



Northeast Fisheries Science Center Reference Document 10-02

A Standard Method to Apportion Groundfish Catch to Stock Area for the Purpose of Real Time Quota Monitoring under Amendment 16

by Michael C. Palmer

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NOAA's National Marine Fisheries Serv., 166 Water St., Woods Hole MA 02543

U.S. DEPARTMENT OF COMMERCE
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Executive Summary

The Magnuson-Stevens Reauthorization Act requires fishery managers to set annual catch limits (ACLs) for all overfished stocks by 2010 (2011 for all stocks). Monitoring of ACLs will require that fishery catches (landings and discards) can be monitored effectively in near real-time. In addition, Amendment 16 to the Northeast Multispecies Fishery Management Plan allows for the creation of additional groundfish sectors, each receiving individual sector Annual Catch Entitlements (ACEs) of managed stocks. The ACEs are smaller subdivisions of the federal commercial groundfish ACL; a sub-component of the overall groundfish ACL. The total groundfish catch (landings and discards) of each sector must be closely monitored to ensure that the individual ACEs and total ACLs are not exceeded. Effectively monitoring the large numbers of quotas, many of which may be small, will require new methods to ensure that the fishery yield is maximized and catch limits are not exceeded.

Monitoring both groundfish landings and discards requires information about the total landed amount of all species caught by area and gear type (otter trawl, gillnet or longline). There are a variety of sources for this information, each with varying levels of certainty. In the Northeast Region, the primary source of the total landed catch are the dealer weighout data which are apportioned to statistical area and gear type using the vessel trip report (VTR) data. Discard ratios can be applied to the dealer-based K_{all} (total retained catch of all species from the fishing trip) for the appropriate gear and stock; this requires assigning a gear and area to dealer-reported landings. All of the data sources that are required to monitor total catch are expected to be available on a weekly basis by May 1, 2010; however, past experience with quota monitoring has shown that incomplete compliance and inadequate data quality will require that alternate data sources and methods be employed to estimate total sector and common pool catch by stock. This document outlines a methodology to account for the all of the varying levels of data completeness expected under Amendment 16 (both sectors and common pool groundfish trips) and provides contingencies for when data are unavailable and establishes incentives to facilitate industry compliance. The objectives of the method are: (1) allow groundfish quotas to be effectively monitored even when information are missing or of poor quality; (2) provide a standard methodology by which fishery managers (e.g., sector managers) can monitor catch; (3) provide incentives to the industry to comply with reporting requirements; and (4) provide fishery managers (both NMFS and sectors) with an understanding of the certainty associated with the estimates of groundfish catch.

List of Acronyms

ABC – Acceptable Biological Catch
ACL – Annual Catch Limit
ACE – Annual Catch Entitlement
ACT – Annual Catch Target
AM – Accountability Measure
DSM – Dockside Monitoring
FMC – Fisheries Management Councils
FMP – Fishery Management Plan
IVR – Interactive Voice Recording
MSA – Magnusson Stevens Act
NEFMC – New England Fisheries Management Council
NEFSC – Northeast Fisheries Science Center
NMFS – National Marine Fisheries Service
OFL – Overfishing Levels
TAC – Total Allowable Catch
VMS – Vessel Monitoring Service
VTR – Vessel Trip Report

Introduction

The Magnuson-Stevens Reauthorization Act (MSA) requires fishery managers to set annual catch limits (ACLs) for all overfished stocks by 2010 (2011 for all stocks; USOFR 2009). The ACLs are set by the regional Fisheries Management Councils (FMCs) to ensure that the amount of annual catch does not exceed that which can be sustained by the resource. Before the FMCs can set ACLs, they must develop overfishing levels (OFL) and acceptable biological catch (ABC). In practice, the ACLs are less than or equal to the ABCs which in turn are less than or equal to the OFLs (Figure 1). The size of the buffer placed between the various levels will depend on the perceived scientific and management uncertainty associated with the resource. By setting ACLs below the Acceptable Biological Catches (ABCs) managers can account for management uncertainty. According to National Standard 1 (NS1; USOFR 2009) management uncertainty is defined as uncertainty occurring because of the lack of sufficient information about catch (e.g., late reporting, underreporting and misreporting of landings or bycatch). The MSA also requires that individual fishery management plans (FMPs) institute accountability measures (AMs) which are management controls to prevent ACLs from being exceeded. There are two types of AMs: (1) in-season measures that prevent ACLs from being exceeded within the fishing year; and, (2) postseason measures which account for overages during the previous fishing year.

In addition to the requirements of the MSA, the Northeast Fisheries Management Council (NEFMC) passed Amendment 16 to the Northeast Multispecies Fishery Management Plan in June 2009. Amendment 16 allows for the formation of additional groundfish sectors, each receiving individual sector Annual Catch Entitlements (ACEs) of managed stocks (NEFMC 2009). The ACEs are smaller subdivisions of the federal commercial groundfish ACLs; a sub-component of the overall groundfish ACL with the size of the ACE determined from the aggregate catch history of a sector's membership. If approved, up to 19 groundfish sectors will begin operations on May 1, 2010. A portion of the groundfish industry will exist outside of sectors in the common pool, and beginning in 2012, the groundfish catch of the common pool fishery will be controlled through a hard total allowable catch (TAC).

Monitoring of the federal commercial groundfish ACLs and the smaller ACEs will require that fishery catches (landings and discards) can be monitored effectively in near real-time. In order to monitor both groundfish landings and discards, information is needed on the total landed amount of all species caught by area and gear type (e.g., otter trawl, gillnet or longline). Fishery discard data are collected by fisheries observers; however, observer coverage is less than 100% in the Northeast Region of the United States, requiring that discards be estimated from the unobserved trips. The discard estimation methods used in the Standardized Bycatch Reduction Methodology (Wigley et al. 2007) require that total landings (K_{all}) are known for each trip by area and gear type (e.g., otter trawl, gillnet or longline). There are a variety of sources of this information, each with varying levels of certainty; however, ultimately, the primary source of the total landed amount is determined from the dealer landings that are then apportioned to statistical area and gear type using Vessel Trip Reports (VTRs). This method is consistent

with that used for stock assessments (Wigley et al. 2008), which are in turn used by FMCs to set the OFLs, ABCs and ACLs.

Although dealer landings, VTRs and observer data are expected to be available on a weekly basis beginning May 1, 2010, past quota monitoring experience has shown that incomplete compliance and inadequate data quality will require that alternate data sources and methods be employed to estimate total catch when information are missing or when fishing trips cannot be aligned across sources. Missing or incomplete information are types of management uncertainty that must be considered when developing quota monitoring programs. NS1 discusses the concept of establishing ‘Tiers’ based on the levels of management uncertainty. While the actual language is specific to how to set annual catch target (ACT) control rules, the concept can be extended to quota monitoring methodologies to account for varying levels of management uncertainty when critical data are unavailable.

When catch must be estimated at lower information tiers, a quota monitoring method should account for this uncertainty. One way to account for the uncertainty is to establish AMs that overestimate total catch when information are missing or of poor quality (i.e., provide a positive buffer). This precautionary approach helps prevent ACL overages and in doing so creates incentives to facilitate industry compliance (i.e., non-reporting or misreporting will adversely impact the industry’s ability to achieve optimum harvest). Improved industry compliance will ensure that a higher percentage of the total catch is accounted for at the higher information tiers and that the resulting catch and proximity to ACLs/ACEs will be estimated with greater certainty. As the quality of previously submitted data improves over time, either as result of data audits or compliance efforts, catch that was previously handled at lower information tiers would be expected to move up in the tier hierarchy and be estimated with greater certainty.

Historically, catches of northeast United States groundfish estimated through quota monitoring programs have differed from the catch estimates used in stock assessments (L. O’Brien, NEFSC, pers. comm.). These differences exist because of differences in the underlying data sets and methods. Quota monitoring must be performed in-season as such must work with the constraints of utilizing the best data available in-season (i.e., there are a larger amount of missing and unaudited data). Stock assessments are able to use a more robust methodology that takes advantage of a more complete and higher quality data set. As the quality and completeness of the data used in quota monitoring improves, the differences between quota monitoring and stock assessment catch estimates decreases. Utilizing a precautionary approach to quota monitoring that provides direct incentives to the industry to report timely and accurately will help reduce these differences. Reducing these differences will achieve internal consistency between the scientific advice and management measures used to achieve optimum yield.

This document provides an overview of a comprehensive quota monitoring method that is consistent with both MSA and Amendment 16 Multispecies FMP. The method utilizes a tiered approach to account for varying levels of information availability and the associated uncertainty of these information sources. It is the intent that both the National Marine Fisheries Service (NMFS) and sector managers could apply this methodology. Use of standard methodology by both the regulatory agency and sector managers will help mitigate differences in the catch accounting that are likely to occur

under Amendment 16 and allow managers to quickly assess the amount of ACE currently harvested and the level of certainty associated with that fraction.

2. Methods

2.1. Data Sources

The majority of the Region's commercial fisheries data are self reported, meaning the quality and integrity of the data are dependent on the honesty and accuracy of the industry. The Region has a responsibility to stringently monitor the quality of the data it collects and enforce mandatory reporting requirements. The quality of the Region's fisheries dependent data can be improved by using more stringent and complex audits and enforcing known problems areas (e.g., the non-reporting of dealer-discarded landings, underreporting of statistical area fished on VTRs).

2.1.1. Dealer landings

The dealer weighout system maintains mandatory weekly reports of dealer landings purchased by federally permitted seafood dealers. All dealers issued permits to purchase any of the species listed in Table 1 are required to submit electronic reports weekly. The weekly reports include transaction-level records of all seafood purchases regardless of whether the originating vessel is federally permitted. Dealers are required to submit the VTR serial number from the trip from which the purchased fish originated. Once data are submitted by dealers they are immediately available to analysts. Post processing audits are performed on the data daily. Dealer weighout data are assumed to be a census of total species landings and, hence the most accurate accounting of species landing amounts.

2.1.2. Vessel Trip Report

The VTR system maintains data from the mandatory vessel logbooks. All federally permitted vessels in the Northeast Region must submit a logbook report for each fishing trip within 15 days from the end of the month in which the trip occurred. Amendment 16 will revise this timeline for federal vessels issued a multispecies permit; beginning May 1, 2010, these vessels will be required to submit VTRs weekly. A separate logbook sheet must be filled out for each statistical area fished or when the gear or mesh size changes. The serial number from the first logbook sheet used on a trip constitutes the unique trip identifier; ***the trip identifier is the critical data element that links all of the fisheries dependent data systems (dealer landings, VTR, vessel monitoring system data, etc.).*** VTR data are used to assign area and effort information to dealer-reported landings.

There are five species managed under the Northeast Multispecies FMP that are managed as multiple stocks. The statistical area information contained on the VTR is critical to attributing fishery catches to the correct stock. Table 2 contains a list of the statistical areas that define the Northeast Multispecies managed species. Statistical areas for the Region are shown in Figure 2.

2.1.3. Vessel Monitoring System activity declaration and catch report

All limited access groundfish vessels in the Northeast Region must have a vessel monitoring system (VMS) on board (NEFMC 2006). All limited access groundfish vessels required to use VMS must make a declaration into the fishery via VMS at the beginning of every groundfish trip. Additionally, Amendment 16 will establish four broad reporting areas to facilitate the process of allocating groundfish catch to stock area (Figure 3). The VMS declaration will indicate: (1) whether the trip is a groundfish trip (e.g., requiring a multispecies permit); (2) the general gear type being used on the trip (trawl, gillnet or longline); and, (3) which of the four broad reporting areas the vessels intends to fish in during the course of the trip. There is a small fraction of the groundfish fishery that occurs landward of the VMS declaration line. These vessels do not use the VMS activity declarations, but instead use an Interactive Voice Recording (IVR) system to declare into the fishery (Doug Christel, Northeast Regional Office – Office of Sustainable Fisheries, January 6, 2010). For these vessels, the information coming from the IVR system would be used in place of the VMS declaration information.

If a vessel operator reports that only a single VMS reporting area will be fished during the trip, the vessel cannot fish in multiple reporting areas on that trip, but can fish in multiple areas on subsequent trips. Vessels that notify NMFS they intend to fish in multiple areas will be required to submit a VMS catch report to NMFS that reports both the amount of groundfish retained, and the amount of all species retained by broad reporting area (reporting periods to be determined by NMFS). There are no restrictions on the number of areas that can be fished on such trips, or on the number of times a vessel can enter or exit an area, as long as accurate catch reports are submitted by VMS. In order to link the information on area fished and catch to dealer data, each limited access groundfish vessel operator (whether fishing in one or multiple broad reporting areas) will be required to report a VTR serial number, or other appropriate identifier, through the VMS catch reports at a time specified by NMFS.

2.1.4. Ancillary data

In addition to the core information sources that should be available for every groundfish trip, there will also be several ancillary data sources available for many of the trips. These ancillary data sources include observer/at-sea monitor data, VMS track lines, vessel hail-in/-out notices and dockside monitoring data (DSM) and NMFS port sampling. Because these data will either not exist for all trips or not contain necessary information on catch by area and gear, they are unsuitable for use in this quota monitoring method. However, they can provide important ancillary information on fishing trips for which they are available and they should be used to monitor vessel compliance and improve the overall data quality of the core data sources.

2.2. Trip Matching

The VTR serial number is intended to be the critical data element that links all of the fisheries dependent data systems (dealer landings, VTR, vessel monitoring system

data, etc.). However, since its implementation as a linking mechanism in May 2004, the VTR serial number has been insufficient for this use. Table 3 provides a summary of trip matching between the VTR and dealer data using the VTR serial number. When quality constraints are placed on the match (i.e., VTR serial number must match, must be from the same vessel, trip must have landed in the same month in which the dealer transaction occurred) the matching rate has averaged less than 50%. There is some evidence that matching has improved over time; however, the current matching rate of 56.2% is still insufficient to rely solely on the VTR serial number as a means of trip matching.

Trips can also be matched using alternative methods such as matching on the vessel permit number and date landed/sold. This is the method used to assign area and gear to dealer landings for the purposes of stock assessments (Wigley et al. 2008). The matching rates of this alternative method are about the same as those achieved by matching on VTR serial number (Table 3).

A third method involves using both the VTR serial number and the alternative method described above. This ‘combined’ approach attempts to first use the VTR serial number and then using the alternative method on all trips that could not find a match using the VTR serial number. This approach results in slight improvements in trip matching with an average annual matching rate of 56.5%.

It is recommended that the quota monitoring method described in this document utilize some variation of the combined trip-matching method. While the degree of non-matching trips remains high, it offers the best foundation off which to base a quota monitoring program. Additional effort should be expended to improve the trip matching rate using the VTR serial number. This can be accomplished through data collection quality assurance programs and industry outreach and education. It is foreseeable that the level of trip matching will improve under Amendment 16 as sector managers become engaged in the quota monitoring process and begin to assist the industry comply with these regulations. Because landings from trips that can not be matched may be counted multiple times using the quota monitoring method described in this document, there is a strong incentive to ensure that the vessels provide the dealer with the correct VTR serial number and the dealer correctly records it.

If a combined trip-matching method is used, a coding system must be used to denote how the trip match was made (e.g., VTR serial number or permit/month/day). This will be necessary in order to resolve discrepancies between NMFS and sector manager quota accounting.

2.3. Accounting of Nondealer Transactions

There are a small amount of groundfish landings that are not sold to seafood dealers (e.g., home consumption, kept for bait). These landings are referred to as non-dealer transactions and only reported on the VTR. NMFS and sectors will be responsible for accounting for these removals. DSM data could be used to monitor a vessel’s and sector compliance with regards to reporting home consumption landings.

2.4. Live Weight Conversions

Quotas in the northeast United States are monitored in live weight in pounds because target harvest levels (e.g., maximum sustainable yield, TACs, ACLs, ACEs) are established using live weights. All weights reported by the industry, regardless of the data source (dealer, VTR, VMS, observer), must be converted to the live weight equivalents in pounds before being used for stock apportionment. The live weight equivalent is the weight of the fish if it was not processed. The Northeast Fisheries Science Center (NEFSC) maintains support tables to convert VTR data, dealer data and observer data to live weight equivalents in pounds. The primary species conversion factor tables are (table names and locations are subject to change):

- Dealer: SOLE.CFDBS.SPECIES_ITIS_NE.
- VTR: SOLE.MPALMER.VTR_SPPCODE_LNDLB_LIVLB_CONV.
This table provides only translations of VTR species codes to species itis, grade, market and unit of measure. The translated codes must be run through SPECIES_ITIS_NE to obtain the appropriate conversion factors. See Palmer (2009) document for instructions on the proper use of this table.
- Observer: NOVA.MPALMER.OBS_SPP_CONV_FULL. See Palmer et al. (2008) document for instructions on the proper use of this table.
- VMS: *Table does not exist yet.*

2.5. Information Scenarios

There are three broad types of fishing trips that will occur when monitoring groundfish catch: trips occurring in multiple VMS reporting areas (type M), trips occurring in a single VMS reporting area (type S), and trips where it is unknown whether they occurred in a single reporting area or multiple reporting areas (type U). These three broad trip types are denoted in the first column of Table 4a-c. For the ‘M’ and ‘S’ trip type there are several possible tiers of information availability dependent on reporting compliance, completeness and timeliness. Under ideal circumstances, landings and discards will be calculated using information available at tier 1 (both dealer and VTR data are available). Tier levels greater than 1 are indicative of either some level of non-compliance on the part of the dealer or the vessel (i.e., data are unavailable for the reporting week). In general, the higher the tier number, the greater the degree of uncertainty there will be in accounting for stock landings and discards. For each tier, a summary of data sources and information availability are provided and a method is outlined to utilize what information is available to apportion landings to stock area and calculate discards (when a trip is not observed).

It is the intent that both NMFS and sector managers would apply this methodology and that weekly sector reports would report landings and discards broken down by trip type and tier (e.g., S1, M4, U1). This would allow NMFS the capacity to gauge the level of certainty associated with the overall sector ACE accounting. As missing information becomes available in subsequent weeks, landings and discards

would be continually updated and catch accounted for at higher tiers (greater than 1) in previous weeks would be expected to move to lower tiers. Large amounts of catch accounted for at higher tier levels would be indicative of compliance issues warranting closer attention.

There are two ‘Methods’ columns in Table 4b and 4c. Each of the columns describes how groundfish landings (column Q) and the total catch (K_{all} ; column R) will be estimated under each of the information availability scenarios. Under these two columns are cells shaded either white or grey. The cells in white are those where information is complete (though some information may be provisional) and no imputation of the landed catch is necessary. The cells in grey are indicative of some level of missing information requiring some level of imputation of the landed catch.

2.5.1. Trips matched across sources, catch records completely aligned

The method for determining how to calculate landings by stock area and gear types for situations where information is complete (white shaded cells) and catch records between sources are completely aligned is shown in Equation 1 through 4 and described in detail in Appendix A. Catch records are considered completely aligned when all species reportedly sold to a dealer on a VTR (or VMS catch report) are reported by the dealer and vice versa.

Total sector species landings by statistical area and gear is calculated as:

$$(1) \quad \hat{L}_{c,s,a,g} = \sum_{i=1}^{N_c} \left[l_{v,i,s} \left(\frac{\hat{r}_{v,i,s}}{\hat{r}_{v,i,s,a,g}} \right) \right]$$

with the total landings of all species calculated as:

$$(2) \quad \hat{K}_{c,a,g} = \sum \hat{L}_{c,s,a,g}$$

and aggregated to the stock level by:

$$(3) \quad \hat{L}_{c,s,j} = \sum_{a \in j} \hat{L}_{c,s,a,g}$$

$$(4) \quad \hat{K}_{c,j,g} = \sum_{a \in j} \hat{K}_{c,a,g}$$

where $L_{c,s,a,g}$ is the total landings for sector c of species s in statistical area a and gear type/mesh size g
 $l_{v,i,s}$ is dealer landings (converted to live weight) for vessel v , trip i and species s
 $r_{v,i,s}$ is VTR [VMS] hail weights for vessel v , trip i and species s
 $r_{v,i,s,j,g}$ is VTR [VMS] hail weights for vessel v , trip i , species s , area a and gear type/mesh size g
 N_c is the total number of trips i to date in the fishing year for sector c

$K_{c,a,g}$ is the total landings of all species for sector c in statistical area a and gear type g
 $L_{c,s,j}$ is the total landings for sector c of species s , stock j
 $K_{c,j,g}$ is the total landings of all species for sector c , stock j and gear/mesh/size g
 j is the stock area of a species s that is an aggregate of several statistical areas a
 (Table 2)

2.5.2. Trips matched across sources, some misalignment of catch records

In some situations trip information may be complete (dealer report matched to a VTR), but the landing records may not be completely aligned. There may be species reportedly sold to the dealer on the VTR or the dealer reports purchasing fish not reported on the VTR. Figure 4 illustrates the various record matching scenarios that can be encountered when the two report sources do not completely match. The methods for handling these situations are described below (*in all of these situations, the VMS catch report can be used to replace the VTR if the VTR is unavailable such as in Tier M3*). The record match code (e.g., R1, R2) of individual quota landings should be tracked and recorded in the quota monitoring process.

R1. Single subtrip, dealer and VTR records are completely aligned: Assign dealer landings to the statistical area and gear type using the apportionment methodology described in Appendix A.

R2. Single subtrip, dealer records with no VTR match: For the unmatched records assign dealer landings to the statistical area and gear type indicated on the VTR. Notify the dealer and the vessel that the discrepancy must be resolved.

R3. Single subtrip, VTR records with no dealer match: For the unmatched records use the VTR reported landings by statistical area and gear type until the discrepancy can be resolved. Notify the dealer and the vessel that the discrepancy must be resolved.

R4. Single subtrip, both VTR and dealer records are missing matching records: For the unmatched records this represents a combination of scenarios R2 and R3. In practice a single landing record will never be assigned an R4 designation; use the appropriate method for each of the situations. Notify the dealer and the vessel that the discrepancy must be resolved.

R5. Multi-subtrip, dealer and VTR records are completely aligned: Assign dealer landings to the statistical areas and/or gear types using the apportionment methodology described in Appendix A.

R6. Multi-subtrip, dealer records with no VTR match: If all VTR subtrips from those unmatched records occur within the same stock area for the non-matched species assign the dealer records to the statistical area and gear type corresponding to the subtrip with the greatest amount of catch (or the first VTR sheet in the case of a tie). If the VTR subtrips occur in different stock areas for the non-matched species, assign the dealer

records to all subtrips. **This will result in the multiple counting of landings which is consistent with the precautionary approach prescribed in the apportionment methodology when stock identification of landings are unknown.* In the situation where there are more than two subtrips and only two stock areas are fished, the landings only need to be assigned once to the stock area with multiple subtrips, (i.e., the landings shouldn't be triple counted). For example a vessel has VTR reports for 515, 521 and 522 and the dealer has reported haddock, but there are no haddock reported on the VTR. The dealer haddock landings should be assigned to both 515 and either 521 or 522 (contingent on which statistical area had greater landings). In the situation where gear type differs between subtrips, but area fished does not, assign the dealer landings to the gear type with the greatest discard ratio. Notify the dealer and the vessel that the discrepancy must be resolved.

R7. Multi-subtrip, VTR records with no dealer match: For the unmatched records, use the VTR reported landings by statistical area and gear type until discrepancy can be resolved (analogous to record match scenario R3). Notify the dealer and the vessel that the discrepancy must be resolved.

R8. Multi-subtrip, both VTR and dealer records are missing matching records: For the unmatched records this represents a combination of scenarios R5 and R6. In practice a single landing record will never be assigned an R4 designation; use the appropriate method for each of the situations. Notify the dealer and the vessel that the discrepancy must be resolved.

2.5.3. Trip information is missing

When trip information is missing or trips can not be matched between sources, stock landings by gear type must be determined using alternate means. Missing information is likely a product of non-compliance or data quality. When information is suspected missing, the appropriate source should be contacted (dealer, sector, or vessel; column O, Table 4a). The imputation methods for situations where information is incomplete (grey shaded cells) are described below.

2.5.3.1. Landings imputation

The scenarios are cross referenced in column Q in Table 4b and c using the notation L1, L2, etc. ('L' indicates it is a landings scenario).

L1. VTR data are available, but dealer data are not (Tiers S2, M2): Use the provisional [official] VTR landings by statistical area until dealer data become available. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies.

L2. Have groundfish landings, but there is no area information (Tiers U1, M4): Apply landings to all stocks for which a sector [common pool] has ACE.

L3. No groundfish landings, but area is known (Tier S4): Apply the *maximum* trip-level groundfish landings by that vessel/gear combination for all groundfish stocks within that reporting area in the given fishing year. If no landings by that vessel/gear combination exist to date for the fishing year apply the *maximum* trip-level groundfish landings across all sector [common pool] vessels for that reporting area/gear type fished. If no landings recorded to date by any sector vessels fishing that gear type in that area, apply the *maximum* trip-level groundfish landings across all sector [common pool] vessels for that reporting area fished.

L4. No groundfish landings or area information (Tier M6): Apply the *maximum* trip-level groundfish landings by that vessel/gear combination for all groundfish stocks for which the sector [common pool] has ACE. If no landings by that vessel to date apply the *maximum* trip-level landings across all sector [common pool] vessels fishing the particular gear for which the sector [common pool] has ACE. If there are no sector [common pool] landings for that gear type to date, use the *maximum* trip-level landings across all sector [common pool] vessels regardless of gear.

L5. No trip information; vessel permit, quarter and port of landing are known (Tiers S5, M7): Apply the *maximum* trip-level groundfish landings by that vessel/gear combination for all groundfish stocks for which the sector [common pool] has ACE. If no landings by that vessel to date apply the *maximum* trip-level landings across all sector [common pool] vessels fishing the particular gear for which the sector [common pool] has ACE. If there are no sector [common pool] landings for that gear type to date, use the *maximum* trip-level landings across all sector [common pool] vessels regardless of gear.

2.5.3.2. Total landings imputation (for discard calculation)

The scenarios are cross referenced in column R in Table 4b and c using the notation D1, D2, etc. ('D' indicates it is a discard scenario). The scenarios are only relevant when discard rates must be applied to unobserved/non-monitored trips.

D1. VTR data are available, but there are no dealer data (Tiers S2, M2): Expand rate using the provisional [official] VTR-derived K-all by stock area and gear. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies.

D2. Have K-all, but no area or gear information (Tier U1): *Use the most frequently used gear type for that vessel within the fishing year to determine gear type* and then multiply K_{all} by the stock/fleet-specific discard rates for all stocks for which the sector [common pool] has ACE. If no information to date on gear type usage by that vessel, use the gear type most frequently used by all sector [common pool] vessels (**note: in the*

case of equal gear use by either vessel or sector [common pool], use the gear type with the highest discard rate).

D3. No K-all, area and gear are known (Tier S4): Use the *maximum* trip-level landings to estimate K_{all} for that vessel/gear/area combination in the fishing year to calculate groundfish discards for all stocks corresponding to the area fished and for which the sector [common pool] has ACE. If no trip landings (dealer) for that vessel/gear/area combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished that gear type and fished in that area. If there are no trip landings (dealer) for that sector/gear/area combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished that gear type. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished regardless of gear type.

D4. Have K-all by gear, but not by area (Tier M4): Use the *maximum* trip-level landings for that vessel/gear combination in the fishing year to estimate K_{all} and calculate groundfish discards for all stocks for which the sector [common pool] has ACE. If no trip landings (dealer) for that vessel/gear combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished that gear type. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished regardless of gear type.

D6. VMS reporting area available with gear declarations as well as VMS catch reports, but no dealer data (Tier M5): Expand rate using the VMS-reported K-all by stock area and gear. Apply live weight corrections to account for the live weight pounds reported on the VTR.

D7. No K-all or area, but gear is known (Tier M6): Use the *maximum* trip-level landings by that vessel/gear combination for all areas fished in the given fishing year to estimate K_{all} . If no landings by that vessel/gear combination to date apply the *maximum* trip-level landings across all sector [common pool] vessels fishing that gear. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the *maximum* trip-level landings from all sector [common pool] vessels having fished regardless of gear type. Calculate discards by multiplying the estimated K_{all} by the fleet-specific discard rate for all stocks for which the sector [common pool] has ACE.

D8. No trip information; vessel permit, quarter and port of landing are known (Tiers S5, M7): Use the *maximum* trip-level landings by that vessel for all areas fished in the given fishing year to estimate K_{all} . If no landings by that vessel to date apply the *maximum* trip-level groundfish landings across all sector [common pool] vessels. Apply the stock/fleet-specific discard rates to K_{all} for all stock for which a sector [common pool] has ACE.

3. Implementation and Use

This document provides a precautionary method to monitor groundfish catch under a variety of information availability and quality scenarios likely to exist under the management framework of Amendment 16. The objectives of the method are: (1) allow groundfish quotas to be effectively monitored even when information is missing or of poor quality; (2) provide a standard methodology by which fishery managers (e.g., sector managers) can monitor catch; (3) provide incentives to the industry to comply with reporting requirements; and (4) provide fishery managers (both NMFS and sectors) with an understanding of the certainty associated with the estimates of groundfish catch. The trip matching, record matching and tier coding systems outlined in this document are designed to meet this objective. By categorizing all groundfish catch using these coding systems, managers can quantify what fraction of the catch is known with some degree of certainty and what fraction has been estimated using less than optimal information. Fishery managers should attempt to maximize the fraction of groundfish landings estimated using optimal information. The optimal situation are where both dealer and VTR data were available for the trip (Tier M1 or S1), the trip was matched using the VTR serial number and the landings records between the two sources were completely aligned (record matching levels R1 or R5). Each landing record can be characterized by an uncertainty category and the total landings can be summarized by categories to achieve a summary quota monitoring report. An example of quota monitoring report where the landings are tracked based on the uncertainty categories outlined in this document is included in Appendix B.

4. Acknowledgments

This document is the product of considerable discussions between the Northeast Fisheries Science Center and the Northeast Regional Office. In particular, the input of the following staff members were critical to the development of the methodology: Susan Wigley, Joan Palmer, Frank Almeida, Wendy Gabriel, Greg Power, Dan Morris, Doug Christel and Mark Grant. Additionally, the content and quality of this document was improved thanks to the comments provided by Greg Power, Melissa Warden, and Kathryn Bisack.

5. References

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Tables

Table 1. Seafood dealer permit categories for which mandatory weekly reporting are required. Permit categories correspond to fishery management plans.

Seafood dealer permit category
Atlantic bluefish
Northeast multispecies
Atlantic deep-sea red crab
Ocean quahog
Atlantic hagfish
Squid (<i>Loligo/Illex</i>)/Atlantic mackerel/butterfish
Scup
Atlantic herring
American lobster
Skates
Spiny dogfish
Atlantic sea scallop
Black sea bass
Summer flounder
Surf clam
Monkfish
Golden tilefish

Table 2. Stock area definitions for the 13 species managed under the Northeast Multispecies Fishery Management Plan.

Species	Stock	Statistical areas
Atlantic cod	Gulf of Maine	464, 465, 467, 511, 512, 513, 514, 515
	Georges Bank	521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Haddock	Gulf of Maine	464, 465, 467, 511, 512, 513, 514, 515
	Georges Bank	521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Pollock	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
White hake	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Acadian redfish	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Ocean pout	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Wolffish	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Yellowtail flounder	Cape Cod/Gulf of Maine	464, 465, 467, 511, 512, 513, 514, 515, 521
	Georges Bank	522, 525, 542, 543, 561, 562
	Southern New England/Mid-Atlantic	526, 533, 534, 537, 538, 539, 541, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Winter flounder	Gulf of Maine	464, 465, 467, 511, 512, 513, 514, 515
	Georges Bank	522, 525, 542, 543, 561, 562
	Southern New England/Mid-Atlantic	521, 526, 533, 534, 537, 538, 539, 541, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Windowpane flounder	Northern	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 542, 543, 561, 562
	Southern	526, 533, 534, 537, 538, 539, 541, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
American plaice	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Witch flounder	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640
Atlantic halibut	Unit	464, 465, 467, 511, 512, 513, 514, 515, 521, 522, 525, 526, 533, 534, 537, 538, 539, 541, 542, 543, 561, 562, 611, 612, 613, 614, 615, 616, 621, 622, 623, 624, 625, 626, 627, 628, 629, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640

Table 3. Matching rates between Vessel Trip Reports (VTR) and dealer weighout data using multiple matching methods. Matching rates for 2009 current as of January 25, 2010.

Year	Total VTR trips	Match on only VTR serial number		Match on VTR serial number, vessel permit and month landed/sold		Match on vessel permit, month and day landed/sold		Combined methods	
		Number of trips	Match rate (%)	Number of trips	Match rate (%)	Number of trips	Match rate (%)	Number of trips	Match rate (%)
2004	114,878	43,039	37.5	39,147	34.1	47,551	41.4	55,376	48.2
2005	120,322	64,812	53.9	60,398	50.2	58,320	48.5	70,305	58.4
2006	120,874	64,249	53.2	59,119	48.9	56,229	46.5	69,259	57.3
2007	112,710	62,447	55.4	57,181	50.7	53,956	47.9	65,776	58.4
2008	109,385	65,116	59.5	58,204	53.2	54,667	50.0	65,592	60.0
2009	91,335	56,183	61.5	49,777	54.5	46,179	50.6	54,737	59.9
2004 - 2008 summary	115,634	59,933	51.8	54,810	47.4	54,145	46.8	65,262	56.5

Table 4a. Overview of information availability expected under Amendment 16 to the Northeast Multispecies Fisheries Management Plan (NEFMC 2009) and tier types and tier descriptions.

A	B	C	D	E	F	G	H	I	Information available					Compliance issue						
									Data sources available					Landings		Landings by area		Landings by gear	Who's out of compliance	Who enforces compliance
									Dealer data	VTR data	VMS area declaration	VMS catch report	Ancillary evidence of groundfish trip (e.g., NEFOP/ASM, DSM, etc.)	All species	Groundfish only	All species	Groundfish only			
	N/A		No information																	
Area(s) unknown	U	1	Dealer data only	■					■						Vessel, sector	NMFS, sector				
Single reporting area	S	1	Dealer and VTR data are available	■	■				■		■		■							
Single reporting area	S	2	VTR data, no dealer		■				■		■		■	Dealer	NMFS					
Single reporting area	S	3	Dealer data, no VTR, have VMS area declaration, no VMS catch report (not required)	■		■	N/A		■		■		■	Vessel, sector	NMFS, sector					
Single reporting area	S	4	VMS area report, no VMS catch reports (not required)			■	N/A				■		■	Vessel, sector	NMFS, sector					
Single reporting area	S	5	No vessel information, but ancillary evidence of a groundfish trip					■						Vessel, sector	NMFS, sector					
Multiple reporting areas	M	1	Dealer and VTR data are available	■	■				■		■		■							
Multiple reporting areas	M	2	VTR data, no dealer		■				■		■		■	Dealer	NMFS					
Multiple reporting areas	M	3	Dealer data, no VTR, have VMS area declaration/catch report	■		■	■		■		■	■	■	Vessel, sector	NMFS, sector					
Multiple reporting areas	M	4	Dealer data, no VTR, have VMS area declaration, no VMS catch report	■		■			■				■	Vessel, sector	NMFS, sector					
Multiple reporting areas	M	5	VMS area/catch reports only			■	■			■	■	■	■	Vessel, sector	NMFS, sector					
Multiple reporting areas	M	6	VMS area report, no VMS catch reports			■							■	Vessel, sector	NMFS, sector					
Multiple reporting areas	M	7	No vessel information, but ancillary evidence of a groundfish trip					■						Vessel, sector	NMFS, sector					

Table 4b. Overview of information availability expected under Amendment 16 to the Northeast Multispecies Fisheries Management Plan (NEFMC 2009) and methods to be used to calculate landings by stock area needed for quota monitoring. Cells shaded grey indicate trips where information is incomplete (landings by area and/or gear are unavailable). Methods for when fishing area is unknown or fishing occurred in a single reporting area.

A	B	C	D	Q	R
Trip type	Trip type code	Tier code	Tier description	Method for landings apportionment	Method for estimating Kall for use in discard estimation
	N/A		No information	No evidence of a groundfish trip occurring.	N/A
Area(s) unknown	U	1	Dealer data only	Apply landings to all stocks for which a sector [common pool] has ACE. (Scenario L2)	Use the most frequently used gear type for that vessel within the fishing year to determine gear type and then multiply Kall by the stock/fleet-specific discard rates for all stocks for which the sector [common pool] has ACE. If no information to date on gear type usage by that vessel, use the gear type most frequently used by all sector [common pool] vessels (*note: in the case of equal gear use by either vessel or sector [common pool], use the gear type with the highest discard rate). (Scenario D2)
Single reporting area	S	1	Dealer and VTR data are available	Assign all dealer groundfish landings to statistical area based on the statistical area reported on the VTR.	Assign all dealer landings to statistical area based on the statistical area reported on the VTR. Expand in-season discard rate using K-all by stock area and gear.
Single reporting area	S	2	VTR data, no dealer	Use the provisional [official] VTR landings by statistical area until dealer data become available. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies. (Scenario L1)	Expand rate using the provisional [official] VTR-derived K-all by stock area and gear. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies. (Scenario D1)
Single reporting area	S	3	Dealer data, no VTR, have VMS area declaration, no VMS catch report (not required)	Assign all dealer groundfish landings to the management area recorded on the VMS activity report.	Assign total dealer landings to the management area recorded on the VMS activity report. Expand in-season discard rate using K-all by stock area and gear.
Single reporting area	S	4	VMS area report, no VMS catch reports (not required)	Apply the maximum trip-level groundfish landings by that vessel/gear combination for all groundfish stocks within that reporting area in the given fishing year. If no landings by that vessel/gear combination to date apply the maximum trip-level groundfish landings across all sector [common pool] vessels for that reporting area/gear type fished. If no landings recorded to date by any sector vessels fishing that gear type in that area, apply the maximum trip-level groundfish landings across all sector [common pool] vessels for that reporting area fished. (Scenario L3)	Use the maximum trip-level landings to estimate Kall for that vessel/gear/area combination in the fishing year to calculate groundfish discards for all stocks corresponding to the area fished and for which the sector [common pool] has ACE. If no trip landings (dealer) for that vessel/gear/area combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished that gear type and fished in that area. If there are no trip landings (dealer) for that sector/gear/area combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished that gear type. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished regardless of gear type. (Scenario D3)
Single reporting area	S	5	No vessel information, but ancillary evidence of a groundfish trip	Apply the maximum trip-level groundfish landings by that vessel/gear combination for all groundfish stocks for which the sector [common pool] has ACE. If no landings by that vessel to date apply the maximum trip-level landings across all sector [common pool] vessels fishing the particular gear for which the sector [common pool] has ACE. If there are no sector [common pool] landings for that gear type to date, use the maximum trip-level landings across all sector [common pool] vessels regardless of gear. (Scenario L5)	Use the maximum trip-level landings by that vessel for all areas fished in the given fishing year to estimate Kall. If no landings by that vessel to date apply the maximum trip-level groundfish landings across all sector [common pool] vessels. Apply the stock/fleet-specific discard rates to Kall for all stock for which a sector [common pool] has ACE. (Scenario D7)

Table 4c. Overview of information availability expected under Amendment 16 to the Northeast Multispecies Fisheries Management Plan (NEFMC 2009) and methods to be used to calculate landings by stock area needed for quota monitoring. Cells shaded grey indicate trips where information is incomplete (landings by area and/or gear are unavailable). Methods for when fishing occurred in multiple reporting areas.

A	B	C	D	Q	R
Trip type	Trip type code	Tier code	Tier description	Method for landings apportionment	Method for estimating Kall for use in discard estimation
Multiple reporting areas	M	1	Dealer and VTR data are available	Apportion all dealer groundfish landings to statistical area(s) based on proportions reported on VTR.	Apportion dealer K-all using VTR-reported proportions by stock and gear and apply discard rate in-season discard rate to stratified K-all.
Multiple reporting areas	M	2	VTR data, no dealer	Use the provisional [official] VTR landings by statistical area until dealer data become available. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies. (Scenario L1)	Expand rate using the provisional [official] VTR-derived K-all by stock area and gear. Apply live weight corrections to account for the live weight pounds reported on the VTR. Provisional VTR data are those recorded by the sector manager or their designees. Once official VTR data are available from NMFS, the provisional VTR information should be replaced with the official data if there are discrepancies. (Scenario D1)
Multiple reporting areas	M	3	Dealer data, no VTR, have VMS area declaration/catch report	Apportion all dealer landings to management areas using proportions from VMS catch report.	Apportion dealer K-all using VMS-reported proportions by stock and gear and apply discard rate in-season discard rate to stratified K-all.
Multiple reporting areas	M	4	Dealer data, no VTR, have VMS area declaration, no VMS catch report	Apply landings to all stocks for which a sector [common pool] has ACE. (Scenario L2)	Use the maximum trip-level landings for that vessel/gear combination in the fishing year to estimate Kall and calculate groundfish discards for all stocks for which the sector [common pool] has ACE. If no trip landings (dealer) for that vessel/gear combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished that gear type. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished regardless of gear type. (Scenario D4)
Multiple reporting areas	M	5	VMS area/catch reports only	Use VMS catch reports amounts by management area until additional information becomes available. Apply live weight corrections to account for the live weight pounds reported on the VMS catch reports.	Expand rate using the VMS-reported K-all by stock area and gear. Apply live weight corrections to account for the live weight pounds reported on the VTR. (Scenario D5)
Multiple reporting areas	M	6	VMS area report, no VMS catch reports	Apply the maximum trip-level groundfish landings by that vessel/gear combination for all groundfish stocks for which the sector [common pool] has ACE. If no landings by that vessel to date apply the maximum trip-level landings across all sector [common pool] vessels fishing the particular gear for which the sector [common pool] has ACE. If there are no sector [common pool] landings for that gear type to date, use the maximum trip-level landings across all sector [common pool] vessels regardless of gear. (Scenario L4)	Use the maximum trip-level landings by that vessel/gear combination for all areas fished in the given fishing year to estimate Kall. If no landings by that vessel/gear combination to date apply the maximum trip-level landings across all sector [common pool] vessels fishing that gear. If there are no trip landings (dealer) for that sector/gear combination in the fishing year, use the maximum trip-level landings from all sector [common pool] vessels having fished regardless of gear type. Calculate discards by multiplying the estimated Kall by the fleet-specific discard rate for all stocks for which the sector [common pool] has ACE. (Scenario D6)
Multiple reporting areas	M	7	No vessel information, but ancillary evidence of a groundfish trip	Apply the maximum trip-level groundfish landings by that vessel/gear combination for all groundfish stocks for which the sector [common pool] has ACE. If no landings by that vessel to date apply the maximum trip-level landings across all sector [common pool] vessels fishing the particular gear for which the sector [common pool] has ACE. If there are no sector [common pool] landings for that gear type to date, use the maximum trip-level landings across all sector [common pool] vessels regardless of gear. (Scenario L5)	Use the maximum trip-level landings by that vessel for all areas fished in the given fishing year to estimate Kall. If no landings by that vessel to date apply the maximum trip-level groundfish landings across all sector [common pool] vessels. Apply the stock/fleet-specific discard rates to Kall for all stock for which a sector [common pool] has ACE. (Scenario D7)

Figures

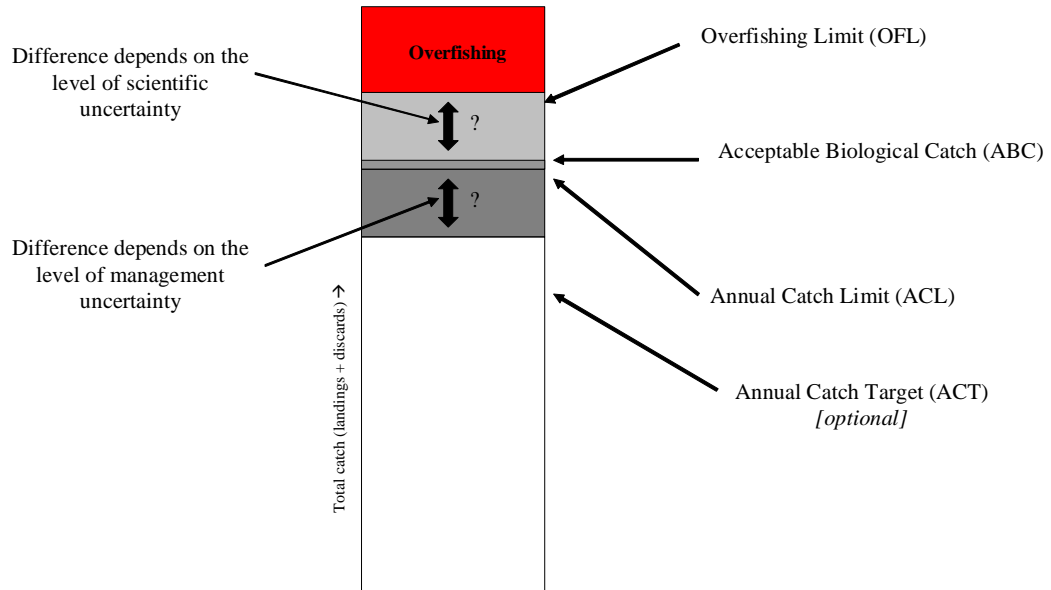


Figure 1. Schematic diagram illustrating the relationship of overfishing limits to acceptable biological catch and annual catch limits.

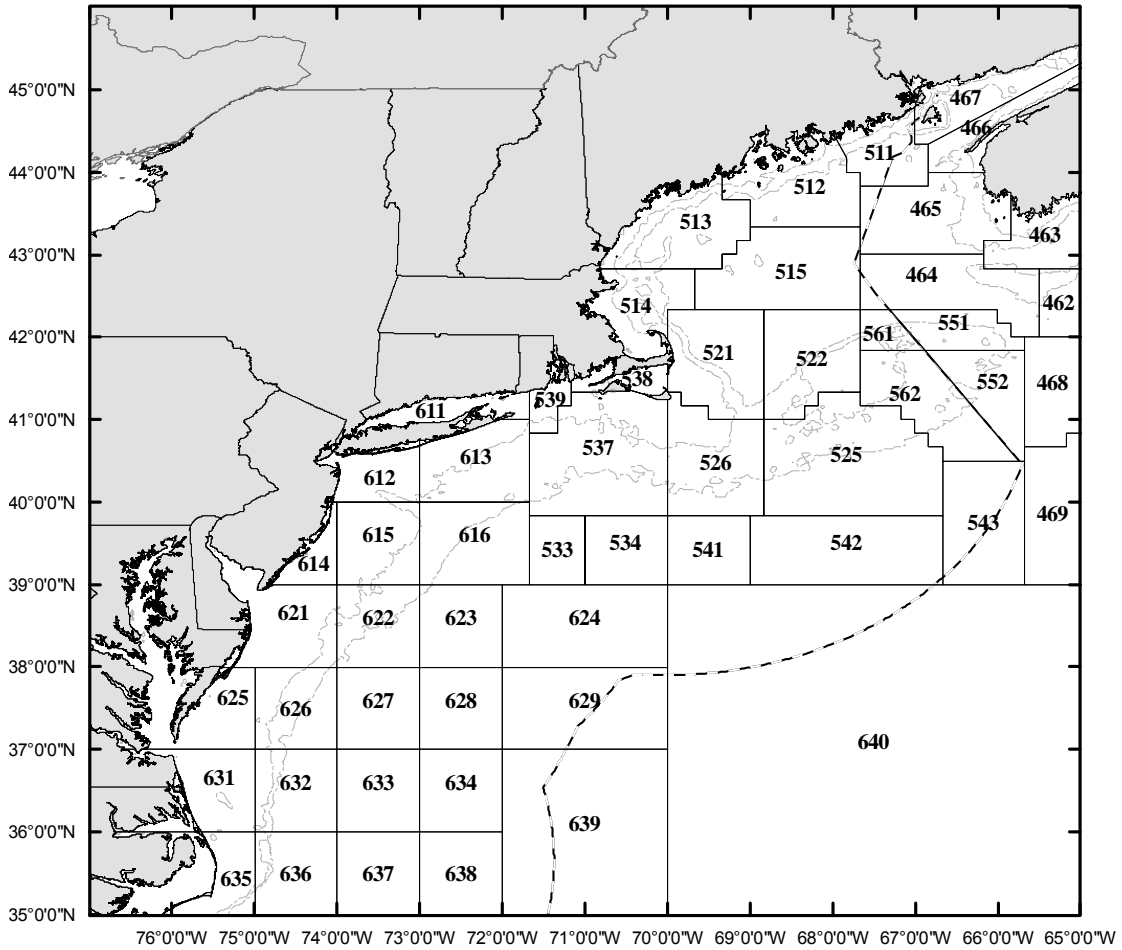


Figure 2. Statistical areas used for commercial fisheries data collection by the National Marine Fisheries Service in the Northeast Region. The 50, 100 and 500 fa bathymetric lines are shown in light gray and the U.S. Exclusive Economic Zone is indicated by the dashed black line.

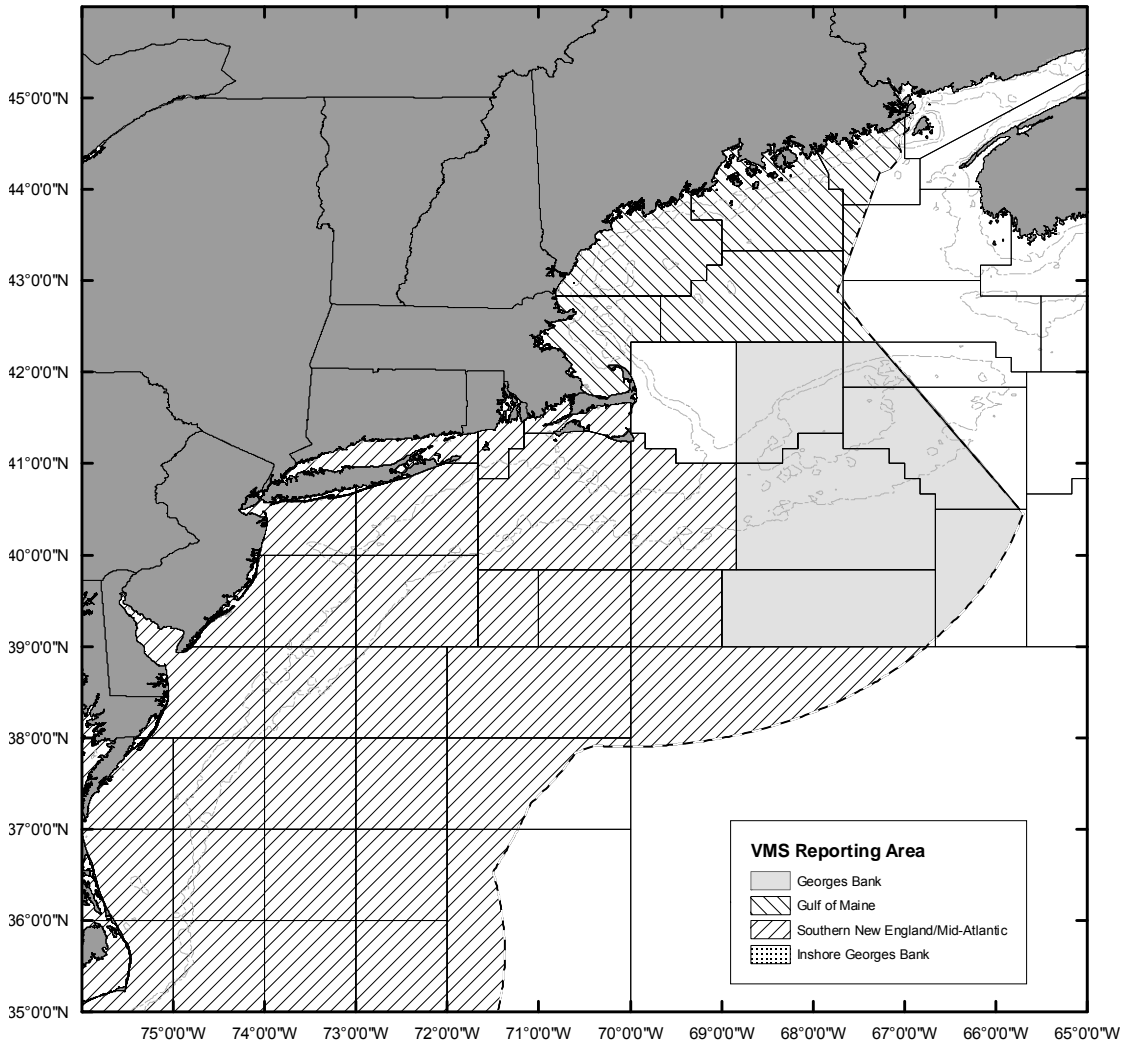


Figure 3. VMS Reporting Areas for the groundfish fishery implemented by Amendment 16.

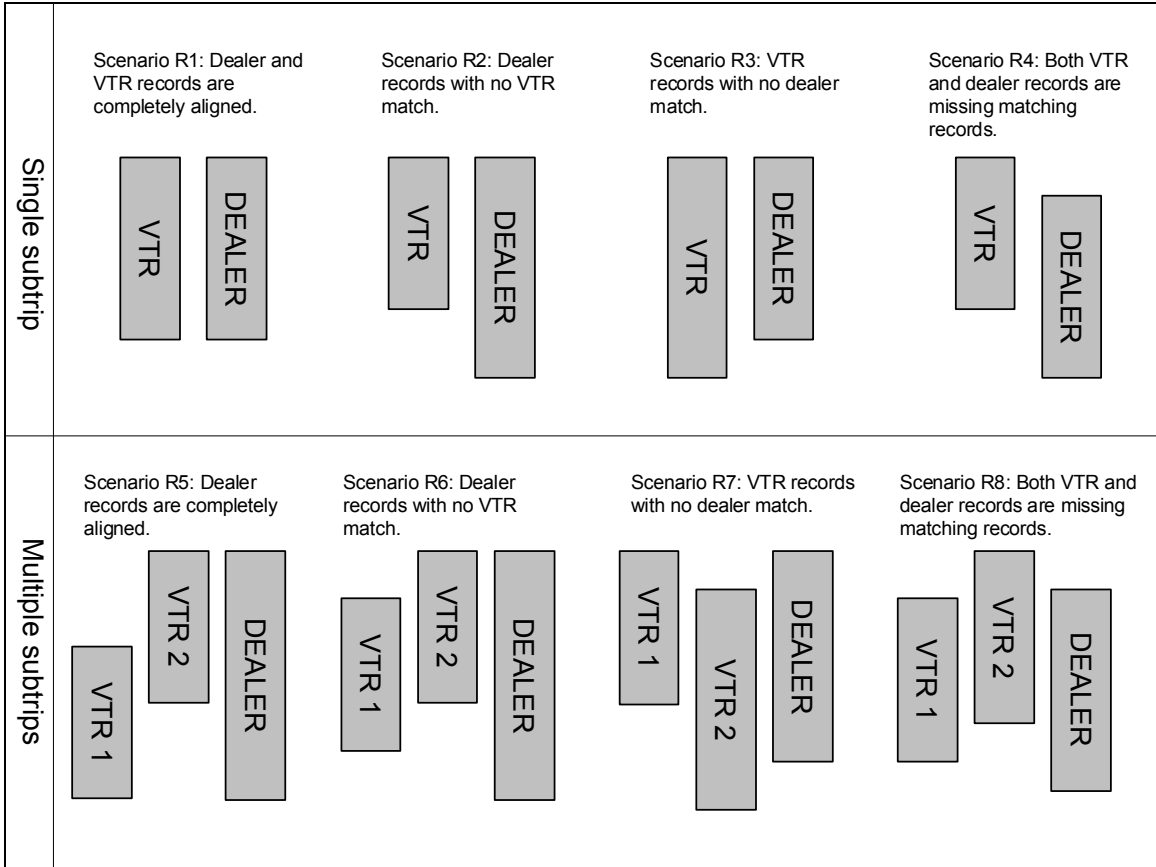


Figure 4. Agreement scenarios for matched trips between the Vessel Trip Report (VTR) species landing records and dealer landing records where species landings records do not completely match. These scenarios also apply to matches between Vessel Monitoring (VMS) catch reports and dealer landing reports in situations where VTR reports are not available (Scenario M3 in the described apportionment methodology).

Appendix A. Apportioning Groundfish Landings to Stock Area Using Dealer and Vessel Reports

**This example uses a multi-statistical area VTR as an example of a vessel report, however, vessel reports can be either VTRs or VMS catch reports. The example shown illustrates how to apportion dealer landings to statistical area when more than one statistical area is fished on a trip; however, this same method can be used to apportion dealer landings to gear type/mesh size when multiple gear types/mesh sizes are used on a trip.*

Step 1: Determine the percentage of species caught in each statistical area based on the VTR.

- a) Convert VTR reported retained catch amount to their live weight equivalent in pounds.
 - Multiply column D by columns E and F to get live weight equivalents (column G).
- b) Determine the percentage of the total species catch caught in each statistical area.
 - Divide column K (total species catch from all statistical areas) by column G to get species % by statistical area (column L)

VTR report (statistical area 514)

H	I	A	B	C	D	E	F	G	K	L
Dealer permit number	Dealer name	Species	FVTR code	Units	Retained quantity	Unit conversion factor	Live weight conversion factor	Live weight (lb)	VTR total live weight (lb)	Species % by statistical area
1234	The Fish Co.	Atlantic cod	COD	lb	200	1.00	1.00	200	500	40.0
1234	The Fish Co.	Haddock	HADD	lb	610	1.00	1.00	610	650	93.8
1234	The Fish Co.	Monkfish, tails	MONKT	lb	10	1.00	3.32	33	33	100.0
1234	The Fish Co.	Spiny dogfish	DGSP	lb	350	1.00	1.00	350	350	100.0
1234	The Fish Co.	Winter flounder	FLBB	lb	200	1.00	1.00	200	200	100.0
99998	Home consumption	Witch flounder	FLGS	lb	15	1.00	1.00	15	15	100.0
1234	The Fish Co.	Yellowtail flounder	FLYT	lb	75	1.00	1.00	75	175	42.9
Total								1483	2444	60.7

VTR report (statistical area 521)

H	I	A	B	C	D	E	F	G	K	L
Dealer permit number	Dealer name	Species	FVTR code	Units	Retained quantity	Unit conversion factor	Live weight conversion factor	Live weight (lb)	VTR total live weight (lb)	Species % by statistical area
1234	The Fish Co.	Atlantic cod	COD	lb	300	1.00	1.00	300	500	60.0
1234	The Fish Co.	Haddock	HADD	lb	40	1.00	1.00	40	650	6.2
1234	The Fish Co.	Scallops	SCALB	bu	1	8.00	8.33	67	67	100.0
1234	The Fish Co.	Winter skate, wings	SKWINW	lb	200	1.00	2.27	454	454	100.0
1234	The Fish Co.	Yellowtail flounder	FLYT	lb	100	1.00	1.00	100	175	57.1
Total								961	2444	39.3

Step 2: Calculate the live weight equivalent of the dealer reported landings.

- a) Convert dealer reported landings amount to their live weight equivalent in pounds.
- Multiply column E by columns F and G to get live weight equivalents (column H).

Dealer report submitted by The Fish Co.

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>
Species	Market category	Grade category	Units	Landed quantity	Unit conversion factor	Live weight conversion factor	Live weight (lb)
Atlantic cod	Scrod	Gutted	lb	480	1.00	1.17	562
Haddock	Large	Gutted	lb	660	1.00	1.14	752
Monkfish	Unknown	Tails	lb	40	1.00	3.32	133
Scallops	11-20 count	Meats	lb	9	1.00	8.33	75
Spiny dogfish	Unknown	Gutted	lb	317	1.00	1.20	380
Winter flounder	Large	Round	lb	205	1.00	1.00	205
Winter skate	Unknown	Wings	lb	500	1.00	2.27	1135
Yellowtail flounder	Small	Round	lb	180	1.00	1.00	180
Total							3422

Step 3: Calculate the total dealer landings by statistical area and the total K_{all} by statistical area.

- a) Calculate the dealer landings by statistical area
 - Multiply column C (from step 2, column H) by column D (step 1, column L) to get dealer landings by statistical area in their live weight equivalents (column E)

- b) Determine dealer K_{all} by statistical area
 - Sum total dealer species landings by statistical area (column E) to get dealer K_{all} by statistical area (column F).

- c) Determine total K_{all}
 - Add any non-dealer landings from the VTR reports (e.g., home consumption; step 1, column G) to the dealer K_{all} (column F) to get total K_{all} by statistical area (column H)

Dealer landings by statistical area							
<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>
Species	Statistical area	Dealer amount (live wt. lb)	VTR statistical area percentage (%)	Total landings by statistical area (live wt. lb)	Dealer Kall dealer (lb)	Non-dealer Kall (lb)	Total Kall (lb)
Atlantic cod	514	562	40	224.8			
Haddock	514	752	93.8	705.4			
Monkfish	514	133	100	133.0			
Scallops	514	75	0	0.0			
Spiny dogfish	514	380	100	380.0	1725.4	15.0	1740.4
Winter flounder	514	205	100	205.0			
Winter skate	514	1135	0	0.0			
Yellowtail flounder	514	180	42.9	77.2			
Atlantic cod	521	562	60	337.2			
Haddock	521	752	6.2	46.6			
Monkfish	521	133	0	0.0			
Scallops	521	75	100	75.0			
Spiny dogfish	521	380	0	0.0	1696.6	0.0	1696.6
Winter flounder	521	205	0	0.0			
Winter skate	521	1135	100	1135.0			
Yellowtail flounder	521	180	57.1	102.8			
Total					3422.0	15.0	3437.0

Step 4: Calculate the total landed catch (K_{species}) and the K_{all} (needed to estimate discards when trip is not observed) for each groundfish stock being monitored.

- a) Calculate total stock landings from dealer reported landings by statistical area and add any non-dealer landings if there were any reported on the VTR.
- Use the NEFSC standard lookup table to determine which statistical areas correspond to each species stock area and then sum dealer landings by statistical area (step 3, column E) to calculate the total landings by stock area (column C) in live weight (lb).
 - Sum up any non-dealer landings by species/stock area reported on the VTR (step 1, column G) and add to the dealer landings by stock area.
- b) Determine the stock K_{all} for each groundfish stock being monitored (needed to calculate discards for unobserved trips).
- Use the NEFSC standard lookup table to determine which statistical areas correspond to each species stock area and then sum the total K_{all} by stock area (step 3, column H) across stock areas to calculate the total species/stock K_{all} (column D). **This must be done on a species/stock basis because stock area boundaries differ from species to species.*

Groundfish stock area totals (only the 14 stocks for which ACE will be allocated in 2010 are included here*)**

A	B	C	D	E	
Species	Stock	Landed catch (live wt. lb)	Total species/stock Kall (live wt. lb)		Notes
Haddock	Gulf of Maine	705.4	1740.4		
	Georges Bank	46.6	1696.6		
Atlantic cod	Gulf of Maine	224.8	1740.4		
	Georges Bank	337.2	1696.6		
Pollock	Unit	0.0	3437.0		
White hake	Unit	0.0	3437.0		
Acadian redfish	Unit	0.0	3437.0		
Yellowtail flounder	Cape Cod/Gulf of Maine	180.0	3437.0		
	Georges Bank	0.0	0.0		
	Souther New England/Mid-Atlantic	0.0	0.0		
Winter flounder	Gulf of Maine	205.0	1740.4		
	Georges Bank	0.0	0.0		
American plaice	Unit	0.0	3437.0		
Witch flounder	Unit	15	3437.0		Home consumption; from VTR report

Appendix B. Example of a Quota Monitoring Report Using the Uncertainty Categories

Sector: Sector A

Quota monitoring report for the week ending: September 4, 2010

Stock: Gulf of Maine Atlantic cod

Statistical areas: 511, 512, 513, 514, 515

Landings estimates

Trip Type	Tier Code	Trip match	Record match	Species	Stock	Landings (lb)
S		1 VTR	R1	Atlantic cod	Gulf of Maine	10,000
S		1 Permit, month, day	R1	Atlantic cod	Gulf of Maine	1,520
S		1 Permit, month, day	R3	Atlantic cod	Gulf of Maine	60
S		2 None		Atlantic cod	Gulf of Maine	500
S		3 None		Atlantic cod	Gulf of Maine	850
M		1 VTR	R1	Atlantic cod	Gulf of Maine	12,000
M		4 VTR	R1	Atlantic cod	Gulf of Maine	500
M		1 None		Atlantic cod	Gulf of Maine	120
M		2 None		Atlantic cod	Gulf of Maine	80
Total						25,630

Kall landings to estimate unobserved discards

Trip Type	Tier Code	Trip match	Record match	Gear	Landings (lb)
S		1 VTR	R1	Trawl	25,000
S		1 VTR	R1	Gillnet	6,000
S		1 Permit, month, day	R1	Gillnet	400
S		1 Permit, month, day	R3	Gillnet	8,200
S		2 None		Trawl	10,500
S		3 None		Gillnet	60,000
M		1 VTR	R1	Trawl	5,000
M		4 VTR	R1	Trawl	6,000
M		1 None		Trawl	2,000
M		2 None		Trawl	400

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