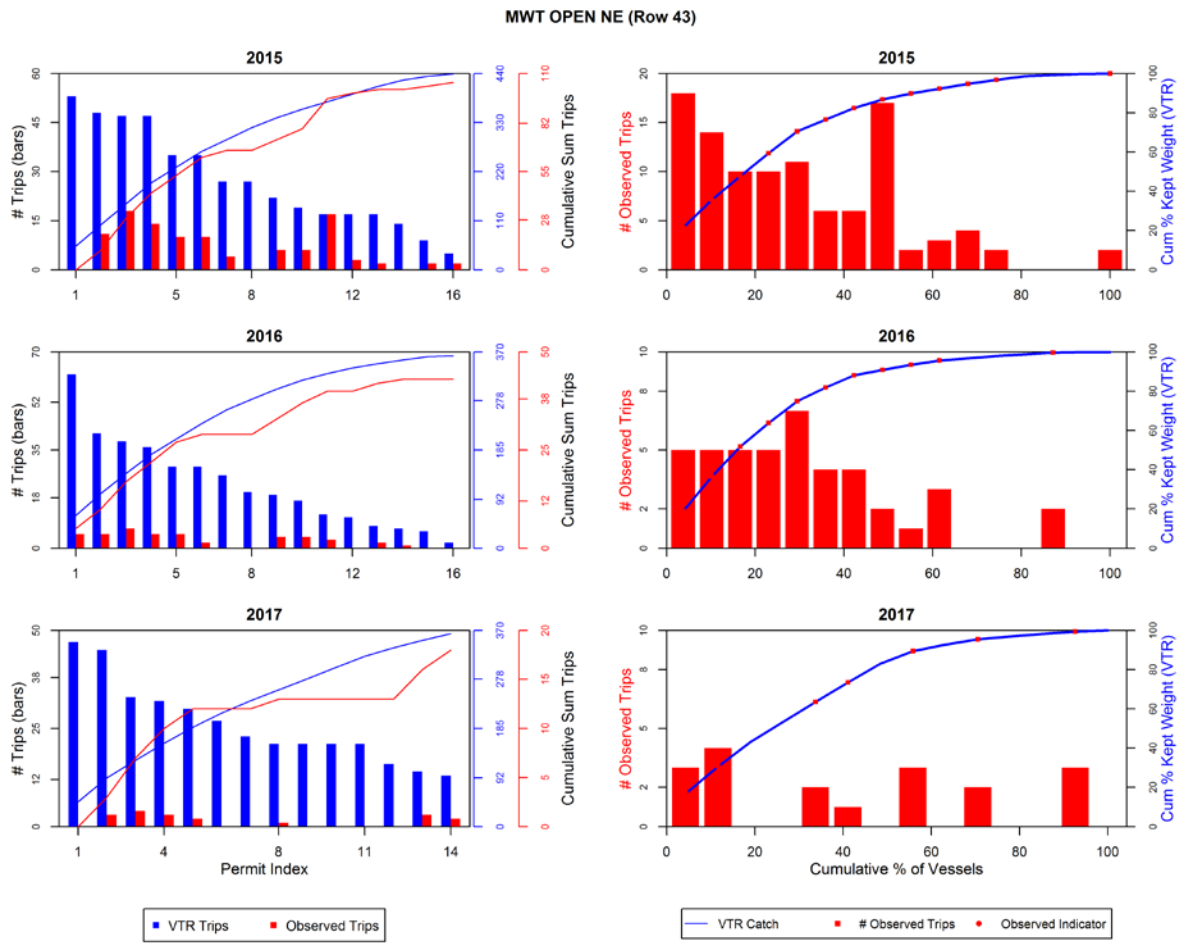

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

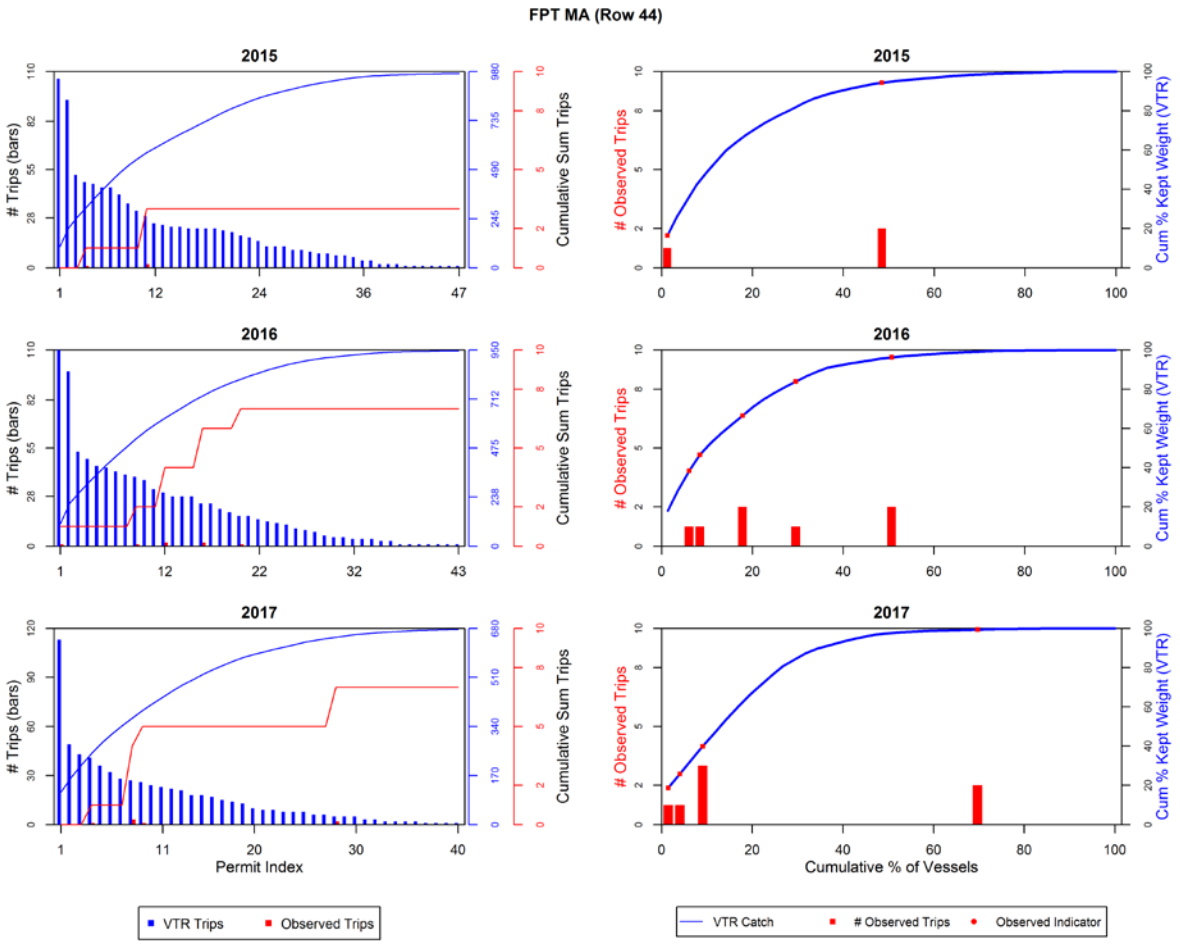

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

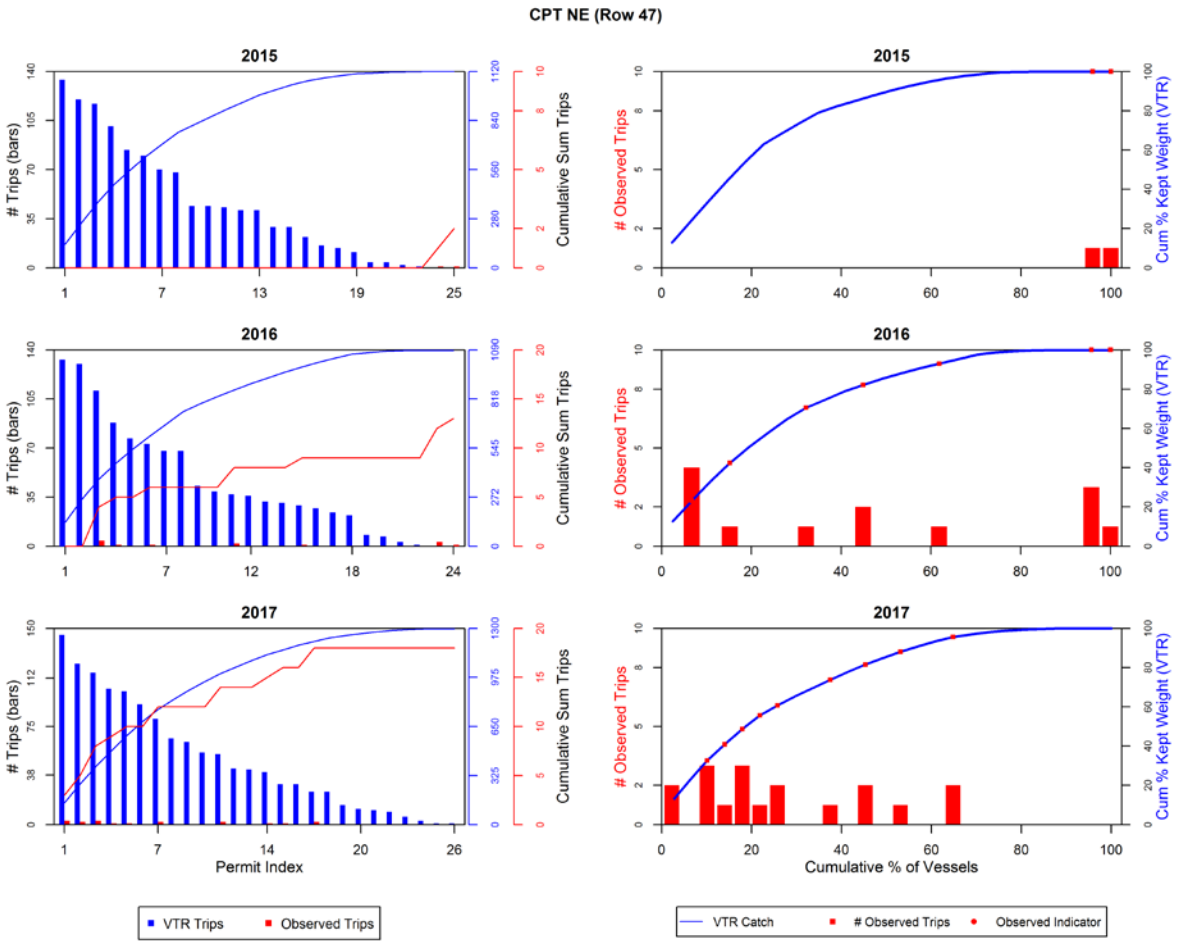

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

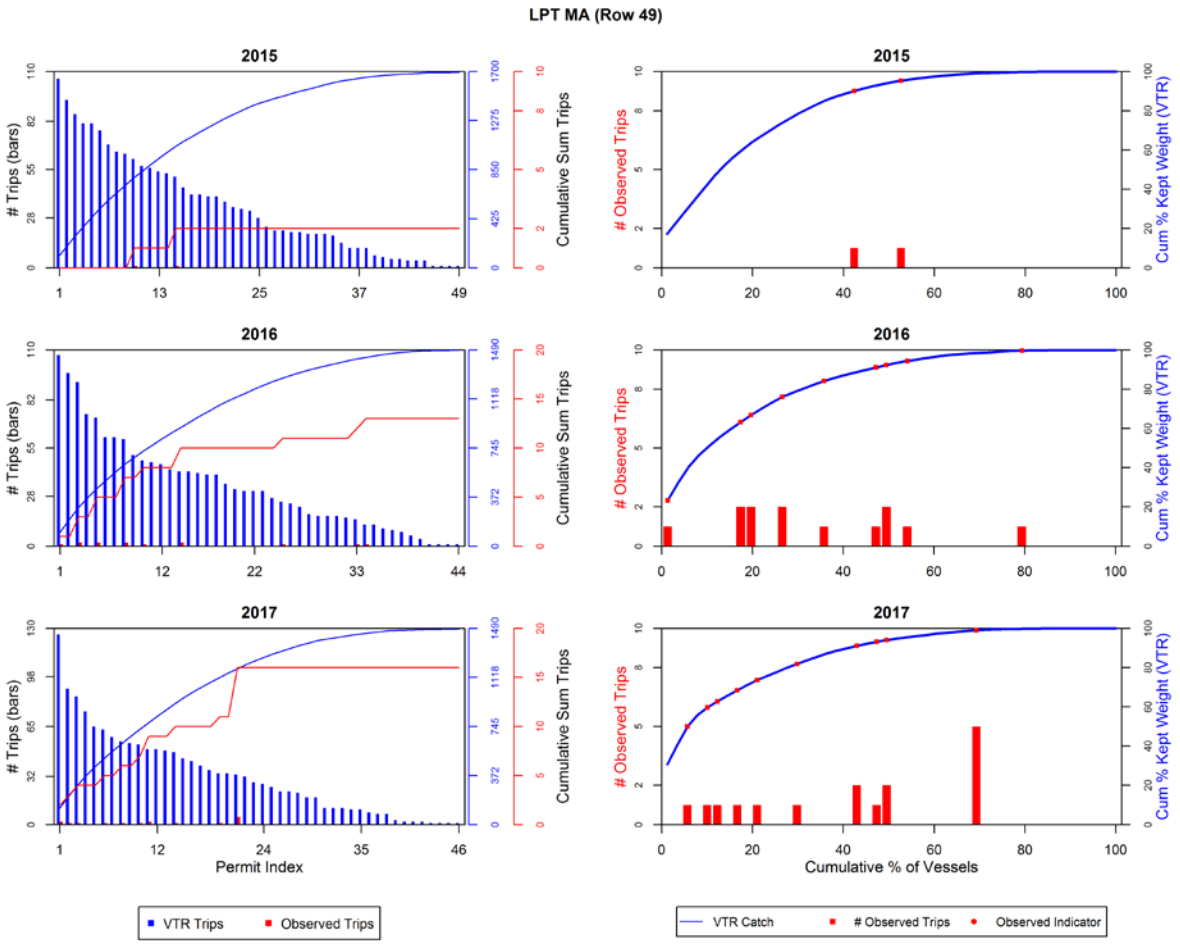

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

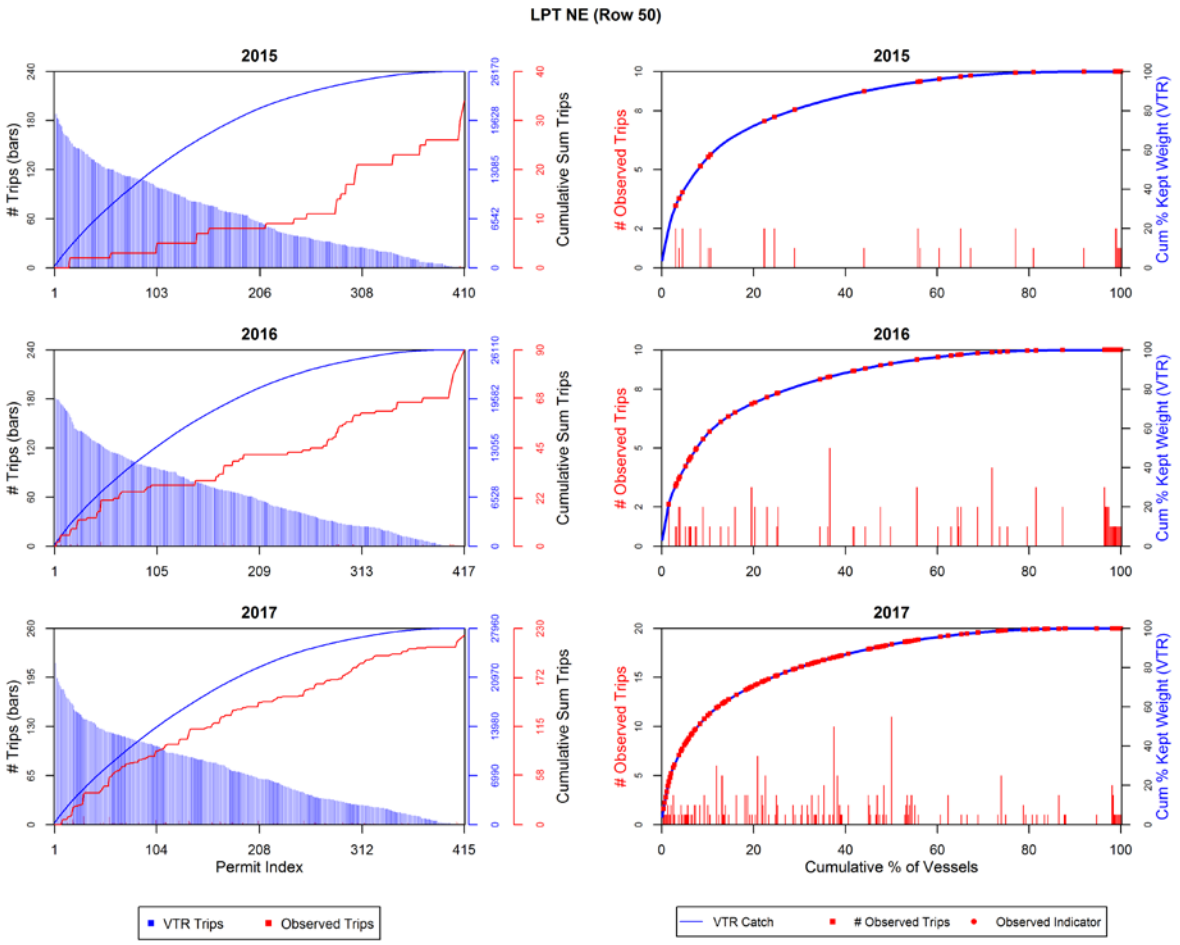

Figure 20, continued. Number of trips (bars; left-hand plots) by vessel and their cumulative sum (lines) by data set (Vessel Trip Report [VTR; blue] and observer [Observed; red]) and the cumulative percentage of kept weight of all species on VTR trips by vessel (right-hand plots) for 1 of 28 selected fleets, by Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Appendix Table 1 for fleet name abbreviations.

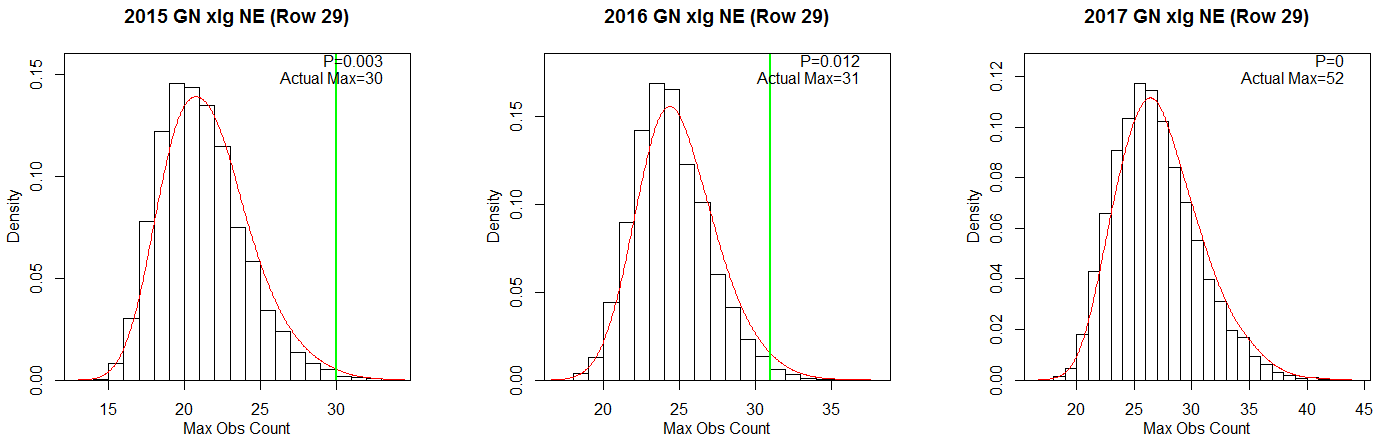

Figure 21. Results from the randomization tests for the New England extra-large mesh gillnet fleet (Row 29) for each Standardized Bycatch Reporting Methodology year illustrating the maximum number of observed trips for a given permit. The open bars indicate the distribution of the maximum number of observed trips (Max Obs Count) for a given permit from the randomized trails (representing the sampling distribution under the null hypothesis that maximum number of observed trips for a given permit would be similar to those from the actual data). The vertical green line represents the actual maximum observed trips for a given permit. The associated p-value is given. When p-values are low (<0.05), it may be concluded that vessel selection bias is present. Results for all fleets examined are given in Table 26.

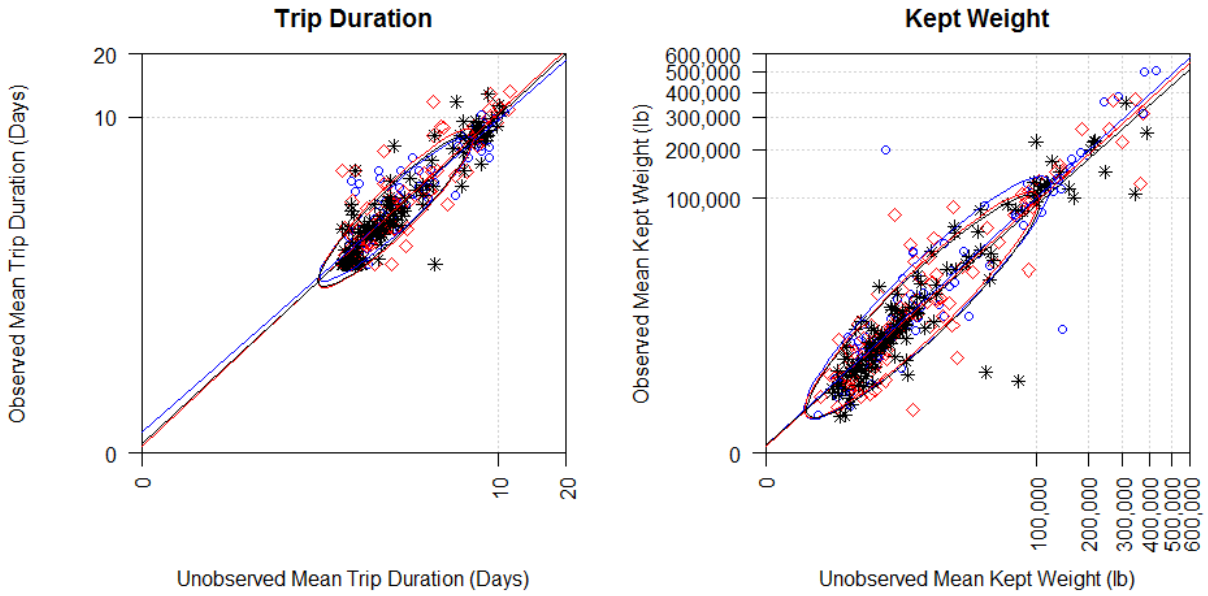

Figure 22. Comparison of mean trip duration (days; left) and mean kept weight of all species (live weight, lb; right) for unobserved and observed Vessel Trip Report trips for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data; blue circle), SBRM 2016 (July 2014 through June 2015 data; red diamond), and SBRM 2017 (July 2015 through June 2016 data; black star). A fourth root transformation was used. Each symbol represents the mean of an individual stratum (SBRM year and fleet); ellipse represents the 68% confidence interval for each SBRM year.

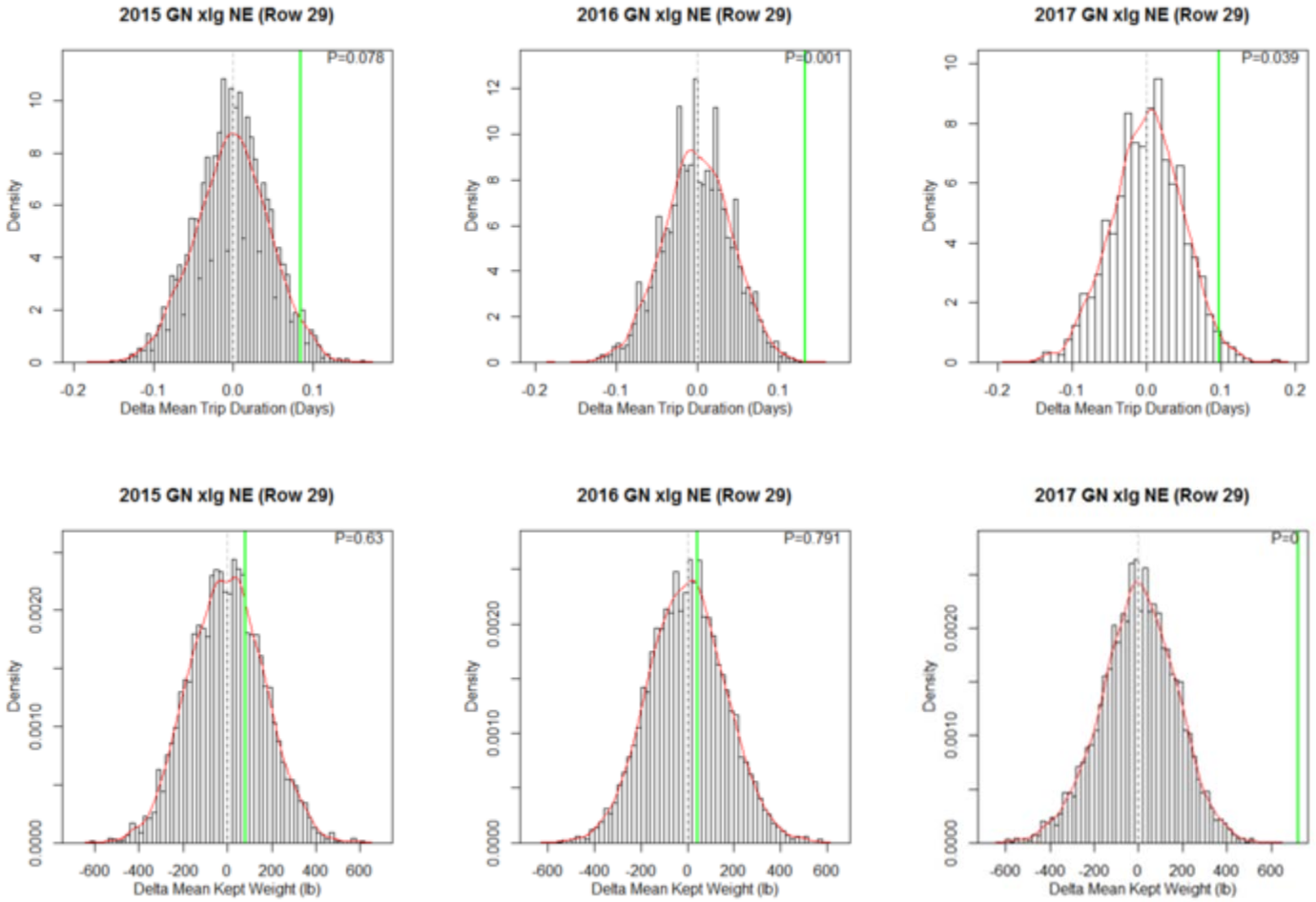

Figure 23. Results from the randomization tests for the New England (NE) extra-large (xlg) mesh gillnet (GN) fleet (Row 29) for each Standardized Bycatch Reporting Methodology year, illustrating the differences between mean trip duration (days; top panel) and mean kept weight of all species (live weight, lb; bottom panel) for unobserved and observed Vessel trip Report (VTR) trips. The open bars indicate the distribution of differences between means from the randomized trails (representing the sampling distribution under the null hypothesis that unobserved and observed trips are the same). The vertical green line represents the actual difference between the mean unobserved and observed VTR trips (unobserved – observed). The associated p-value is given. When p = values are low (<0.05), it may be concluded that an observer bias is present (reject null hypothesis that mean unobserved and observed trips are the same; Ho: muu – muo = 0). Results for all fleets examined are given in Table 26.

APPENDIX

Standardized Bycatch Reporting Methodology 3-year Review Report – 2018

Reviewing SBRM Years

2015, 2016, and 2017

Appendix Table 1. List of fleets, fleet name abbreviations, and row numbers used in the 2015, 2016, and 2017 annual Standardized Bycatch Reporting Methodology (SBRM) analyses and the row numbers used in this report (2017 3-year Review). See Table 3 for fleet stratification abbreviations.

Fleet						Row Number			
Gear Type	Access Area	Trip Category	Region	Mesh Group	Fleet Name Abbreviation	SBRM 2015	SBRM 2016	SBRM 2017	2017 3-year Review
Longline	OPEN	all	MA	all	LL MA	1	1	1	1
Longline	OPEN	all	NE	all	LL NE	2	2	2	2
Hand Line	OPEN	all	MA	all	HL MA	3	3	3	3
Hand Line	OPEN	all	NE	all	HL NE	4	4	4	4
Otter Trawl	OPEN	all	MA	sm	OT sm MA	5	5	5	5
Otter Trawl	OPEN	all	MA	lg	OT lg MA	6	6	6	6
Otter Trawl	OPEN	all	NE	sm	OT sm NE	7	7	7	7
Otter Trawl	OPEN	all	NE	lg	OT lg NE	8	8	8	8
Scallop Trawl	AA	GEN	MA	all	SCT AA GEN MA	9	9	9	9
Scallop Trawl	AA	LIM	MA	all	SCT AA LIM MA	10	10	10	10
Scallop Trawl	OPEN	GEN	MA	all	SCT OPEN GEN MA	11	11	11	11
Scallop Trawl	OPEN	LIM	MA	all	SCT OPEN LIM MA	12	12	12	12
Otter Trawl, Twin	OPEN	all	MA	all	OTT MA	13	13	13	13
Otter Trawl, Twin	OPEN	all	NE	all	OTT NE	14	14	14	14
Otter Trawl, Ruhle	OPEN	all	MA	lg	OTR lg MA	15	15	15	15
Otter Trawl, Ruhle	OPEN	all	NE	sm	OTR sm NE	16	16	16	16
Otter Trawl, Ruhle	OPEN	all	NE	lg	OTR lg NE	17	17	17	17
Otter Trawl, Haddock Separator	OPEN	all	NE	sm	OTH sm NE	**56**	18		18
Otter Trawl, Haddock Separator	OPEN	all	NE	lg	OTH lg NE	18	19	18	19
Shrimp Trawl	OPEN	all	MA	all	SHT MA	19	20	19	20
Shrimp Trawl	OPEN	all	NE	all	SHT NE	20	21	20	21
Floating Trap	OPEN	all	MA	all	FT MA	21	22	21	22
Floating Trap	OPEN	all	NE	all	FT NE	22	23	22	23
Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	GN sm MA	23	24	23	24
Sink, Anchor, Drift Gillnet	OPEN	all	MA	lg	GN lg MA	24	25	24	25
Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	GN xlg MA	25	26	25	26
Sink, Anchor, Drift Gillnet	OPEN	all	NE	sm	GN sm NE	26	27	26	27
Sink, Anchor, Drift Gillnet	OPEN	all	NE	lg	GN lg NE	27	28	27	28
Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	GN xlg NE	28	29	28	29

Appendix Table 1. List of fleets, fleet name abbreviations, and row numbers used in the 2015, 2016, and 2017 annual Standardized Bycatch Reporting Methodology (SBRM) analyses and the row numbers used in this report (2017 3-year Review). See Table 3 for fleet stratification abbreviations.

Fleet						Row Number			
Gear Type	Access Area	Trip Category	Region	Mesh Group	Fleet Name Abbreviation	SBRM 2015	SBRM 2016	SBRM 2017	2017 3-year Review
Purse Seine	OPEN	all	MA	all	PS MA	29	30	29	30
Purse Seine	OPEN	all	NE	all	PS NE	30	31	30	31
Scallop Dredge	AA	GEN	MA	all	SCD AA GEN MA	31	32	31	32
Scallop Dredge	AA	GEN	NE	all	SCD AA GEN NE	32	33	32	33
Scallop Dredge	AA	LIM	MA	all	SCD AA LIM MA	33	34	33	34
Scallop Dredge	AA	LIM	NE	all	SCD AA LIM NE	34	35	34	35
Scallop Dredge	OPEN	GEN	MA	all	SCD OPEN GEN MA	35	36	35	36
Scallop Dredge	OPEN	GEN	NE	all	SCD OPEN GEN NE	36	37	36	37
Scallop Dredge	OPEN	LIM	MA	all	SCD OPEN LIM MA	37	38	37	38
Scallop Dredge	OPEN	LIM	NE	all	SCD OPEN LIM NE	38	39	38	39
Danish Seine	OPEN	all	MA	all	DS MA	39	40	39	40
Mid-water Paired & Single Trawl	AA	all	NE	all	MWT AA NE		**57**	40	41
Mid-water Paired & Single Trawl	OPEN	all	MA	all	MWT MA	40	41	41	42
Mid-water Paired & Single Trawl	OPEN	all	NE	all	MWT NE	41	42	42	43
Pots and Traps, Fish	OPEN	all	MA	all	FPT MA	42	43	43	44
Pots and Traps, Fish	OPEN	all	NE	all	FPT NE	43	44	44	45
Pots and Traps, Conch	OPEN	all	MA	all	CPT MA	44	45	45	46
Pots and Traps, Conch	OPEN	all	NE	all	CPT NE	45	46	46	47
Pots and Traps, Hagfish	OPEN	all	NE	all	HPT NE	46	47	47	48
Pots and Traps, Lobster	OPEN	all	MA	all	LPT MA	47	48	48	49
Pots and Traps, Lobster	OPEN	all	NE	all	LPT NE	48	49	49	50
Pots and Traps, Crab	OPEN	all	MA	all	CRPT MA	49	50	50	51
Pots and Traps, Crab	OPEN	all	NE	all	CRPT NE	50	51	51	52
Beam Trawl	OPEN	all	MA	all	BT MA	51	52	52	53
Beam Trawl	OPEN	all	NE	all	BT NE	52	53	53	54
Dredge, Other	OPEN	all	MA	all	DRO MA	53	54	54	55
Ocean Quahog/Surfclam Dredge	OPEN	all	MA	all	CDR MA	54	55	55	56
Ocean Quahog/Surfclam Dredge	OPEN	all	NE	all	CDR NE	55	56	56	57

Appendix Table 2. Individual species (in alphabetical order) encountered on observer trips, by species recorded in weight and species recorded in number, during July 2013 through June 2016. Individual species listed reflects the unique species codes used by observers.

Individual species reported in live pounds

ALEWIFE
ALLIGATORFISH
AMBERJACK, NK
ANCHOVY, BAY
ANCHOVY, NK
ANCHOVY, STRIPED
ANEMONE, NK
ARGENTINE, ATLANTIC
BARRACUDA, NK
BARRELFISH
BASS, STRIPED
BATFISH, ATLANTIC
BATFISH, NK
BEARDFISH
BLUEFISH
BLUESPOTTED CORNETFISH
BOARFISH, DEEPBODY
BOARFISH, NK
BONITO, ATLANTIC
BULLET MACKEREL
BUTTERFISH
CARP
CLAM, BLOODARC
CLAM, NK
CLAM, RAZOR
CLAM, SURF
COBIA
COD, ATLANTIC
CORAL, SOFT, NK
CORAL, STONY, NK
CRAB, BLUE
CRAB, CANCER, NK
CRAB, DEEPSEA,RED
CRAB, GREEN
CRAB, HERMIT, NK
CRAB, HORSESHOE
CRAB, JONAH
CRAB, LADY
CRAB, NORTHERN STONE
CRAB, ROCK
CRAB, SNOW
CRAB, SPECKLED, NK
CRAB, SPIDER, NK
CRAB, SPIDER, PORTLY
CRAB, TRUE, NK
CROAKER, ATLANTIC
CUNNER (YELLOW PERCH)
CUSK
CUSK-EEL, NK
CUTLASSFISH, ATL
DOGFISH, CHAIN
DOGFISH, NK
DOGFISH, SMOOTH
DOGFISH, SPINY
DOLPHINFISH (MAHI MAHI)
DORY, BUCKLER (JOHN)
DORY, NK
DRAGONFISH, BOA
DRUM, BANDED
DRUM, BLACK
DRUM, RED
EEL, AMERICAN
EEL, CONGER
EEL, NK
EEL, ROCK (GUNNEL)
EEL, SAND LANCE, NK
EEL, SLENDER SNIPE
EELGRASS
EELPOUT, NK
FILEFISH, NK
FISH, NK
FLOUNDER, AMERICAN PLAICE
FLOUNDER, FOURSPOT
FLOUNDER, GULFSTREAM
FLOUNDER, LEFTEYE, NK
FLOUNDER, NK
FLOUNDER, SAND DAB (WINDOWPANE)
FLOUNDER, SOUTHERN
FLOUNDER, SUMMER (FLUKE)
FLOUNDER, WINTER (BLACKBACK)
FLOUNDER, WITCH (GREY SOLE)
FLOUNDER, YELLOWTAIL
GAPER, RED EYE
GARFISH (NEEDLEFISH)
GRENADIER, COMMON (MARLINSPIKE)
GRENADIER, NK
GROUNDFISH, NK
GROUPER, NK
GROUPER, SNOWY
GRUNT, NK
HADDOCK
HAGFISH, ATLANTIC
HAKE, LONGFIN
HAKE, NK
HAKE, RED (LING)
HAKE, RED/WHITE MIX
HAKE, SILVER (WHITING)

HAKE, SOUTHERN
HAKE, SPOTTED
HAKE, WHITE
HALIBUT, ATLANTIC
HALIBUT, GREENLAND
HARVESTFISH
HERRING, ATLANTIC
HERRING, BLUEBACK
HERRING, NK
HERRING, ROUND
HOGCHOCKER
HOGFISH
HOUNDFISH
INVERTEBRATE, NK
JACK, CREVALLE
JACK, NK
JELLYFISH, NK
KINGFISH, GULF
KINGFISH, NK
KINGFISH, NORTHERN
KINGFISH, SOUTHERN
LADYFISH
LAMPREY, NK
LANTERNFISH, NK
LIZARDFISH
LOBSTER, AMERICAN
LOOKDOWN
LUMPFISH
MACKEREL, ATLANTIC
MACKEREL, CHUB
MACKEREL, KING
MACKEREL, NK
MACKEREL, SNAKE, NK
MACKEREL, SPANISH
MARLIN, NK
MARLIN, WHITE
MENHADEN, ATLANTIC
MOLA, NK
MOLA, OCEAN SUNFISH
MOLA, SHARPTAIL
MOLLUSK, NK
MONKFISH (GOOSEFISH)
MOONFISH, ATLANTIC
MULLET, STRIPED
MUSSEL, NK
NEEDLEFISH, ATLANTIC
OCEAN POUT
OCTOPUS, NK
OYSTER, COMMON
PERCH, SAND
PERCH, WHITE
PERIWINKLE, COMMON
PIGFISH
PILOTFISH
PINFISH
PIPEFISH/SEAHORSE,NK
POLLOCK
POMFRET, BIGSCALE
POMPANO, AFRICAN
POMPANO, FLORIDA
PORGY, NK
PUFFER, NK (BURRFISH)
PUFFER, NORTHERN
QUAHOG, HARD SHELL CLAM
QUAHOG, OCEAN (BLACK CLAM)
RAVEN, SEA
RAY, BULLNOSE
RAY, BUTTERFLY, NK
RAY, BUTTERFLY, SMOOTH
RAY, BUTTERFLY, SPINY
RAY, COWNOSE
RAY, DEVIL
RAY, EAGLE, NK
RAY, MANTA, ATLANTIC
RAY, MANTA,NK
RAY, NK
RAY, TORPEDO
REDFISH, NK (OCEAN PERCH)
REMORA, NK
RIBBONFISH, NK
RIBBONFISH, SCALLOPED
ROCKLING, FOURBEARD
ROCKWEED, NK
ROSEFISH,BLACK BELLY
ROUGHY, BIG
ROUGHY, NK
RUNNER, BLUE
SALMON, ATLANTIC
SAND DOLLAR
SAURY, ATLANTIC
SCAD, BIGEYE
SCAD, MACKEREL
SCAD, ROUGH
SCALLOP, BAY
SCALLOP, ICELANDIC
SCALLOP, NK
SCALLOP, SEA
SCORPIONFISH, NK
SCULPIN, LONGHORN
SCULPIN, NK
SCUP
SEA BASS, BLACK
SEA BASS, NK
SEA CUCUMBER, NK
SEA PANSY
SEA PEN, NK
SEA POTATO
SEA ROBIN, ARMORED

SEA ROBIN, NK
SEA ROBIN, NORTHERN
SEA ROBIN, STRIPED
SEA SQUIRT, NK
SEA URCHIN, NK
SEATROUT (WEAKFISH), SPOTD
SEATROUT, NK
SEAWEED, NK
SHAD, AMERICAN
SHAD, GIZZARD
SHAD, HICKORY
SHANNY, NK
SHARK, ATL ANGEL
SHARK, ATL SHARPNOSE
SHARK, BASKING
SHARK, BIGNOSE
SHARK, BLACK TIP
SHARK, BLACKNOSE
SHARK, BLUE (BLUE DOG)
SHARK, BONNETHEAD
SHARK, BULL
SHARK, CARCHARHINID,NK
SHARK, DUSKY
SHARK, FINETOOTH
SHARK, HAMMERHEAD, GREAT
SHARK, HAMMERHEAD, SCALLOPED
SHARK, HAMMERHEAD, SMOOTH
SHARK, HAMMERHEAD,NK
SHARK, MAKO, SHORTFIN
SHARK, NIGHT
SHARK, NK
SHARK, PELAGIC
SHARK, PORBEAGLE (MACKEREL SHARK)
SHARK, SAND TIGER
SHARK, SANDBAR (BROWN SHARK)
SHARK, SEVENGILL SHARPNOSE
SHARK, SILKY
SHARK, SMALLTOOTH SAND TIGER
SHARK, SPINNER
SHARK, THRESHER
SHARK, THRESHER, BIGEYE
SHARK, TIGER
SHARK, WHITE
SHEEPSHEAD
SHELLFISH, NK
SHORTSPINE BOARFISH
SHRIMP, MANTIS
SHRIMP, NK
SHRIMP, PANDALID (NORTHERN)
SHRIMP, PENAEID (SOUTHERN)
SHRIMP, ROYAL RED
SHRIMP, SCARLET
SILVERSIDE, ATLANTIC
SILVERSIDE, NK
SKATE, BARNDOOR
SKATE, CLEARNOSE
SKATE, LITTLE
SKATE, LITTLE/WINTER, NK
SKATE, NK
SKATE, ROSETTE
SKATE, SMOOTH
SKATE, THORNY
SKATE, WINTER (BIG)
SLENDER SNIPEFISH
SNAIL, MOONSHELL, NK
SNAIL, NK
SNAKEBLENNY
SNAPPER, NK
SNAPPER, RED
SNIPEFISH, LONGSPINE
SNIPEFISH, NK
SPADEFISH
SPONGE, NK
SPOT
SQUID, ATL LONG-FIN
SQUID, NK
SQUID, SHORT-FIN
SQUIRRELFISH, NK
STARFISH, BRITTLE,NK
STARFISH, SEASTAR,NK
STARGAZER, NK
STARGAZER, NORTHERN
STINGRAY, ATLANTIC
STINGRAY, BLUNTNOSE
STINGRAY, NK
STINGRAY, PELAGIC
STINGRAY, ROUGHTAIL
STINGRAY, SOUTHERN
STURGEON, ATLANTIC
STURGEON, NK
SWORDFISH
TAUTOG (BLACKFISH)
TILEFISH, BLUELINE
TILEFISH, GOLDEN
TILEFISH, NK
TOADFISH, NK
TOADFISH, OYSTER
TRIGGERFISH, NK (LEATHERJACKET)
TRIPLETAIL
TUNA, BIG EYE
TUNA, BLACKFIN
TUNA, BLUEFIN
TUNA, LITTLE (FALSE ALBACORE)
TUNA, NK
TUNA, SKIPJACK
TUNA, YELLOWFIN
TURTLE, TERRAPIN

WAHOO

WEAKFISH (SQUETEAGUE SEA TROUT)

WHELK, CHANNELED (SMOOTH)

WHELK, KNOBBED

WHELK, LIGHTNING

WHELK, NK, CONCH

WHELK, TRUE UNC

WHITING, BLACK (HAKE, OFFSHORE)

WOLFFISH, ATLANTIC

WOLFFISH, NORTHERN

WORM, NK

WRECKFISH

WRYMOUTH

Individual species reported in number

BIRD, NK

BUFFLEHEAD

CORMORANT, DBL CREST

DOLPHIN, BOTTLENOSE

DOLPHIN, COMMON (OLD SADDLEBACK)

DOLPHIN, NK (MAMMAL)

DOLPHIN, RISSOS

DOLPHIN, WHITESIDED

DOVEKIE

FULMAR, NORTHERN

GANNET, NORTHERN

GREBE, HORNED

GULL, GREAT BLK-BACK

GULL, HERRING

GULL, LESS BLK-BACK

GULL, NK

LOON, COMMON

LOON, NK

LOON, RED-THROATED

MURRE, THIN-BILLED

PELICAN, BROWN

PORPOISE, HARBOR

PORPOISE/DOLPHIN, NK

RAZORBILL

SCOTER, BLACK

SEAL, GRAY

SEAL, HARBOR

SEAL, HARP

SEAL, HOODED

SEAL, NK

SHEARWATER, CORYS

SHEARWATER, GREATER

SHEARWATER, NK

SHEARWATER, SOOTY

STORM PETREL, WILSON

TURTLE, GREEN

TURTLE, KEMPS RIDLEY

TURTLE, LEATHERBACK

TURTLE, LOGGERHEAD

TURTLE, NK

TURTLE, NK HARD-SHELL

WHALE, BALEEN, NK

WHALE, FINBACK

WHALE, HUMPBACK

WHALE, MINKE

WHALE, NK

WHALE, PILOT, NK

Appendix Table 3. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: ATLANTIC SALMON (Salmo salar)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm									
6	Otter Trawl	OPEN	all	MA	lg									
7	Otter Trawl	OPEN	all	NE	sm									
8	Otter Trawl	OPEN	all	NE	lg									
9	Otter Trawl, Scallop	AA	GEN	MA	all									
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all									
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all									
14	Otter Trawl, Twin	OPEN	all	NE	all									
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm									
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg									
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg									
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg									
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	< 1	0.0	7.0						
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg									

Species Group: ATLANTIC SALMON (Salmo salar)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all									
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all									
35	Dredge, Scallop	AA	LIM	NE	all									
36	Dredge, Scallop	OPEN	GEN	MA	all									
37	Dredge, Scallop	OPEN	GEN	NE	all									
38	Dredge, Scallop	OPEN	LIM	MA	all									
39	Dredge, Scallop	OPEN	LIM	NE	all									
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all									
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all									
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all									
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**< 1**	**0.0**	**7.0**						

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: BLUEFISH (Pomatomus saltatrix)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all							25	0.0	4.9
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all				17	265.5	0.0			
4	Hand Line	OPEN	all	NE	all				6	55.5	0.0			
5	Otter Trawl	OPEN	all	MA	sm	32	12,056.0	1,265.3	38	6,444.4	515.9	35	13,535.7	462.4
6	Otter Trawl	OPEN	all	MA	lg	16	3,682.3	51.2	14	2,989.8	294.2	22	2,769.0	2.2
7	Otter Trawl	OPEN	all	NE	sm	31	3,903.0	737.9	28	9,097.4	981.5	27	4,355.2	937.8
8	Otter Trawl	OPEN	all	NE	lg	8	4,512.8	142.7	5	3,852.7	691.6	7	1,290.3	430.4
9	Otter Trawl, Scallop	AA	GEN	MA	all									
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all				13	46.7	0.0			
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all				9	9.0	8.4			
14	Otter Trawl, Twin	OPEN	all	NE	all							33	0.0	7.3
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm									
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg				2	5.0	0.0			
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	48	43,866.4	1.0	57	18,811.1	100.7	48	19,825.1	228.0
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	22	35,209.1	0.0	32	34,017.3	535.0	32	87,892.6	1,407.6
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	13	92.1	104.4	18	154.2	648.2	27	466.9	495.6
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm							50	597.0	0.0
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	4	4,893.7	53.0	5	7,518.3	385.4	7	10,017.1	277.8
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	20	960.4	1,363.3	21	2,074.3	2,737.0	15	1,288.5	1,425.0

Species Group: BLUEFISH (Pomatomus saltatrix)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all									
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all									
35	Dredge, Scallop	AA	LIM	NE	all									
36	Dredge, Scallop	OPEN	GEN	MA	all									
37	Dredge, Scallop	OPEN	GEN	NE	all				1	0.0	1.0			
38	Dredge, Scallop	OPEN	LIM	MA	all									
39	Dredge, Scallop	OPEN	LIM	NE	all	1	0.0	7.9	1	0.0	9.0			
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	2	0.0	37.7	2	0.0	41.6			
44	Pots and Traps, Fish	OPEN	all	MA	all							15	3.0	0.0
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all				8	8.5	0.0			
50	Pots and Traps, Lobster	OPEN	all	NE	all				1	6.1	0.0			
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							5	0.0	3.0
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**16**	**109,175.8**	**3,764.4**	**16**	**85,355.8**	**6,949.5**	**21**	**142,040.3**	**5,682.0**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: FLUKE (Paralichthys dentatus) - SCUP (Stenotomus chrysops) - BLACK SEA BASS (Centropristis striata)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all							25	82.5	5.0
2	Longline, Bottom	OPEN	all	NE	all	3	3.5	0.0						
3	Hand Line	OPEN	all	MA	all				33	138.3	3.0			
4	Hand Line	OPEN	all	NE	all							6	11.2	1.0
5	Otter Trawl	OPEN	all	MA	sm	90	924,588.2	123,064.2	94	1,162,812.4	163,379.9	95	823,372.4	163,972.6
6	Otter Trawl	OPEN	all	MA	lg	98	439,735.7	40,544.9	95	540,997.6	36,262.0	98	326,099.6	45,937.9
7	Otter Trawl	OPEN	all	NE	sm	63	151,239.1	63,513.9	67	341,327.7	86,610.3	64	308,078.5	227,327.4
8	Otter Trawl	OPEN	all	NE	lg	39	185,340.5	164,608.6	38	303,829.6	86,559.4	35	156,236.1	80,654.4
9	Otter Trawl, Scallop	AA	GEN	MA	all				100	0.0	1.9	83	534.1	1,013.9
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	71	513.3	1,967.9	75	987.7	1,160.4	73	238.2	708.1
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	138.5	593.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	0.0	1,113.6	95	2,182.5	1,184.0	100	2,711.1	92.8
14	Otter Trawl, Twin	OPEN	all	NE	all							100	65.0	613.4
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	50	35,812.0	3,111.0	20	0.0	2.5			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	86	97.8	116.3						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	34	241.0	169.7	15	31.0	540.5	17	13.4	946.1
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	4	28.1	1.1	9	33.2	6.7	8	20.3	22.4
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	19	1,025.0	14.2	24	912.9	49.7	20	762.5	63.1
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	28	542.8	375.5	39	786.7	2,037.4	44	962.1	1,513.7
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	4	13,405.1	25.3	2	370.0	54.9	7	5,840.6	112.6
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	24	1,514.7	5,841.9	19	1,916.4	8,583.1	14	2,327.5	2,724.2

Species Group: FLUKE (Paralichthys dentatus) - SCUP (Stenotomus chrysops) - BLACK SEA BASS (Centropristis striata)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all				31	4.5	48.1	54	495.5	673.3
33	Dredge, Scallop	AA	GEN	NE	all	71	5.0	23.9				51	0.0	72.8
34	Dredge, Scallop	AA	LIM	MA	all	67	399.1	1,225.2	50	98.0	2,177.9	69	588.3	7,321.1
35	Dredge, Scallop	AA	LIM	NE	all	68	12.8	4,190.4	51	39.5	3,431.2	65	218.2	11,588.7
36	Dredge, Scallop	OPEN	GEN	MA	all	77	1,106.6	2,087.0	70	1,190.3	2,389.7	82	1,120.5	2,941.7
37	Dredge, Scallop	OPEN	GEN	NE	all	23	16.7	497.4	19	27.0	553.3	33	11.9	1,151.2
38	Dredge, Scallop	OPEN	LIM	MA	all	92	806.9	9,427.1	73	1,020.3	9,026.0	75	1,244.5	6,270.3
39	Dredge, Scallop	OPEN	LIM	NE	all	79	320.7	45,810.5	69	586.2	25,960.0	59	250.7	10,275.1
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all				2	31.3	660.3			
44	Pots and Traps, Fish	OPEN	all	MA	all	100	2,241.0	492.9	100	3,644.9	1,280.0	100	6,509.3	1,729.3
45	Pots and Traps, Fish	OPEN	all	NE	all				100	1,835.1	918.0	100	6,540.1	2,511.9
46	Pots and Traps, Conch	OPEN	all	MA	all	50	0.0	1.8	57	0.0	11.3	38	0.0	9.5
47	Pots and Traps, Conch	OPEN	all	NE	all	50	10.7	20.7	11	0.0	4.9	33	0.0	47.4
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all	50	0.0	17.4	38	0.0	95.0	56	12.1	303.7
50	Pots and Traps, Lobster	OPEN	all	NE	all	8	0.0	5.9	16	33.9	192.7	11	185.8	1,200.3
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							50	14.8	195.1
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							30	66.9	28.8
					Total	**39**	**1,759,006.3**	**468,268.3**	**38**	**2,364,975.5**	**433,777.1**	**38**	**1,644,613.7**	**572,028.8**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: HERRING, ATLANTIC (Clupea harengus)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all				6	0.0	4.6	6	107.5	4.2
5	Otter Trawl	OPEN	all	MA	sm	10	175.0	1,781.4	12	4,521.9	4,340.1	9	2,519.9	638.0
6	Otter Trawl	OPEN	all	MA	lg	5	0.0	29.5	3	0.3	45.3	3	0.0	44.1
7	Otter Trawl	OPEN	all	NE	sm	42	2,368,507.7	12,575.2	32	2,319,871.5	13,836.5	39	788,930.1	29,955.6
8	Otter Trawl	OPEN	all	NE	lg	20	13.0	2,807.4	19	38.7	1,816.7	17	17.5	1,524.8
9	Otter Trawl, Scallop	AA	GEN	MA	all									
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all							9	0.0	2.0
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all							20	0.0	0.4
14	Otter Trawl, Twin	OPEN	all	NE	all									
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	50	0.0	4.4	20	0.0	0.4			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	100	0.0	0.4	50	0.0	4.2			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	43	0.0	13.0						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	41	14.0	62.3	35	0.0	650.9	41	0.0	171.8
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg									
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg									
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	17	569.1	385.1	14	231.5	859.0	5	1.0	95.4
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	< 1	0.5	0.0				< 1	0.0	1.5

Species Group: HERRING, ATLANTIC (Clupea harengus)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all	89	7,003,307.0	13.0	100	3,719,450.0	6.4	100	2,639,525.0	75.1
32	Dredge, Scallop	AA	GEN	MA	all									
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all									
35	Dredge, Scallop	AA	LIM	NE	all				1	0.0	0.1			
36	Dredge, Scallop	OPEN	GEN	MA	all	1	0.0	0.8				2	0.0	0.8
37	Dredge, Scallop	OPEN	GEN	NE	all	2	0.0	0.4						
38	Dredge, Scallop	OPEN	LIM	MA	all				3	0.0	0.3			
39	Dredge, Scallop	OPEN	LIM	NE	all	6	0.0	2.8	6	0.0	3.4	3	0.0	1.1
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all				100	11,590,514.0	8.1	100	2,608,079.0	102.6
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all	50	33,460.0	0.3	100	9,922.0	97.6			
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	98	47,574,903.0	1,207.2	95	19,730,387.0	2,459.4	91	4,726,617.0	11.1
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all							1	0.0	0.6
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all									
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**19**	**56,980,949.3**	**18,883.2**	**19**	**37,374,936.9**	**24,133.0**	**12**	**10,765,797.0**	**32,629.1**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: LARGE MESH GROUNDFISH

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				27	90.3	8.3	25	7.5	0.0
2	Longline, Bottom	OPEN	all	NE	all	93	12,873.4	1,108.0	75	477.0	2.1	89	3,874.8	235.3
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all	46	1,164.5	284.9	38	1,084.3	218.7	71	15,812.4	1,088.8
5	Otter Trawl	OPEN	all	MA	sm	78	4,552.3	38,783.4	71	1,628.5	26,236.9	75	2,603.9	26,986.2
6	Otter Trawl	OPEN	all	MA	lg	92	55,767.5	21,639.0	92	28,727.8	28,129.9	86	31,454.3	23,357.2
7	Otter Trawl	OPEN	all	NE	sm	85	12,995.0	36,458.8	84	168,658.4	243,127.6	87	564,160.4	123,218.7
8	Otter Trawl	OPEN	all	NE	lg	99	9,667,904.0	604,566.1	97	7,080,975.3	396,650.7	99	4,877,165.7	297,760.7
9	Otter Trawl, Scallop	AA	GEN	MA	all				67	0.0	2.0	50	0.0	6.7
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	100	4.0	2,570.3	88	0.0	452.4	100	3.0	655.5
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	46.5	314.7			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	0.0	106.0	100	3,103.2	1,504.9	80	0.0	60.3
14	Otter Trawl, Twin	OPEN	all	NE	all							67	15.4	159.2
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	50	26,984.9	999.4	80	41,978.7	1,225.5			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	100	11,177.6	3,146.9	100	12,722.5	646.2			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	100	271,843.7	10,552.6						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	100	631,384.9	38,073.1	100	1,323,717.0	89,602.4	97	989,632.6	189,514.2
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	1,649.4	364.9	100	1.0	241.5	100	0.0	20.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	1	2.0	0.2	2	2.1	0.9	5	6.3	16.5
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	4	45.2	7.0	20	8.9	69.8	19	12.0	144.0
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	6	135.7	16.7	7	0.0	27.2	4	8.2	18.9
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm							100	3,269.3	0.0
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	93	1,322,006.9	49,776.3	92	1,198,805.9	48,294.7	89	605,294.0	29,032.9
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	43	18,573.1	3,448.1	40	8,842.9	4,425.6	45	13,123.9	9,560.1

Species Group: LARGE MESH GROUNDFISH

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all	2	9.0	0.0						
32	Dredge, Scallop	AA	GEN	MA	all				31	0.0	19.8	29	0.0	84.8
33	Dredge, Scallop	AA	GEN	NE	all	86	3.2	123.8	100	0.0	26.8	86	7.2	161.7
34	Dredge, Scallop	AA	LIM	MA	all	89	124.5	1,805.0	82	3.5	5,408.2	54	0.0	443.1
35	Dredge, Scallop	AA	LIM	NE	all	100	690.8	7,949.8	91	620.6	30,191.7	45	0.0	438.6
36	Dredge, Scallop	OPEN	GEN	MA	all	95	28.2	3,411.2	91	40.0	2,029.4	91	14.9	1,501.7
37	Dredge, Scallop	OPEN	GEN	NE	all	89	87.9	2,263.1	97	11.3	4,200.0	97	122.2	3,584.3
38	Dredge, Scallop	OPEN	LIM	MA	all	100	79.8	7,201.8	97	34.0	5,313.6	98	22.1	1,825.3
39	Dredge, Scallop	OPEN	LIM	NE	all	100	1,427.9	43,718.9	100	437.2	66,186.9	99	569.1	39,968.5
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all				59	26,331.5	58.3	100	18,052.8	365.2
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	50	197,257.3	14,350.6	41	49,517.6	664.1	22	10,028.5	25.5
44	Pots and Traps, Fish	OPEN	all	MA	all				14	0.0	32.7	23	2.5	104.6
45	Pots and Traps, Fish	OPEN	all	NE	all				33	0.0	2.0			
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all	100	12.5	45.9	69	36.2	271.1	19	0.0	28.1
50	Pots and Traps, Lobster	OPEN	all	NE	all	49	1,117.5	1,395.2	46	513.9	1,905.4	38	899.6	2,424.5
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							27	0.0	13.1
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							61	7.8	108.9
					Total	**75**	**12,239,902.8**	**894,167.0**	**73**	**9,948,416.1**	**957,492.0**	**63**	**7,136,170.4**	**752,913.1**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: MONKFISH (Lophius americanus)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				53	24.6	56.3	63	60.1	50.9
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm	46	15,801.5	12,624.8	42	15,429.4	14,292.2	46	14,032.1	18,349.7
6	Otter Trawl	OPEN	all	MA	lg	61	56,442.0	13,770.7	55	66,828.7	12,456.5	57	55,823.6	13,921.1
7	Otter Trawl	OPEN	all	NE	sm	37	15,432.6	3,029.2	38	21,087.2	4,625.1	44	43,211.3	38,105.1
8	Otter Trawl	OPEN	all	NE	lg	81	2,001,190.5	192,258.4	80	1,746,984.3	184,809.8	88	1,333,938.9	148,903.2
9	Otter Trawl, Scallop	AA	GEN	MA	all				67	10.0	16.5	100	228.9	824.1
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	96	1,856.9	2,302.5	75	25.6	11.5	100	1,225.9	1,460.3
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	308.5	118.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	232.4	10.0	86	1,534.9	605.1	40	146.5	491.0
14	Otter Trawl, Twin	OPEN	all	NE	all							100	418.0	957.2
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	50	28.3	4.5	80	63.8	5.8	100	12.7	11.6
17	Otter Trawl, Ruhle	OPEN	all	NE	lg				25	0.0	1.0			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	71	61.6	2.7						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	59	1,872.9	75.4	83	35,224.8	1,824.2	79	11,964.1	499.5
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	486.0	50.0	100	1,184.5	156.7	100	415.0	62.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	4	231.2	0.0				2	48.8	0.0
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	6	225.0	0.0	6	111.9	9.3	5	153.1	39.0
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	95	194,375.6	4,455.0	88	276,905.4	3,681.0	93	379,876.9	6,691.8
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm							50	33.2	0.0
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	74	33,539.0	2,275.1	76	45,832.1	3,044.4	67	32,148.5	2,092.4
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	92	442,221.0	23,212.3	87	461,295.7	14,968.4	86	584,986.6	19,770.6

Species Group: MONKFISH (Lophius americanus)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all	100	138.4	118.8	86	84.2	703.3	93	872.0	3,928.8
33	Dredge, Scallop	AA	GEN	NE	all	71	500.4	179.0	50	0.0	3.5	100	247.7	1,726.2
34	Dredge, Scallop	AA	LIM	MA	all	100	5,174.9	11,102.1	100	3,464.4	19,617.6	87	2,007.7	25,405.2
35	Dredge, Scallop	AA	LIM	NE	all	100	25,949.9	20,291.7	99	56,854.9	36,942.7	92	4,302.5	37,113.5
36	Dredge, Scallop	OPEN	GEN	MA	all	95	11,150.5	3,715.3	96	7,669.8	2,704.6	99	8,377.4	5,193.2
37	Dredge, Scallop	OPEN	GEN	NE	all	65	1,752.3	2,054.6	77	1,990.6	4,733.5	92	4,746.9	7,398.0
38	Dredge, Scallop	OPEN	LIM	MA	all	100	27,055.1	33,231.0	97	14,281.9	16,108.3	100	16,921.9	52,338.8
39	Dredge, Scallop	OPEN	LIM	NE	all	94	99,005.2	168,281.1	94	79,974.4	104,392.5	97	44,849.0	147,250.2
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all							13	11.4	0.0
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	3	15.6	15.8	5	46.7	7.0			
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all							6	0.0	0.8
50	Pots and Traps, Lobster	OPEN	all	NE	all				4	0.0	17.5	4	22.7	23.6
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							91	560.1	1,221.3
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							48	45.2	663.6
					Total	**66**	**2,934,738.8**	**493,060.0**	**69**	**2,837,218.2**	**425,912.3**	**60**	**2,541,688.7**	**534,492.7**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: RED DEEPSEA CRAB (Chaceon quinquedens)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm	1	0.0	387.0	< 1	0.0	1.2	1	1,380.0	1,267.7
6	Otter Trawl	OPEN	all	MA	lg	2	0.0	224.6	1	0.0	646.5	1	0.0	240.3
7	Otter Trawl	OPEN	all	NE	sm	1	0.0	1.2	1	0.0	12.7			
8	Otter Trawl	OPEN	all	NE	lg	21	8.5	11,448.3	17	0.0	12,548.3	18	0.0	9,673.3
9	Otter Trawl, Scallop	AA	GEN	MA	all									
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all									
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all									
14	Otter Trawl, Twin	OPEN	all	NE	all									
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm				20	0.0	0.1			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	3	0.0	0.2	10	0.0	19.8			
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	307.0	3.6	100	0.0	1,267.0	100	0.0	300.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg									
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg									
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	3	0.0	39.4	2	0.0	18.2	1	0.3	11.4
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	< 1	0.0	3.0	< 1	5.7	5.0			

Species Group: RED DEEPSEA CRAB (Chaceon quinquedens)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all							1	0.0	1.0
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all							1	0.0	12.0
35	Dredge, Scallop	AA	LIM	NE	all									
36	Dredge, Scallop	OPEN	GEN	MA	all									
37	Dredge, Scallop	OPEN	GEN	NE	all							1	0.0	0.3
38	Dredge, Scallop	OPEN	LIM	MA	all	2	0.0	1.0						
39	Dredge, Scallop	OPEN	LIM	NE	all									
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all									
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all	8	0.0	26.4	5	0.0	55.2	4	0.0	1,031.8
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all									
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**8**	**315.5**	**12,134.7**	**6**	**5.7**	**14,574.0**	**7**	**1,380.3**	**12,537.8**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SEA SCALLOP (Placopecten magellanicus)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all							11	0.0	0.5
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all				6	1.0	0.0	3	0.0	0.3
5	Otter Trawl	OPEN	all	MA	sm	11	1,925.1	8,499.6	10	918.1	9,460.8	14	2,088.2	16,192.5
6	Otter Trawl	OPEN	all	MA	lg	31	52,389.8	7,207.5	27	44,726.2	6,254.8	20	5,018.5	10,222.3
7	Otter Trawl	OPEN	all	NE	sm	15	1,577.2	4,849.7	13	5,818.2	9,392.6	9	1,699.9	1,959.0
8	Otter Trawl	OPEN	all	NE	lg	30	25,463.0	10,961.7	24	17,459.6	3,842.4	25	13,908.6	5,070.7
9	Otter Trawl, Scallop	AA	GEN	MA	all				100	15,660.4	4,949.1	100	21,466.4	11,013.2
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	100	111,813.0	10,557.2	100	19,434.6	640.0	100	44,030.1	3,404.4
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	3,873.5	0.0			
13	Otter Trawl, Twin	OPEN	all	MA	all				86	49,838.4	675.0			
14	Otter Trawl, Twin	OPEN	all	NE	all							33	0.0	3.0
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm									
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	17	0.0	4.8	17	148.8	11.3	24	52.7	153.4
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg							< 1	0.0	0.2
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	7	110.9	4.5	10	16.3	37.7	16	200.5	139.7
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	4	386.5	190.9	2	9.9	269.5	2	8.1	11.5
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	10	143.8	52.3	9	499.6	58.9	4	66.8	95.7

Species Group: SEA SCALLOP (Placopecten magellanicus)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all	100	8,621.6	197.0	100	178,411.9	21,616.4	100	603,625.1	102,350.2
33	Dredge, Scallop	AA	GEN	NE	all	100	36,002.1	216.2	100	14,831.6	232.5	100	231,955.3	12,450.3
34	Dredge, Scallop	AA	LIM	MA	all	100	648,454.6	38,289.1	100	3,959,946.1	138,186.5	100	4,195,682.7	468,766.6
35	Dredge, Scallop	AA	LIM	NE	all	100	1,900,775.1	38,035.8	100	4,754,131.8	242,193.5	100	5,965,875.0	620,640.4
36	Dredge, Scallop	OPEN	GEN	MA	all	99	507,536.9	6,942.7	100	427,448.1	6,579.6	100	310,901.6	16,317.4
37	Dredge, Scallop	OPEN	GEN	NE	all	100	454,097.4	8,473.5	100	437,538.7	10,695.6	100	303,769.1	13,195.1
38	Dredge, Scallop	OPEN	LIM	MA	all	100	3,074,063.4	6,336.7	100	1,994,547.7	50,319.7	100	2,514,623.7	147,800.9
39	Dredge, Scallop	OPEN	LIM	NE	all	100	10,851,960.5	169,124.3	100	7,494,275.1	192,185.1	100	6,285,191.8	203,622.6
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all									
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all							< 1	0.6	0.0
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							77	5,704.9	3,546.4
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							30	1,296.3	2,008.8
					Total	**28**	**17,675,320.9**	**309,943.6**	**25**	**19,419,535.6**	**697,600.8**	**24**	**20,507,165.7**	**1,638,965.0**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SKATE COMPLEX (Rajidae)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				53	0.0	12,385.1	75	4.5	12,688.1
2	Longline, Bottom	OPEN	all	NE	all	100	182.7	2,128.4	63	0.0	47.6	78	0.0	319.2
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm	92	63,084.3	526,094.4	89	40,045.2	386,135.1	93	79,653.6	684,284.1
6	Otter Trawl	OPEN	all	MA	lg	100	166,671.3	848,580.1	99	243,102.6	957,701.5	99	219,082.1	668,356.6
7	Otter Trawl	OPEN	all	NE	sm	71	11,357.3	135,189.5	72	30,030.4	186,720.4	71	24,273.7	239,366.6
8	Otter Trawl	OPEN	all	NE	lg	99	1,490,875.9	6,330,030.5	98	1,881,127.3	4,900,640.5	98	1,054,370.2	3,870,832.6
9	Otter Trawl, Scallop	AA	GEN	MA	all				100	0.0	550.7	100	0.0	15,494.0
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	100	2,971.7	85,978.1	100	311.9	27,231.8	100	1,111.1	31,450.0
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	0.0	4,062.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	0.0	18.6	95	10,445.2	139,411.8	80	0.0	5,609.6
14	Otter Trawl, Twin	OPEN	all	NE	all							100	0.0	1,930.8
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	50	0.0	384.6	80	0.0	1,214.8			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	100	0.0	348.0	75	0.0	616.8			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	100	1,956.6	10,517.9						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	93	4,249.4	40,373.8	98	19,863.2	242,005.8	97	1,789.2	79,403.5
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	0.0	33.5	33	0.0	141.0	100	0.0	0.3
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	< 1	0.0	4.0	5	14.0	48.2	9	57.2	173.3
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	15	1,584.5	711.6	49	2,128.9	2,511.7	53	909.5	6,786.1
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	99	155,114.4	7,579.1	92	257,979.6	46,513.1	96	245,436.4	115,674.7
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	76	10,689.1	25,638.8	74	11,618.3	22,938.6	73	17,425.9	26,609.4
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	95	1,524,439.6	218,273.4	95	2,568,053.2	209,004.8	91	1,629,702.6	146,831.4

Species Group: SKATE COMPLEX (Rajidae)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all	100	0.0	620.5	97	0.0	2,241.0	100	7.9	15,015.3
33	Dredge, Scallop	AA	GEN	NE	all	100	0.0	870.7	100	0.0	475.8	100	0.0	3,468.6
34	Dredge, Scallop	AA	LIM	MA	all	100	0.0	40,745.6	100	0.0	101,474.9	100	35.5	70,639.9
35	Dredge, Scallop	AA	LIM	NE	all	100	0.0	108,429.3	100	0.0	358,708.4	100	0.0	111,823.4
36	Dredge, Scallop	OPEN	GEN	MA	all	100	3,229.9	94,552.0	100	513.5	94,954.5	99	629.1	92,214.1
37	Dredge, Scallop	OPEN	GEN	NE	all	98	0.0	28,172.2	98	0.0	38,043.4	99	0.0	40,154.0
38	Dredge, Scallop	OPEN	LIM	MA	all	100	0.0	242,729.1	100	0.0	350,901.5	100	169.6	265,874.5
39	Dredge, Scallop	OPEN	LIM	NE	all	99	20.0	1,170,051.9	100	0.0	938,711.7	100	0.0	530,642.8
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	2	0.0	14.0						
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all	50	0.0	8.2	54	33.0	30.9	6	0.0	1.5
50	Pots and Traps, Lobster	OPEN	all	NE	all	3	0.0	8.2	7	73.4	7.5	4	33.8	28.3
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							95	0.0	6,035.0
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							100	0.0	11,419.6
					Total	**80**	**3,436,426.6**	**9,918,086.0**	**83**	**5,065,339.6**	**9,025,430.9**	**76**	**3,274,692.0**	**7,053,127.3**

Appendix Table 3,continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SMALL MESH GROUNDFISH

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				47	25.8	61.7	75	92.7	40.9
2	Longline, Bottom	OPEN	all	NE	all	20	0.0	16.7	50	104.0	2.0	11	0.0	0.8
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all				6	1.0	0.0	3	0.0	2.0
5	Otter Trawl	OPEN	all	MA	sm	53	171,616.5	84,260.1	46	117,188.0	40,838.1	42	38,367.3	25,247.4
6	Otter Trawl	OPEN	all	MA	lg	49	810.5	4,696.7	40	805.2	3,584.4	31	1,328.0	2,290.3
7	Otter Trawl	OPEN	all	NE	sm	61	828,234.8	164,065.8	72	1,460,924.9	336,099.8	67	1,202,169.1	300,748.8
8	Otter Trawl	OPEN	all	NE	lg	72	26,298.7	155,615.0	75	52,076.7	145,001.8	73	39,687.9	100,042.0
9	Otter Trawl, Scallop	AA	GEN	MA	all							33	0.0	4.9
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	75	35.2	203.3	13	1.0	2.0	45	92.0	67.3
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	0.0	14.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	0.0	933.0	36	66.8	658.7	20	0.0	112.6
14	Otter Trawl, Twin	OPEN	all	NE	all							100	0.0	1,934.0
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	100	440.8	679.4	100	25.0	3,199.7	100	0.0	23.4
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	100	0.0	91.8	100	0.0	168.6			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	100	3,423.5	2,431.2						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	93	436.0	3,409.0	92	2,872.4	14,836.3	83	643.9	4,983.8
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	2,240.4	83.0	100	2,872.0	393.0	100	395.0	141.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg				1	0.0	1.0			
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	4	2.3	2.2	4	1.0	13.6	2	2.4	5.0
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm							50	200.0	0.0
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	72	19,268.0	3,908.8	73	36,708.7	6,294.2	60	16,143.1	3,299.4
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	14	474.5	90.8	17	1,361.6	277.5	23	3,257.9	725.2

Species Group: SMALL MESH GROUNDFISH

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all	44	12,408.0	0.9	14	275.0	0.0	36	1,647.0	0.0
32	Dredge, Scallop	AA	GEN	MA	all	67	0.0	6.8	31	1.7	9.3	36	0.0	107.9
33	Dredge, Scallop	AA	GEN	NE	all	71	0.0	7.4	50	0.0	9.7	68	0.0	73.9
34	Dredge, Scallop	AA	LIM	MA	all	72	0.0	980.4	64	2.0	730.4	55	0.6	359.5
35	Dredge, Scallop	AA	LIM	NE	all	85	3.8	3,253.5	80	26.7	6,588.8	49	0.0	303.9
36	Dredge, Scallop	OPEN	GEN	MA	all	48	36.6	224.5	29	4.8	63.7	28	1.5	161.1
37	Dredge, Scallop	OPEN	GEN	NE	all	41	11.3	301.8	49	32.7	437.4	38	15.0	465.3
38	Dredge, Scallop	OPEN	LIM	MA	all	67	12.5	855.8	49	0.0	272.6	85	1.0	1,315.1
39	Dredge, Scallop	OPEN	LIM	NE	all	70	52.4	6,493.6	61	33.4	7,578.5	65	32.6	8,880.8
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all				36	27,527.0	0.5	50	2,507.0	0.0
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all	50	0.0	2.3						
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	42	80,027.8	1,420.9	46	136,563.7	12.6	4	96.0	0.0
44	Pots and Traps, Fish	OPEN	all	MA	all				29	21.7	0.0	8	3.8	0.0
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all	100	193.0	2.6	77	496.2	26.0	44	324.5	20.7
50	Pots and Traps, Lobster	OPEN	all	NE	all	30	302.7	8.5	28	702.3	792.2	26	640.2	1,964.9
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all	100	2.3	0.0						
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							5	0.0	2.5
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							9	0.0	7.9
					Total	**57**	**1,146,331.6**	**434,045.8**	**53**	**1,840,721.3**	**567,968.1**	**47**	**1,307,648.3**	**453,332.3**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SPINY DOGFISH (Squalus acanthias)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				67	38,848.7	3,329.2	75	22,323.8	2,850.1
2	Longline, Bottom	OPEN	all	NE	all	27	7,474.0	448.0	75	7,517.0	237.0	56	5,272.5	1,477.6
3	Hand Line	OPEN	all	MA	all							33	4.0	0.0
4	Hand Line	OPEN	all	NE	all	54	70.5	18.0	31	9,061.1	10.5	32	14,968.1	74.0
5	Otter Trawl	OPEN	all	MA	sm	52	18,126.9	443,819.8	46	9,159.6	338,644.6	44	48,146.1	211,313.3
6	Otter Trawl	OPEN	all	MA	lg	58	6,457.4	277,476.9	52	8,955.0	117,492.3	46	16,313.0	60,908.8
7	Otter Trawl	OPEN	all	NE	sm	31	6,885.0	88,100.6	45	7,555.7	301,571.6	37	11,957.0	190,136.5
8	Otter Trawl	OPEN	all	NE	lg	68	48,592.0	1,256,028.5	68	79,274.7	687,124.2	66	34,544.5	465,498.2
9	Otter Trawl, Scallop	AA	GEN	MA	all							67	4,446.5	8,830.1
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	46	18.5	14,833.9	25	0.0	133.3	64	0.0	1,524.8
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	0.0	5,900.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	0.0	1,370.0	77	0.0	12,714.9	20	0.0	101.5
14	Otter Trawl, Twin	OPEN	all	NE	all							100	0.0	187.8
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	100	0.0	6,409.1	80	0.0	14,798.7			
17	Otter Trawl, Ruhle	OPEN	all	NE	lg	100	0.0	1,292.3	25	0.0	48.0			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	100	0.0	47,026.1						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	83	505.0	63,292.1	78	1,107.3	87,948.1	72	0.0	18,318.1
20	Otter Trawl, Shrimp	OPEN	all	MA	all				33	0.0	5.9	100	0.0	19.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	21	167,618.5	96.2	17	132,286.0	3,892.8	24	308,078.1	8,364.5
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	52	234,375.1	650.4	63	391,392.0	4,053.0	69	873,077.8	33,830.5
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	28	289.0	2,588.3	58	508.1	4,117.0	60	779.3	6,997.2
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	90	507,795.8	744,255.0	97	1,107,099.4	711,043.7	91	936,768.5	376,776.2
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	82	52,687.0	45,375.4	82	66,243.6	23,903.8	67	42,447.9	11,986.5

Species Group: SPINY DOGFISH (Squalus acanthias)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all	12	2,804.0	1,276.0						
32	Dredge, Scallop	AA	GEN	MA	all				14	0.0	24.2	20	0.0	483.5
33	Dredge, Scallop	AA	GEN	NE	all							8	0.0	9.2
34	Dredge, Scallop	AA	LIM	MA	all	56	0.0	764.6	20	0.0	180.4	27	0.0	4,983.8
35	Dredge, Scallop	AA	LIM	NE	all	71	0.0	2,164.8	42	0.0	673.1	34	0.0	2,955.6
36	Dredge, Scallop	OPEN	GEN	MA	all	29	0.0	546.4	35	0.0	817.1	40	0.0	800.1
37	Dredge, Scallop	OPEN	GEN	NE	all	16	0.0	422.3	19	0.0	874.4	12	0.0	217.1
38	Dredge, Scallop	OPEN	LIM	MA	all	71	0.0	3,421.7	46	0.0	1,354.6	63	0.0	2,600.2
39	Dredge, Scallop	OPEN	LIM	NE	all	66	4.0	11,783.1	43	0.0	2,668.5	43	0.0	3,226.6
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all							25	0.0	2,212.0
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all	50	0.0	859.5	67	100.0	1,100.0			
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	16	0.0	8,188.6	11	1,244.4	62,554.3			
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all				38	0.0	49.1	6	0.0	10.0
50	Pots and Traps, Lobster	OPEN	all	NE	all	8	32.3	15.0	3	0.0	50.0	4	11.0	60.3
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all	100	0.0	3.5						
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							55	0.0	839.9
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							43	0.0	571.3
					Total	**60**	**1,053,735.0**	**3,022,526.1**	**62**	**1,860,352.6**	**2,387,314.3**	**53**	**2,319,138.1**	**1,418,164.3**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SQUID (Doryteuthis [Amerigo] pealeii, Illex illecebrosus)- BUTTERFISH (Peprilus triacanthus) - MACKEREL (Scomber scombrus)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all				17	3.0	0.0			
4	Hand Line	OPEN	all	NE	all	23	0.8	1.0	25	4,760.1	244.1	19	53.9	0.0
5	Otter Trawl	OPEN	all	MA	sm	88	1,488,469.8	244,443.3	83	2,904,494.0	163,144.2	81	1,336,340.8	330,218.2
6	Otter Trawl	OPEN	all	MA	lg	63	3,085.0	1,510.9	57	2,750.6	1,398.5	68	6,620.5	2,516.7
7	Otter Trawl	OPEN	all	NE	sm	89	2,806,688.2	161,051.0	91	4,878,498.0	223,025.2	92	5,074,980.8	333,240.6
8	Otter Trawl	OPEN	all	NE	lg	51	6,367.6	10,700.8	56	20,026.2	9,518.6	53	7,537.9	7,627.3
9	Otter Trawl, Scallop	AA	GEN	MA	all							67	1.4	17.1
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	71	27.1	59.5	38	9.5	7.8	55	20.2	15.0
12	Otter Trawl, Scallop	OPEN	LIM	MA	all				100	0.0	11.0			
13	Otter Trawl, Twin	OPEN	all	MA	all	100	89,757.0	4,578.0	50	84,055.6	16,143.2	60	87,619.3	3,719.3
14	Otter Trawl, Twin	OPEN	all	NE	all							100	105,151.0	16,434.7
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm	100	77.0	43.3	80	86,650.0	46.2	100	3,883.0	352.9
17	Otter Trawl, Ruhle	OPEN	all	NE	lg				25	0.0	86.5			
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm	43	0.0	4.9						
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	62	7.1	907.8	72	1,388.7	2,282.7	55	1.5	86.1
20	Otter Trawl, Shrimp	OPEN	all	MA	all	100	5.0	558.3	100	0.0	328.8	100	0.0	197.0
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm	27	3,174.8	1.0	39	1,499.5	12.4	29	1,953.4	147.4
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg	2	30.6	0.0	4	16.0	0.1	8	25.3	12.2
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg	3	1.1	8.6	1	1.5	0.8	13	28.8	12.0
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	24	901.1	365.5	27	7,381.2	596.4	18	1,419.2	189.6
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	3	14.8	11.3	3	53.2	39.6	4	300.5	11.8

Species Group: SQUID (Doryteuthis [Amerigo] pealeii, Illex illecebrosus)- BUTTERFISH (Peprilus triacanthus) - MACKEREL (Scomber scombrus)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all	32	2,978.0	3.2	24	277.0	1.0	29	5,425.0	0.8
32	Dredge, Scallop	AA	GEN	MA	all	100	0.0	1.1	10	0.5	0.7	31	7.1	17.2
33	Dredge, Scallop	AA	GEN	NE	all	14	0.0	1.0				5	0.0	1.3
34	Dredge, Scallop	AA	LIM	MA	all	39	1.3	7.0	46	4.3	79.3	63	26.0	255.5
35	Dredge, Scallop	AA	LIM	NE	all	29	4.3	54.0	35	0.0	83.5	70	6.9	274.6
36	Dredge, Scallop	OPEN	GEN	MA	all	32	4.3	60.9	32	5.9	43.6	44	13.9	67.6
37	Dredge, Scallop	OPEN	GEN	NE	all	4	0.0	6.9	8	0.0	10.5	11	2.8	13.6
38	Dredge, Scallop	OPEN	LIM	MA	all	40	4.0	73.5	54	0.5	144.5	68	28.7	119.1
39	Dredge, Scallop	OPEN	LIM	NE	all	43	5.9	321.4	45	34.7	335.1	40	20.3	120.1
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all				55	6,014.9	1.1	50	3,442.0	1.0
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all	100	7,969.0	292.3	67	0.0	21.2			
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all	68	3,203,851.6	629.5	66	84,994.1	408.6	74	495,772.0	4.2
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all				1	0.0	0.5	< 1	0.0	0.6
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							5	0.0	2.1
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**41**	**7,613,425.4**	**425,696.0**	**41**	**8,082,919.0**	**418,015.7**	**37**	**7,130,682.2**	**695,675.6**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: SURFCLAM (Spisula solidissima) - OCEAN QUAHOG (Arctica islandica)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all									
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all									
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm	1	0.0	199.4				3	0.0	774.5
6	Otter Trawl	OPEN	all	MA	lg	4	12.0	208.5	3	0.0	231.6	5	0.0	214.9
7	Otter Trawl	OPEN	all	NE	sm	3	0.0	92.9	2	0.0	46.7	2	0.0	151.6
8	Otter Trawl	OPEN	all	NE	lg	2	46.4	678.5	2	0.0	522.6	2	0.0	419.4
9	Otter Trawl, Scallop	AA	GEN	MA	all							33	0.0	28.0
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all	4	0.0	7.0	13	0.0	70.0	18	18.5	245.0
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all				5	0.0	90.0	20	0.0	0.2
14	Otter Trawl, Twin	OPEN	all	NE	all									
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm									
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg									
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg									
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg				1	0.0	1.0	2	0.0	3.0
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg				< 1	0.0	0.5			
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	< 1	0.0	0.5						

Species Group: SURFCLAM (Spisula solidissima) - OCEAN QUAHOG (Arctica islandica)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all							9	0.0	19.4
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all	6	0.0	88.0				12	0.0	158.8
35	Dredge, Scallop	AA	LIM	NE	all	9	0.0	413.0	1	0.0	2.0	9	0.0	509.3
36	Dredge, Scallop	OPEN	GEN	MA	all	1	0.0	59.0	1	0.0	3.0	2	0.0	2.2
37	Dredge, Scallop	OPEN	GEN	NE	all	2	0.0	24.0	2	0.0	3.0	9	0.0	103.6
38	Dredge, Scallop	OPEN	LIM	MA	all				3	0.0	3.0	18	0.0	497.6
39	Dredge, Scallop	OPEN	LIM	NE	all	2	4.6	1.0	3	0.0	53.5	14	18.6	1,097.0
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all									
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all									
50	Pots and Traps, Lobster	OPEN	all	NE	all									
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all				100	0.0	64.0			
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all							100	2,597,048.0	30,522.3
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all							100	2,741,124.4	303.2
					Total	**2**	**63.0**	**1,771.8**	**1**	**0.0**	**1,090.9**	**6**	**5,338,209.4**	**35,050.0**

Appendix Table 3, continued. Percentage of observed trips which encountered each species group and observed catch weight (kept and discarded, live weight, lb) on observed trips by fleet for Standardized Bycatch Reporting Methodology (SBRM) 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). Dark shading indicates fleets not considered in annual SBRM analyses. Light shading indicates confidential fleets in annual SBRM analyses. See Table 3 for fleet stratification abbreviations.

Species Group: TILEFISH (Lopholatilus chamaeleonticeps)

						SBRM 2015			SBRM 2016			SBRM 2017		
Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
1	Longline, Bottom	OPEN	all	MA	all				87	194,735.0	212.7	88	57,758.9	165.6
2	Longline, Bottom	OPEN	all	NE	all									
3	Hand Line	OPEN	all	MA	all							33	94.6	0.0
4	Hand Line	OPEN	all	NE	all									
5	Otter Trawl	OPEN	all	MA	sm	7	572.9	78.1	5	434.0	125.5	4	337.8	584.9
6	Otter Trawl	OPEN	all	MA	lg	3	58.3	4.1	3	126.1	11.3	5	78.6	28.8
7	Otter Trawl	OPEN	all	NE	sm	6	571.3	112.3	7	388.6	419.7	9	665.7	972.9
8	Otter Trawl	OPEN	all	NE	lg	1	143.6	71.0	1	98.4	25.3	1	32.4	22.5
9	Otter Trawl, Scallop	AA	GEN	MA	all									
10	Otter Trawl, Scallop	AA	LIM	MA	all									
11	Otter Trawl, Scallop	OPEN	GEN	MA	all									
12	Otter Trawl, Scallop	OPEN	LIM	MA	all									
13	Otter Trawl, Twin	OPEN	all	MA	all							20	10.0	77.0
14	Otter Trawl, Twin	OPEN	all	NE	all							33	0.0	13.0
15	Otter Trawl, Ruhle	OPEN	all	MA	lg									
16	Otter Trawl, Ruhle	OPEN	all	NE	sm							100	0.0	5.3
17	Otter Trawl, Ruhle	OPEN	all	NE	lg									
18	Otter Trawl, Haddock Separator	OPEN	all	NE	sm									
19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg									
20	Otter Trawl, Shrimp	OPEN	all	MA	all									
21	Otter Trawl, Shrimp	OPEN	all	NE	all									
22	Floating Trap	OPEN	all	MA	all									
23	Floating Trap	OPEN	all	NE	all									
24	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	sm									
25	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	lg									
26	Gillnet, Sink, Anchor, Drift	OPEN	all	MA	xlg				1	5.5	0.0			
27	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	sm									
28	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	lg	< 1	46.0	0.0	< 1	17.5	20.0			
29	Gillnet, Sink, Anchor, Drift	OPEN	all	NE	xlg	3	312.2	130.0	1	136.0	51.2	1	149.3	0.0

Species Group: TILEFISH (Lopholatilus chamaeleonticeps)

Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	SBRM 2015			SBRM 2016			SBRM 2017		
						% Trips	Kept	Discarded	% Trips	Kept	Discarded	% Trips	Kept	Discarded
30	Purse Seine	OPEN	all	MA	all									
31	Purse Seine	OPEN	all	NE	all									
32	Dredge, Scallop	AA	GEN	MA	all									
33	Dredge, Scallop	AA	GEN	NE	all									
34	Dredge, Scallop	AA	LIM	MA	all									
35	Dredge, Scallop	AA	LIM	NE	all									
36	Dredge, Scallop	OPEN	GEN	MA	all									
37	Dredge, Scallop	OPEN	GEN	NE	all									
38	Dredge, Scallop	OPEN	LIM	MA	all									
39	Dredge, Scallop	OPEN	LIM	NE	all	1	0.0	2.9						
40	Danish Seine	OPEN	all	MA	all									
41	Trawl, Mid-water Paired&Single	AA	all	NE	all									
42	Trawl, Mid-water Paired&Single	OPEN	all	MA	all									
43	Trawl, Mid-water Paired&Single	OPEN	all	NE	all									
44	Pots and Traps, Fish	OPEN	all	MA	all									
45	Pots and Traps, Fish	OPEN	all	NE	all									
46	Pots and Traps, Conch	OPEN	all	MA	all									
47	Pots and Traps, Conch	OPEN	all	NE	all									
48	Pots and Traps, Hagfish	OPEN	all	NE	all									
49	Pots and Traps, Lobster	OPEN	all	MA	all				8	13.8	0.0			
50	Pots and Traps, Lobster	OPEN	all	NE	all				3	7.8	2.1	1	0.0	8.0
51	Pots and Traps, Crab	OPEN	all	MA	all									
52	Pots and Traps, Crab	OPEN	all	NE	all									
53	Beam Trawl	OPEN	all	MA	all									
54	Beam Trawl	OPEN	all	NE	all									
55	Dredge, Other	OPEN	all	MA	all									
56	Dredge, Ocean Quahog/Surfclam	OPEN	all	MA	all									
57	Dredge, Ocean Quahog/Surfclam	OPEN	all	NE	all									
					Total	**2**	**1,704.2**	**398.4**	**2**	**195,962.7**	**867.8**	**3**	**59,127.3**	**1,878.0**

Appendix Table 4. Discard reason categories used and the associated discard fish dispositions.

Discard Reason Category	FISH DISPOSITIION Code	FISH DISPOSITIION Description
No Market	001	NO MARKET, REASON NOT SPECIFIED
	002	NO MARKET, TOO SMALL
	003	NO MARKET, TOO LARGE
	005	NO MARKET, WONT KEEP UNTIL TRIP END
	006	NO MARKET, BUT RETAINED BY VESSEL FOR ALTERNATE PROGRAM
	007	NO MARKET, BUT RETAINED FOR OBSERVER FOR SCIENTIFIC PURPOSES
	008	NO MARKET, BROUGHT ONBOARD ONLY FOR THE PURPOSE OF OBSERVER SAMPLING
Regulation (Size)	012	REGULATIONS PROHIBIT RETENTION, TOO SMALL
	013	REGULATIONS PROHIBIT RETENTION, TOO LARGE
Regulation (Quota)	004	NO MARKET, QUOTA FILLED
	014	REGULATIONS PROHIBIT RETENTION, QUOTA FILLED
	015	REGULATIONS PROHIBIT RETENTION, NO QUOTA IN AREA
	025	REGULATIONS PROHIBIT ANY RETENTION
Regulation (Other)	011	REGULATIONS PROHIBIT RETENTION, REASON NOT SPECIFIED
	022	REGULATIONS PROHIBIT RETENTION, V-NOTCHED
	023	REGULATIONS PROHIBIT RETENTION, SOFT-SHELL
	024	REGULATIONS PROHIBIT RETENTION, WITH EGGS
Poor Quality	030	POOR QUALITY, GREY MEAT/PARASITES OBSERVED
	031	POOR QUALITY, REASON NOT SPECIFIED
	032	POOR QUALITY, SANDFLEA DAMAGE
	033	POOR QUALITY, SEAL DAMAGE
	034	POOR QUALITY, SHARK DAMAGE
	035	POOR QUALITY, CETACEAN DAMAGE
	036	POOR QUALITY, HAGFISH DAMAGE
	037	POOR QUALITY, SHELL DISEASE
	038	POOR QUALITY, GEAR DAMAGE
Other	000	DISCARDED, UNKNOWN REASON
	040	NOT BROUGHT ON BOARD, OPERATIONAL DISCARDS
	041	NOT BROUGHT ON BOARD, REASON NOT SPECIFIED
	042	NOT BROUGHT ON BOARD, GEAR DAMAGE PREVENTED CAPTURE
	043	NOT BROUGHT ON BOARD, FELL OUT/OFF OF GEAR
	044	NOT BROUGHT ON BOARD, CONSIDERED TO HAVE NO MARKET VALUE
	045	NOT BROUGHT ON BOARD, SAFETY REASON
	046	NOT BROUGHT ON BOARD, MECHANICAL FAILURE
	047	NOT BROUGHT ON BOARD, SPINY DOG CLOGGING PUMP
	048	NOT BROUGHT ON BOARD, VESSEL CAPACITY FILLED
	049	NOT BROUGHT ON BOARD, NOT ENOUGH FISH TO PUMP ABOARD
	052	INCIDENTAL TAKE (MAMMAL, SEA TURTLE, SEA BIRD)
	053	DEBRIS
	054	EMPTY SHELLS
	062	UPGRADED
	063	RETAINING ONLY CERTAIN SIZE BETTER PRICE TRIP QUOTA IN EFFECT
	064	RETAINING ONLY CERTAIN SIZE FOR BEST PRICE BECAUSE OF PRICE DIFFERENCE
	070	NOT BROUGHT ON BOARD, QUALITY OF FISH
	071	NOT BROUGHT ON BOARD, CLOGGED PUMP OTHER
	099	DISCARDED, OTHER

Note: Fish disposition code '039' = POOR QUALITY, PREVIOUSLY DISCARDED has been excluded from this report.

Appendix Table 5. List of fleets and Standardized Bycatch Reporting Methodology (SBRM) species groups with associated coefficient of variation (CV) for which the SBRM performance classification was "Not Met" for nonpilot cells for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data). See Table 3 for fleet stratification abbreviations and Table 4 for SBRM species group abbreviations.

SBRM Year	Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Species Group	CV
2015	4	Hand Line	OPEN	all	NE	all	GFL	0.518
	6	Otter Trawl	OPEN	all	MA	lg	MONK	0.425
	7	Otter Trawl	OPEN	all	NE	sm	SBM	0.418
	8	Otter Trawl	OPEN	all	NE	lg	RCRAB	0.399
	19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	DOG	0.353
	26	Sink, Anchor, Drift Gillnet	OPEN	all	MA	xlg	MONK	0.492
	34	Scallop Dredge	AA	LIM	MA	all	MONK	0.314
	50	Pots and Traps, Lobster	OPEN	all	NE	all	GFL	1.042
2016	5	Otter Trawl	OPEN	all	MA	sm	GFS	0.347
	5	Otter Trawl	OPEN	all	MA	sm	SBM	0.473
	8	Otter Trawl	OPEN	all	NE	lg	RCRAB	0.327
	13	Otter Trawl, Twin	OPEN	all	MA	all	SKATE	0.634
	19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	DOG	0.370
	24	Sink, Anchor, Drift Gillnet	OPEN	all	MA	sm	DOG	0.929
	43	Mid-water Paired & Single Trawl	OPEN	all	NE	all	DOG	0.664
2017	2	Longline	OPEN	all	NE	all	DOG	0.531
	5	Otter Trawl	OPEN	all	MA	sm	GFS	0.337
	7	Otter Trawl	OPEN	all	NE	sm	MONK	0.481
	8	Otter Trawl	OPEN	all	NE	lg	RCRAB	0.530
	9	Scallop Trawl	AA	GEN	MA	all	DOG	0.666
	50	Pots and Traps, Lobster	OPEN	all	NE	all	RCRAB	0.432

Appendix Table 6. Additional fleets and Standardized Bycatch Reporting Methodology (SBRM) species groups with associated coefficient of variation (adjusted CV) for which the SBRM performance classification would have been "Not Met" for nonpilot cells for SBRM 2015 (July 2013 through June 2014 data), SBRM 2016 (July 2014 through June 2015 data), and SBRM 2017 (July 2015 through June 2016 data) had the adjusted observed trips had been used. See Table 3 for fleet stratification abbreviations and Table 4 for SBRM species group abbreviations.

SBRM Year	Fleet Row	Gear Type	Access Area	Trip Category	Region	Mesh Group	Species Group	Adjusted CV
2015	7	Otter Trawl	OPEN	all	NE	sm	FSB	0.320
	29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	DOG	0.301
2016	5	Otter Trawl	OPEN	all	MA	sm	SKATE	0.303
	7	Otter Trawl	OPEN	all	NE	sm	DOG	0.303
	19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	GFS	0.438
	19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	SKATE	0.335
2017	5	Otter Trawl	OPEN	all	MA	sm	SBM	0.332
	19	Otter Trawl, Haddock Separator	OPEN	all	NE	lg	GFL	0.404
	29	Sink, Anchor, Drift Gillnet	OPEN	all	NE	xlg	DOG	0.479

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