Standardized Bycatch Reporting Methodology
Proposed 2009 Observer Sea Day Allocation
Consultation and Prioritization Process
Response to Comments from New England and Mid Atlantic Fishery Management Councils and the Northeast Regional Office

Northeast Regional Coordinating Committee
April 1, 2009

I. Introduction

The Northeast Fisheries Center Science (NEFSC) and the Northeast Regional Office (NERO) have received comments on the 2009 Standardized Bycatch Reporting Methodology (SBRM) sea day prioritization from the New England Fisheries Management Council (MAFMC) and the Mid-Atlantic Fisheries Management Council (MAFMC). The Northeast Regional Office also provided comments and requested background information. The 2009 SBRM prioritization of sea days was presentation to the Councils during February 9-12, 2009 as required by the SBRM Omnibus Amendment due to the shortfall in sea days for the April 2009 to March 2010 sea day schedule. The updated SBRM analysis indicated that 15,124 sea days will be required to achieve a 30% CV in the federally fisheries prosecuted in the New England (NE) and Mid-Atlantic (MA) regions. There is a total of 6,161 funded sea days. In addition, there are 122 days from the 2008 sea day schedule that could not be allocated in 2008. These have been added to the allocation to 2009 in the Mid-Atlantic region.

In this report we provide a summary of the feedback received, specific responses to the comments, and additional rationale for the existing allocations and where appropriate, the proposed revisions.

II. Summary of comments received

Several general themes were apparent in the comments. First, coverage levels in the Mid Atlantic are much lower than in New England because of funding constraints that restrict deployment of observers to fisheries to fleets that catch NE groundfish species. Dedicated funds for Mid Atlantic coverage will only allow 1,020 days between April 1, 2009 and March 31, 2010. Second, concerns were expressed about the coverage levels for fleets that take smaller species, notably those that take small mesh multispecies groundfish, butterfish, and loligo. Third, coverage for discards in fleets that target herring were a concern as well. Finally, reductions in the coverage rates for compliance monitoring under SAP, B days, and US-Canada monitoring were a concern of the NERO. In the following sections we provide more details on the specific comments.

1) The NEFMC is concerned that too many observer days might have been allocated to the NE large-mesh mixed trawl fishery and that these days could be better used to cover other fishing modes. If there are excess days or unused days under any fishing mode, these days should be reassigned to fishing modes that catch small-mesh species such as whiting and herring. NEFMC

is developing and/or has plans to develop amendments to the fishery management plans (FMP) associated with these two species and considers their reliable future estimates of discards an important priority.

2) The MAFMC has a general concern that proposed sea sampling intensity for the fisheries in the Mid-Atlantic region will not be sufficient to obtain an acceptable CV for bycatch for most species groups. Small-mesh trawl fisheries in SNE and MA regions are of particular concern. MAFMC requests that NEFOP sampling of small-mesh trawl fisheries in the northeast region be conducted at a level that results in acceptable levels of precision about the estimates of butterfish bycatch in the *Loligo* fishery. Parenthetically we wish to emphasize that the '*Loligo fishery*' is a sub-fleet of the SBRM MA small-mesh otter trawl fleet. The '*Loligo fishery*' is defined based on the outcome of the trip, which is inconsistent with SBRM fleet definition.

3) The NERO commented that the report would be improved if more information was provided to explain the basis for the proposed prioritization, particularly for fleets for which the proposed observer coverage differs substantially from the levels indicated by the 'Available coverage with shortfall applied proportionally' column of the original allocation table. The fleets mentioned are:

1) **NE large-mesh gillnet**
   (proposed 680 days; proportional 76 days; SBRM 187 days)
2) **MA small-mesh gillnet**
   (proposed 0 days; proportional 470 days; SBRM 1,155 days)
3) **NE large-mesh otter trawl**
   (proposed 1,978 days; proportional 502 days; SBRM 1,233 days)
4) **NE small-mesh otter trawl**
   (proposed 129 days; proportional 1640 days; SBRM 4,027 days)
5) **NE Mid-water trawl**
   (proposed 123 days; proportional 176 days, SBRM 433 days)
6) **NE small-mesh trawl**
   (proposed 129 days; proportional 1640 days; SBRM 4,027 days).
7) **MA small-mesh trawl**
   (proposed 225; proportional 609 days, SBRM 1,495 days)
8) **SAP/B-DAS/US-CAN** (proposed 1,940 days) and **NE large-mesh otter trawl**
   (proposed 1,978 days)

The NERO requested justification for the proposed days in the NE Mid-water trawl and expressed concern that this coverage was not adequate. The NERO is also concerned about number of proposed days in the NE and MA small-mesh otter trawl fleets and expressed the need for sufficient coverage to monitor the butterfish cap in Amendment 10. Concern was also expressed that the proposed days for SAP/B-DAS/US-CAN may not be sufficient and NERO requested an explanation of the interactions between this fleet and the NE large-mesh otter trawl fleet.

III. Response to comments

Funding Issues

Regardless of how the funded sea days are assigned among the Mid-Atlantic fleets, 1,020 funded sea days are insufficient to meet the SBRM needed 7,290 days for the 15 species groups. A similar situation exists in the New England region, although not to the extent as the Mid-Atlantic. In New England, 3,141 funded sea days are insufficient to meet the SBRM needed 7,835 days for the 15 species groups. (We note that the 1,940 days allocated for SAP/B DAS and US-Canada monitoring and 60 discovery days are not included in the analyses of potential effects on reducing the variability of discards. Total DAS in New England fisheries is the sum of the 3,141 and 1,940 or 5,081 days). The shortfall in the Mid-Atlantic region has been an on-going issue since the beginning of the sea sampling program in the late 1980's. In addition to the shortfall associated with each region, there are also constraints associated with the funding restricting its use to a particular region. These restrictions limit re-distribution of sea days among the two regions. Many of the concerns expressed in the comments are directly related to a lack on funding. It would be desirable if additional unrestricted funds could be obtained to support the SBRM Omnibus Amendment which supports all FMPs. An important topic of discussion, but one that cannot be addressed here, is the roles and responsibilities of NRCC agencies to identify funding sources or admissible changes in funding allocations.

Compliance Issues

Another factor contributing to the limitations of sea day assignment is the need to meet multiple objectives: bycatch monitoring of individual species (fish and turtles) and quota-monitoring of hard TACs. SBRM focuses on monitoring to achieve acceptable measures of precision. Quota monitoring and monitoring for compliance with regulations is more challenging since increased coverage may be necessary to ensure more frequent reports of discards rates. Monitoring rates for compliance with regulations, say B-Days, 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. Therefore these requirements are treated in a more ad hoc fashion. Owing to the difficulties of identifying the vessels which are participants in the SAP/B-DAS/US-Canada fisheries in the VTRs, it is not possible to uniquely identify the implications of the current sea day allocation of 3,000 days for these programs. However, it is important to emphasize that the discard observations obtained for these fisheries are included in the stock assessments. We cannot rigorously estimate discard totals for vessels that are being monitored for compliance from those which are monitored for precision.

Notwithstanding these concerns, we recognize the importance of having a sea-day allocation program oriented towards compliance issues. The current call-in program is well established and could serve as a model for future monitoring programs for sectors. Similarly, because we cannot currently evaluate the implications of a drastic cutback in this program on the precision of discard estimates or the ability to monitor quotas, we recommended a modest reduction of 33% to 2000 days from the previous 3000 days. The consequences of this reduction should be monitored in 2009-10 with a renewed emphasis on adequate linking of the databases (Observer

and VTR) and an evaluation of the sampling requirements necessary for real-time estimation of quotas as in the US-Canada groundfish fisheries.

Relationship between the SBRM Allocation and Optimization Methods

The SBRM focuses on 15 species groups and derives sea day requirements for 45 fleets based on the relative variability (Coefficient of variation or CV) of estimates for these species groups. A filtering algorithm is used to reduce the coverage for fleets whose landings or discards represent a small fraction of the total fishing mortality imposed on a species group. In other words, it is a broad brush approach. In contrast the optimization model operates at a finer scale of resolution—temporally, spatially and with respect to fleet stratification. However its application is restricted to a smaller set of species groups (NE groundfish, summer flounder, scup and black sea bass, and monkfish) and fewer gear types. One consequence of this finer resolution is that it can lead to higher coverage rates to improve estimation in a particular cell whose variance may be masked by aggregation at the higher SBRM level of resolution. A side-by-side comparison of the SBRM and Optimization methods is provided below.

Factor	**Optimization**	**SBRM**
Temporal Scale	Quarterly	Annual
Spatial Resolution	6 subregions	2 regions
Trip Length	Not considered	Two groups for otter trawl and gill net
Mesh size	3 mesh groups for otter trawl and gill net	2 mesh groups for otter trawl and gill net.
Number of Species Groups	Three	Fifteen groups(14 fish, 1 turtle)
Number of gears	Three: Longline, Otter trawl, Gill net	Fifteeen (44 fleets)

Ultimately, the optimization tool used needs to be expanded from three species groups and three gear groups to 15 species groups and 13 gear groups. This expansion is a major undertaking and work in on-going to address this limitation.

Distinctions between Fisheries and Fleets

The sea-day allocation process relies on the identification of strata, e.g., groups of vessels in a particular port and quarter, based on observable properties before the vessel begins fishing. The list of vessels with these observable properties can be used to generate a random sample. Moreover, these observable properties can be used to identify the total size of the strata and the landings from the unobserved fraction of the fleet. Together, the random sample and observations from the unobserved fleet allow for estimation of total discards. In contrast, properties of vessels that are the result of the fishing activity, e.g., the mix of species landed, are not known in advance and cannot be used for allocating sampling effort. It is not possible to allocate observers to yellowtail flounder trips or Loligo trips, nor is it possible to identify the

necessary expansion factors based on post trip identification of these same outcomes. For example is a loligo trip one that catches 50% loligo by weight or 75% or some other value? At best an allocation program that operates at a multi-fleet level, can improve the chances of obtaining estimates of discards of some species of interest. It can never ensure it unless all vessels are monitored.

Plan development teams and other groups charged with crafting monitoring programs will often base their results on analyses of species or stock specific information. Such analyses are often at a finer level of resolution than can be considered in the SBRM. For the aforementioned reasons, the estimated sample sizes will be underestimates since they fail to consider the fact that sending an observer on a vessel that often catches or intends to catch a certain species does not ensure that a trip will provide useful information.

Methods for Dealing with Observer Coverage Shortfalls

The proposed 2009 SBRM sea day prioritization combines the results of various statistical analyses (SBRM and Optimization), historical precedents (Compliance monitoring), and recommendations from PDTs (e.g., herring). Modifications of the initially proposed allocations require further consideration of all three approaches. It is important to recognize that the allocations from one fleet to another will act to improve the precision of the fleet receiving additional coverage and degrade the precision of discard estimates for one or more species in fleets that donate days.

Possible options for dealing with observer coverage shortfalls include

1) No revisions, use original optimization (accept optimization)
2) Use proportional allocation (disregard optimization)
3) Adjust the proposed sea day prioritization using an ad-hoc approach informed by the expected precisions attainable by species groups using both the optimization and the SBRM sea days analyses and constraints imposed by regionalized funding.

IV. Summary of revised sea days and associated consequences of revisions, by fleet.

MA Small-mesh Gillnet (Row 8) The proposed 0 days have not been revised. There are an additional 192 days (protected species coverage) which will provide for some turtle coverage. The SBRM 1,155 days are solely for turtles (all fish species groups were filtered out by the Importance filter).

> Consequences: The 192 days exceeds the 162 proportionally assigned days with funding constraints. The 192 days is lower than the 470 days proportionally assigned without funding constraints and is substantially lower than the SBRM 1,155 days.

NE Large-mesh Gillnet (Row 9) The proposed 680 days have been revised to 225 days. There are an additional 134 days (protected species coverage) which will provide for turtle coverage. The combined total days exceeds the SBRM 187 days.

Consequences: This maintains funding constraints and is very similar to the 76 proportionally assigned sea days without funding constraints. The 75 days exceeds the 60 days for large-mesh groundfish (the penultimate species group); while the 359 days (225 days + 134 days) exceeds the 187 days needed for turtles (the ultimate species group).

Cautionary note: The 225 days is less than the 680 days assigned by the optimization which minimizes the overall variance among the many fleets composed the three sub-regions and 2 trip length categories in the New England region. However optimization results suggested that variations at finer scales were important and overall CVs could be reduced by increased coverage.

NE Mid-Water Trawl (Row 19) The proposed 123 days have been increased to 433 days which is the level recommended to achieve a 30% CV for the spiny dogfish. All other species would have CV lower than 30%.

Consequences: The 433 days should provide improved estimates of the variance of discards for all species.

NE Small-Mesh Trawl (Row 21) The proposed 129 days have been increased to 1,019 days, based on the proportionally assigned days with funding constraints. The optimization model did not consider the discards of fluke, scup and sea bass in NE so the previous estimate of 129 days was probably too low.

Consequences: This revision maintains funding constraints and is similar to the 1,640 proportionally assigned sea days without funding constraints. The 1,019 days are substantially lower than the SBRM 4,027 days needed for fluke-scup-black sea bass (the ultimate species group). However 1,019 approaches the 1,448 days needed for dogfish (the penultimate species groups) and exceeds the sea day needs of all other species groups.

MA Small-Mesh Trawl (Row 22) The proposed 225 days have been increased to 347 days by using 122 days left over from the 2008-09 sea days. This transfer of coverage is a one time transfer; a long-term reallocation of this magnitude will require additional allocation for Mid Atlantic monitoring.

Consequences: This allocation addresses concerns raised by the MAFMC but does not achieve target level of precision except for skates. The 347 days is substantially lower than the SBRM 1,495 days needed for turtles (the ultimate species group) as well as for small-mesh groundfish (1,242 days), dogfish and monkfish (623 days), fluke-scup-black sea bass (456 days) and skates (294 days). All other species groups are filtered out by the Importance Filter.

NE Large-Mesh Trawl (Row 23) The proposed 1,978 days have been revised to 1,233 days; This level of coverage achieves the required SBRM coverage for 30% CV for small mesh groundfish. All other species groups would have CVs lower than 30%.

Consequences: This allocation is expected to overlap with coverages implemented as part of the SAP/B DAS/US-Canada coverages. This will tend to enhance the precision of all species when these fleets are incorporated into stock assessments.

Cautionary note: The 1,233 days are less than the 1,978 days assigned by the optimization which minimizes the overall variance among the many fleets composed the three sub-regions and 2 trip length categories in the New England region.

SAP/B DAS/US-CAN (Row 40) The proposed 1,940 days have not been revised.

Consequences: Analyses of sea day requirements, based on an approximate method suggested that coverage was sufficient for cod and yellowtail flounder but deficient for haddock. High number of days for haddock may be reflective of the size limit problems in 2007-08 when the slow growing 2003 year class was just entering the legal size fishery. Reductions in the size limit and continued growth of this year class may reduce this problem. See Appendix A.

Table 1. Standardized Bycatch Reporting Methodology Prioritization Information, April 2009 to March 2010, based on data from July 2007 to June 2008. (REVISED MARCH 2009).

	Fishing Mode	Updated Omnibus Amendment Preferred Alternative: 95% of Discards & 98% of Mortality	Available Coverage with shortfall applied proportionally	***Available Coverage with shortfall applied proportionally within funding contraints***	Prioritized April 2009 - March 2010 Coverage (Original presented Feb. 2009)	***Prioritized April 2009 - March 2010 Coverage REVISED March 2009***
1	NE Clam Dredge	46	19	19	0	0
2	MA Clam Dredge	122	50	17	0	0
3	NE Crab Pot	70	29	28	0	0
4	MA Crab Pot	28	12	4	0	0
5	NE Fish Pot	17	7	7	0	0
6	MA Fish Pot	28	11	4	0	0
7	NE Small-mesh Gillnet	12	5	5	0	0
8	MA Small-mesh Gillnet	1,155	470	162	0	0
9	NE Large-mesh Gillnet	187	76	75	680	225
10	MA Large-mesh Gillnet	139	57	19	0	0
11	NE X-Large-mesh Gillnet	171	69	68	34	34
12	MA X-Large-mesh Gillnet	1,273	519	178	55	55
13	NE Handline	44	18	18	0	0
14	MA Handline	80	32	11	0	0
15	NE Lobster Pot	430	175	172	0	0
16	MA Lobster Pot	69	28	10	0	0
17	NE Longline	456	186	183	104	104
18	MA Longline	108	44	15	0	0
19	NE Mid-Water Trawl	433	176	173	123	433
20	MA Mid-Water Trawl	41	17	6	12	12
21	NE Small-mesh Trawl	4,027	1,640	1,614	129	1,019
22	MA Small-mesh Trawl	1,495	609	209	225	347
23	NE Large-mesh Trawl	1,233	502	494	1,978	1,233
24	MA Large-mesh Trawl	1,459	594	204	655	655
25	NE Purse Seine	24	10	10	71	71
26	MA Purse Seine	10	4	1	44	44
27	NE Scallop Dredge OL	254	103	102	IF	IF
28	MA Scallop Dredge OL	398	162	56	IF	IF
29	NE Scallop Dredge CL	233	95	94	IF	IF
30	MA Scallop Dredge CL	271	110	38	IF	IF
31	NE Scallop Dredge OG	43	18	17	6	6
32	MA Scallop Dredge OG	167	68	23	29	29
33	NE Scallop Dredge CG	26	11	10	IF	IF
34	MA Scallop Dredge CG	36	15	5	IF	IF
35	MA Scallop Trawl OL	97	39	14	0	0
36	MA Scallop Trawl OG	39	16	5	0	0
37	NE Scottish Seine					
38	NE Shrimp Trawl	61	25	24	16	16
39	MA Shrimp Trawl	80	33	11	0	0
40	SAP/B day/US-CAN				1,940	1,940
41	Discovery				60	60
42	NE Conch Pot & Trap	14	6	6	0	0
43	MA Conch Pot & Trap	15	6	2	0	0
44	NE Hagfish Pot & Trap	55	22	22	0	0
45	MA Hagfish Pot & Trap	106	43	15	0	0
46	MA Scallop Trawl CG	27	11	4	0	0
47	MA Scallop Trawl CL	46	19	6	0	0
	Total Number Days	*15,125*	*6,161*		*6,161*	*6,283*
	Projected Cost	$18,149,520	$7,393,200		$7,393,200	

OL= Open Area, Limited Access ; CL= Closed Area, Limited Access; OG= Open Area, General Category; CG=Clo

NE region	7,835		3,141	3,141	3,141
MA region	7,290		1,020	1,020	1,142
Residual days from 2008-09			122		
total check	**15,125**		**4,283**		**4,283**

Table 2. Summary of recommended changes in sea day allocation from Feb 2009 report to Council.

Fishery	***Initial Sea Day Allocation***	***Revised Sea Day Allocation***	***Comment/ Rationale***
MA Small-mesh Gillnet (Row 8)	0	0	192 days are allocated for protected species coverage. Coverage requirement of 1,115 is based solely on turtles. All fish species are excluded based on importance filter in SBRM.
NE Large-mesh Gillnet (Row 9)	680	225	In addition to the recommended coverage, 134 days are added for turtle coverage. The combined total of 359 days exceeds the total based on SBRM for all species except turtles. The 225 days allocated for fish species exceeds the 60 days needed for groundfish and all other fish species. However optimization results suggested that variations at finer scales were important and overall CVs could be reduced by increased coverage.
NE Mid-Water Trawl (Row 19)	123	433	Reallocation increased to cover overall SBRM requirement. This will provide improved basis for estimating variance of discard rates for all species.
NE Small-Mesh Trawl (Row 21)	129	1,019	Achieves a less than 30% CV for large mesh groundfish and small mesh groundfish based on SBRM. The optimization model did not consider the discards of fluke, scup and sea bass in NE so the previous estimate of 129 days was probably too low.
MA Small-Mesh Trawl (Row 22)	225	347	This total includes 122 days left over from the 2008-09 allocation that originally targeted the large mesh otter trawl fishery in New England. This transfer of coverage is a one time transfer.
NE Large-Mesh Trawl (Row 23)	1,978	1,233	Represents SBRM coverage for 30% CV of small mesh groundfish. All other species groups would have CVs lower than 30%.
SAP/B DAS/US-CAN (Row 40)	1,940	1,940	No changes proposed. Analyses of sea day requirements, based on an approximate method suggested that coverage was sufficient for cod and yellowtail flounder but deficient for haddock. High number of days for haddock may be reflective of the size limit problems in 2007-08 when the slow growing 2003 year class was just entering the legal size fishery. Reductions in the size limit and continued growth of this year class may reduce this problem. See Appendix A.

A Revised Sea Day Schedule will provide to Fisheries Sampling Branch (FSB) by April 3, 2009 and will subsequently be posted on the FSB website
http://www.nefsc.noaa.gov/femad/fishsamp/fsb/

Appendix A

'Back-of-the-envelope' calculation of precision and sample size of US/CAN SAP Catch

TACs exist for Cod, Haddock and YT in the US/CAN Resource Sharing Area

(1) $C_j = K_j + D_j$

(2) $Var(C_j) = Var(K_j) + Var(D_j)$

where C_j = catch of species j, K_j = kept landings of species j, and D_j = discards for species j. Kept landings have always been assumed a census, thus can assume Var(K) = 0

In the SBRM, discards are estimated using a combined ratio estimator as given below:

Total discarded pounds for species j and the discard variance is defined as:

(3) $$\hat{D}_{2,j} = \sum_{h=1}^{L} K_h r_{c,j}$$

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

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

Coefficient of variation of $D_{2,j}$ hat is defined as:

(6) $$CV(\hat{D}_{2,j}) = \frac{\sqrt{V(\hat{D}_{2,j})}}{\hat{D}_{2,j}}$$

where $D_{2,j}$ hat is total discarded pounds for species j;
K_h is VTR total kept pounds in stratum h; $r_{c,j}$ is the combined ratio of species j; d_{jih} is discards of species j from trip i in stratum h; k_{ih} is kept pounds of all species on trip i in stratum h;
N_h is the number of VTR trips in stratum h; n_h is the number of observed trips in stratum h.
In Eq 2 the summation over strata h = 1 to L is over calendar quarters and the other strata values are held constant.

Issue

The Dealer and VTR databases do not contain information needed to identify US/CAN SAP trips and this prevents these trips from proper stratum assignment (e.g. $\mathbf{N_h}$ and $\mathbf{K_j}$ is not known for Eq 3, 4, and 5)

The RO's Fisheries Statistics Office has been notified of this issue. The SBRM approach can not be used for this SAP until the RO's Fisheries Statistic Office provides the needed information.

Back-of-the-envelope work-around

As a surrogate, use the discard ratio and its associated variance based only observer data where trips can be adequately identified (call-in but never fish in US/CAN, etc).

$$(7)\quad \hat{R}_{jh} = \frac{\sum_{i=1}^{n_h} d_{ijh}}{\sum_{i=1}^{n_h} k_{ih}}$$

$$(8)\quad V\left(\hat{R}_{jh}\right) = \frac{1}{n_h \bar{k}_h^2}\left[\frac{\left(\sum_{i=1}^{n_h} d_{ijh}^2\right) + \hat{R}_{jh}^2\left(\sum_{i=1}^{n_h} k_{ih}^2\right) - 2\hat{R}_{jh}\left(\sum_{i=1}^{n_h} d_{ijh}k_{ih}\right)}{(n_h - 1)}\right]\left[\frac{N_h - n_h}{N_h}\right]$$

where R_{jh} is the bycatch rate of species group j in stratum h; d_{ijh} is the discards for species group j within trip i in stratum h; k_{ih} is the kept weight, in pounds, of all species within trip i in stratum h; n_h is the number of observed trips in stratum h, N_h is the number of VTR trips in stratum h

The number of trips necessary to achieve a 30% CV for species group j in stratum h is defined as

$$(9)\quad \hat{T}_{jh} = \frac{N_h\left(\frac{n_h N_h}{N_h - n_h}\right)V(\hat{R}_{jh})}{(0.09)\hat{R}^2 N_h + \left(\frac{n_h N_h}{N_h - n_h}\right)V(\hat{R}_{jh})}$$

Issue: Can not use Eq. 9 given to estimate the number of trips because we do not know N_h

Back-of-the-envelope work-around

A simplified estimator for the number of trips necessary to achieve target CVs is provided in Gabriel and Fogarty 2005. Their method was used to approximate the consequences of alternative coverage rates on the CV of discard to kept ratios for cod, haddock and yellowtail flounder.

To translate trips into sea days, average trip length is multiplied by number of trips. Thus the number of sea days necessary to achieve a 30% CV for species group j in stratum h is defined as

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

where DA_h bar is the average trip length of VTR trips in stratum h.

Data used and Summary

Northeast Fisheries Observer Program observed trips with program code = 130 (US/CAN SAP) during July 2007 to June 2008. Three species were evaluated: Cod, haddock and yellowtail flounder. The number of trips and sea days needed to achieve a 30% CV are given in Table A-1. The potential number of US/CAN SAP sea days over a range of overlap scenarios are given in Table A-2. The quarterly relationships between precision (CV) and sample size (trips) for cod, haddock and yellowtail flounder are given in Figure A-1.

- Surrogate method indicates approximately 2,000 sea days are needed to achieve a 30% CV on catch (assume landings are known with variance = 0) with exception of haddock. Haddock needs approximately 4,600 days, however, that ay have been management changes that occurs during July 2007 to June 2008 that has not been accounted for in the stratification (the use of a quarterly time step may not be appropriate if management regulations changed mid-quarter).

- Assume some overlap in sea days between NE large-mesh otter trawl and US/CAN SAP will occur.

- 2,000 sea days could be achieve for US/CAN SAP assuming a 5% or more overlap in sea days occurred between NE large-mesh otter trawl and US/CAN SAP fleets.

Recommendations

Improve data collection systems of VTR, DEALER and VMS
Effective trip identifier is needed
Clean, accurate data is needed

Table A-1. Number of trips and sea days needed to achieve a 30%CV based on the variance of the discard to kept ratio.

Number of trips needed to achieve a 30% CV

TRIPS	Q1	Q2	Q3	Q4	Annual
Cod	49	32	53	73	207
Haddock	76	188	192	140	596
YT	62	37	62	60	221

Number of sea days needed to achieve a 30% CV

DAYS	Q1	Q2	Q3	Q4	Annual
Cod	377	246	408	562	1,594
Haddock	585	1,448	1,478	1,078	4,589
YT	477	285	477	462	1,702

If 65 trips per quarter were observed, representing 2,002 sea days

CV achieved	Q1	Q2	Q3	Q4
Cod	26	21	27	32
Haddock	32	51	51	44
YT	29	22	29	28

Table A-2. Number of sea days that may occur for US/CAN for a range of overlap scenarios between US/CAN and NE large-mesh otter trawl fleets.

Number of sea days over a range of overlap scenarios

Sea Days	100%	75%	50%	25%	10%	5%
NE large-mesh Otter Trawl	1,233	925	617	308	123	62
US/CAN SAP	1,940	1,940	1,940	1,940	1,940	1,940
Potential US/CAN SAP	3,173	2,865	2,557	2,248	2,063	2,002

Figure A-1. CV and sample size relationship for cod (top), haddock (middle), and yellowtail flounder (bottom) in US/CAN SAP based on NEFOP data from July 2007 to June 2008.

Black curves represent quarterly relationship between CV and number of trips; red horizontal line indicates 30% CV; blue vertical lines indicate the 35 to 65 trip range where, for most quarters, a 30%CV is achieved. Haddock is the exception where approximately 75 to 200 trips are needed.

Cod

Haddock

Yellowtail Fld.