Industry-Funded Monitoring Omnibus Amendment

Herring Supplement To the Draft Environmental Assessment

New England Fishery Management Council Herring Advisory Panel and Herring Oversight Committee Meetings June 1-2, 2016

Prepared by NOAA's National Marine Fisheries Service

1.1 OBSERVER COVERAGE IN 2015

The table below describes Northeast Fisheries Observer Program (NEFOP) coverage by gear type. Revisions to the Standardized Bycatch Reporting Methodology (SBRM) in April 2015 affected how funding is used to allocate observer coverage. Therefore, the level of observer coverage during 2015 may be more indicative of future observer coverage levels than observer coverage levels from previous years.

2015 Midwater Trawl[1], Purse Seine[2], and Small Mesh Bottom Trawl[3] Observer Coverage Rates

Gear	Observer Coverage[4]
Midwater Trawl	4.7%
Purse Seine	2.5%
Small Mesh Bottom Trawl	9.1%

Source: DMIS and ODBS databases as of 2016-05-21

[1]Midwater Trawl: Includes both single and paired midwater trawl gears

[2]Purse Seine: Includes all purse seine gears (including tuna)

[3]Small Mesh Bottom Trawl: Includes bottom trawl gear w/codend mesh size less than 5.5" excluding bottom otter twin trawl, scallop and shrimp trawl trips

[4]Includes observer trips w/at least 1 observed haul divided by VTR trips reporting kept catch

1.2 MONITORING CATCH CAPS IN THE HERRING FISHERY

The proposed observer coverage levels in the Atlantic herring fishery described in Herring Alternatives 2.1 and 2.2 of the Industry-Funded Monitoring (IFM) Omnibus Amendment were evaluated with regard to their impact on Haddock and River Herring/Shad (RHS) Catch Cap catch estimate precision. Only fishing years (FY) when catch caps were implemented were included in the analysis. The Haddock Catch Cap analysis includes 2011-2015 fishing and the RHS Catch Cap analysis includes 2014-2015 fishing years. The FY2015 data for these catch caps are not finalized, and should be considered preliminary. Herring discards were not evaluated. Herring discards are generally a small component of the overall herring catch. Herring discards are estimated by extrapolating discards from observed hauls only. In recent years, herring discards have accounted for well less than 1% of the total herring catch.

The Atlantic herring fishery currently has six catch caps: (1) Haddock: Georges Bank (GB) Midwater Trawl, (2) Haddock: Gulf of Maine (GOM) Midwater Trawl, (3) RHS: Cape Cod (CC) Midwater Trawl, (4) RHS: GOM Midwater Trawl, (5) RHS: Southern New England (SNE) Bottom Trawl, and (6) SNE Midwater Trawl. The GB and GOM Haddock Catch Caps were implemented through Groundfish Framework 46 in 2011, which separated the previous existing Haddock Catch Cap into GB and GOM stock areas and adjusted the estimation methodology to the current extrapolation method. Herring Framework

Adjustment 3 implemented RHS Catch Caps for 2014-2015 that were effective on December 4, 2014. The Haddock Catch Caps operate on a May-April Fishing Year, while the RHS Catch Caps operate on a January-December Fishing Year. For RHS Catch Caps, trips landing greater than 6,600 pounds of herring are counted against an individual catch cap, depending on the gear and area of the trip. For Haddock Catch Caps, all midwater trawl trips in GB and GOM are counted against the catch caps.

Catch cap estimates in the Atlantic herring fishery are comprised of both incidental kept and discard components. Current quota monitoring methodology for these catch caps employs the cumulative method to extrapolate incidental catch (kept and discard) to the fleet based on a ratio estimator (incidental catch divided by total catch) derived from Northeast Fisheries Observer Program (NEFOP) data. Only observed trips are used to derive the ratio estimator. Fleet kept all (KALL) is obtained from vessel trip reports (VTR) and dealer data, which provides effort information (gear and area) and landings information respectively. Actual observed incidental catch amounts are used in lieu of estimated incidental catch amounts whenever possible.

This analysis uses the same data sources as quota monitoring. However, this analysis focuses strictly on the precision of the incidental catch ratio estimator in each catch cap, and does not incorporate the replacement of actual observed values for estimated incidental catch based on the ratio estimator (described above). Furthermore, this analysis is constrained to trips that count towards a specific catch cap (e.g., RHS cap trips must land >6,600 pounds of herring regardless of gear). Trips that would not be count against a catch cap are not included in the analysis. The coefficient of variation (CV), defined for this analysis as the ratio of the standard error of total catch (incidental kept and discards) to was used to quantify the precision of the estimated catch. The CV is sensitive to sample size. In a finite population, the CV will converge to zero as the sample size approaches the population size. The total fishing trips within a stratum is considered finite, therefore, as sampling coverage approaches 100%, the CV will converge to zero for that stratum. The CV analysis follows the guidelines detailed by the SBRM and uses the trip as the sampling unit. Only observed trips (trips with at least one observed haul) and trips reporting kept catch on their VTR were used in the CV analysis. This distinction is important to understand when interpreting observer coverage rates (referred to below as "realized" observer coverage) because in the paired midwater trawl fishery it is not uncommon for wing vessels to carry observers and but not carry any catch. These trips would not be reflected in the observer coverage rates described in this analysis. Furthermore, trips that did not yield any observed hauls are excluded from this analysis.

The At-Sea Monitor (ASM) as defined by the IFM Amendment will collect both retained and discarded catch composition in a manner consistent with existing NEFOP protocols. Therefore it is assumed that there will be no difference in the catch composition data collected by NEFOP observers and ASMs under Herring Alternatives 2.1 and 2.2. This analysis uses NEFOP data as a proxy for potential future ASM coverage estimate simulations. Also, observer and ASM coverage targets proposed in the IFM Amendment are additive, so simulated CV estimates based on proposed coverage targets assume both SBRM and IFM coverage will contribute to the target.

Table 1 and Figure 1 summarize the CV calculated according to SBRM methodology as well as the realized observer coverage for each catch cap during the years when catch caps were in place. For each year and catch cap, the CV and the realized observer coverage in italics are shown in Table 1. Although there is no defined CV target, a 30% CV was provided for context. The GB Haddock Catch Cap remained below a CV of 30% for all years except for 2015, while the GOM haddock had a CV of 0% for all years because no GOM haddock catch was observed. The RHS Catch Cap CVs are more variable, but it is difficult to infer a trend based on the limited data. Table 1 and Figure 1 characterize the history of catch cap estimate precision produced from NEFOP coverage (Herring Alternative 1). It must be noted that due to the implementation of RHS catch caps in late 2014, most of the 2014 effort was not subject to the RHS Catch Cap. Furthermore, the 2015 GB Haddock Catch Cap was closed in October, effectively truncating the May-April fishing year.

TABLE 1. HERRING CATCH CAP CV AND OBSERVER COVERAGE, 2011-2015

Catch Cap Fishery	Fishing Year[1]: CV (Observer Coverage)				
	2011	2012	2013	2014	2015[3]
Haddock: GB Midwater Trawl	17.6% *(41.7%)*	12.3% *(62.9%)*	21.3% *(35.6%)*	20.5% *(27.2%)*	61.4% *(4.9%)***
Haddock: GOM Midwater Trawl	0.0% *(30.4%)*	0.0% *(29.2%)*	0.0% *(34.8%)*	0.0% *(46.3%)*	0.0% *(8.6%)*
Herring-RHS: CC Midwater Trawl				36.2% *(48.0%)**	81.4% *(10.1%)*
Herring-RHS: GOM Midwater Trawl				37.3% *(50.0%)**	94.8% *(8.7%)*
Herring-RHS: SNE Bottom Trawl				28.4% *(17.4%)**	24.5% *(15.0%)*
Herring-RHS: SNE Midwater Trawl				70.2% *(3.4%)**	11.8% *(2.3%)*

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April
[3]Fishing Year 2015 data are PRELIMINARY
*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014
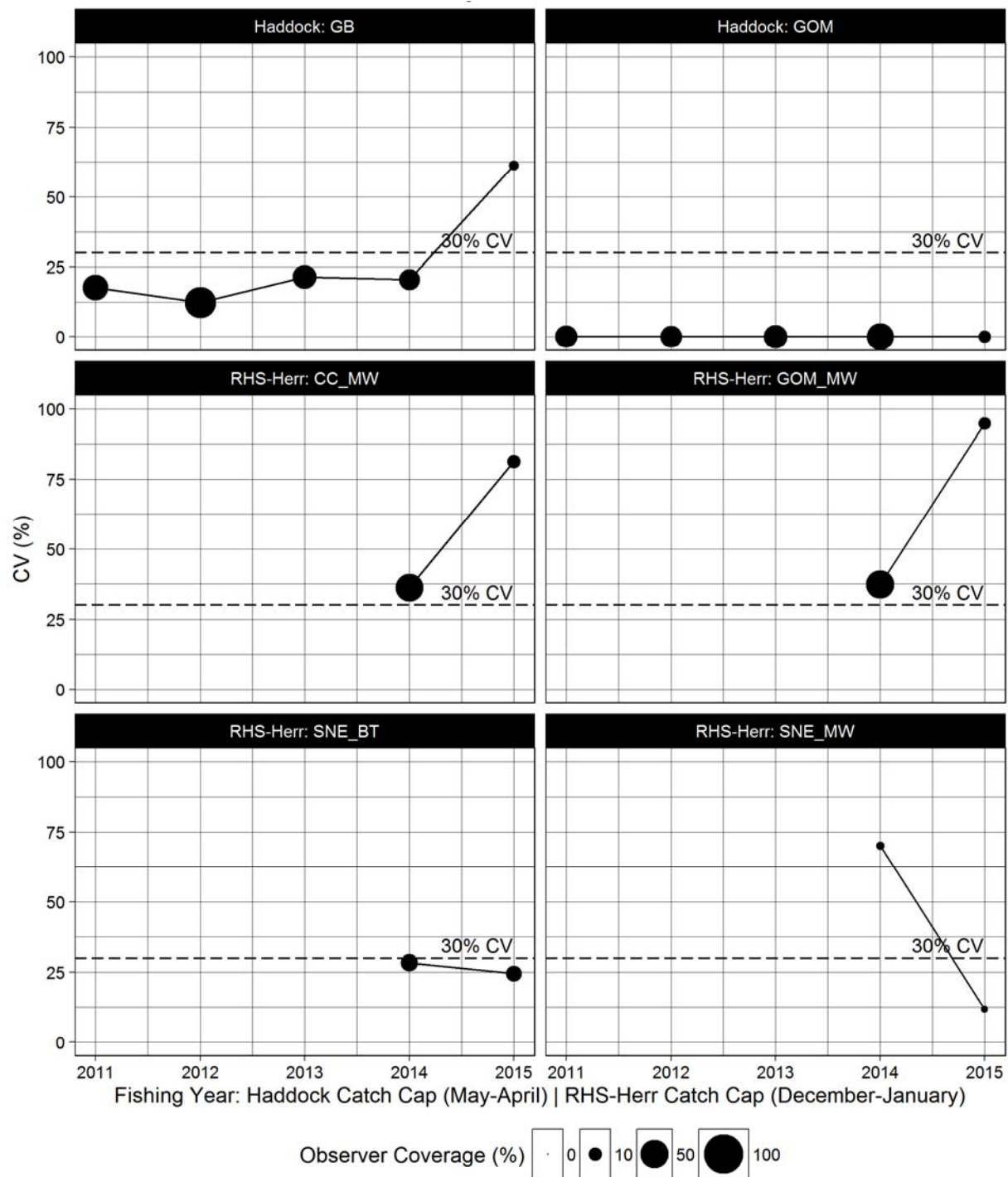**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

FIGURE 1. HERRING CATCH CAP CV AND OBSERVER COVERAGE (DOT SIZE) IN RELATION TO A 30% CV.

Figure 2 details CV curves calculated according to SBRM methodology across varying coverage levels in relation to a 30% CV. These curves are solely based on observer data within each catch cap and year

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and are estimated on those data and how observer coverage was assigned for that particular year and does not describe the potential impacts of Alternative 2.1-2.2.
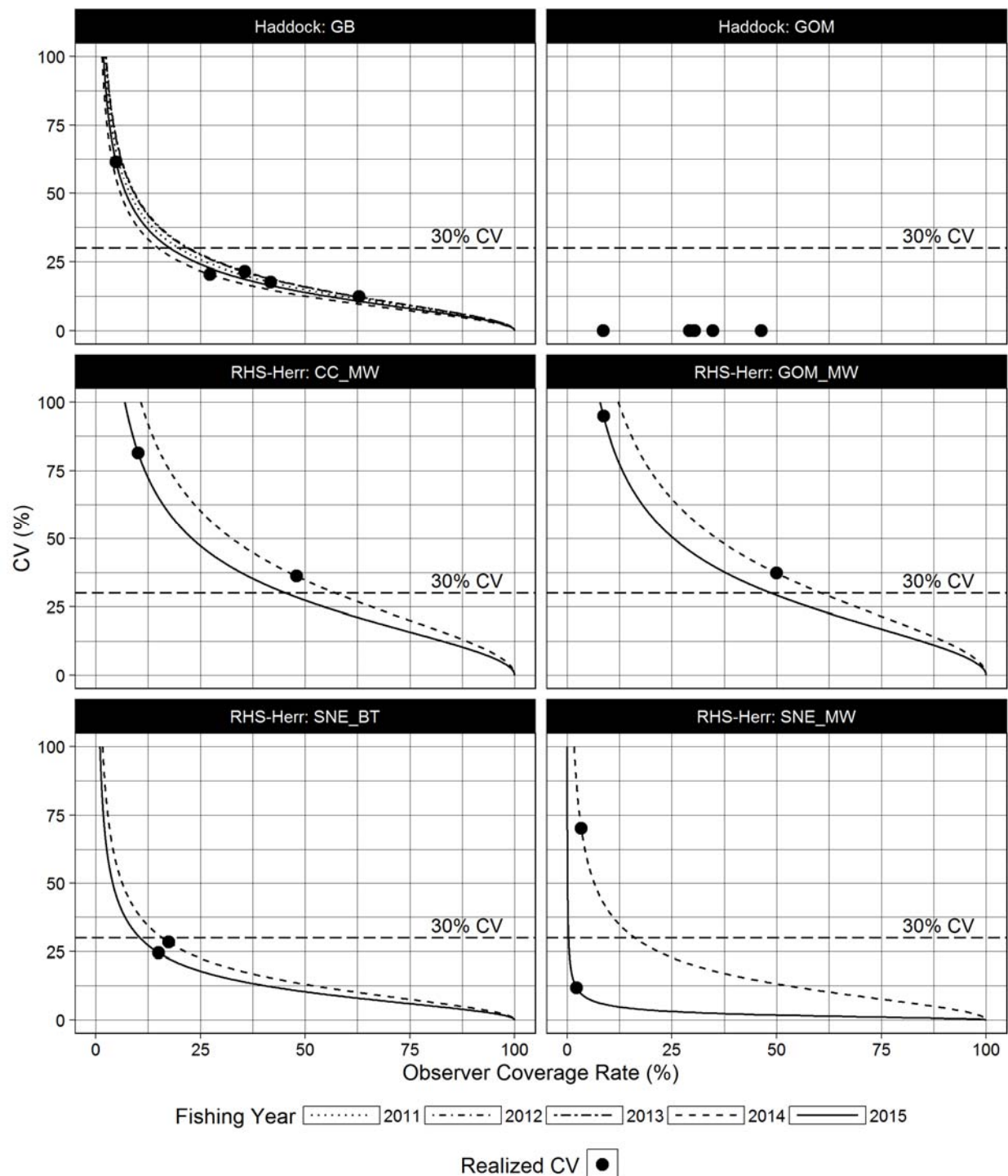
FIGURE 2. 2011-2015 DERIVED CV CURVE FOR EACH CATCH CAP BASED ON SBRM SAMPLE SIZE ANALYSIS METHODOLOGY, WITH REALIZED CV FOR EACH CATCH CAP YEAR (BLACK DOT)

Due to the structure of Herring Alternatives 2.1 and 2.2, and how coverage is being selectively assigned based on gear, permit, category, and a 25 mt landings threshold, estimated CVs based on proposed coverage levels could not be estimated formulaically according to SBRM, and instead required simulation based on resampling of observed trips. Simulations were performed for each catch cap and year and based on NEFOP observer data. Proposed coverage levels were simulated by resampling the required amount of observer trips to obtain the target coverage level based on the effort profile for a particular catch cap and year. Herring Alternatives 2.1 and 2.2 focus IFM coverage on Category A/B herring vessels. Due to this, simulated increasing coverage was confined to Category A/B vessel trips until 100% of those trips were simulated as observed. Observed non-category A/B herring vessel trips were assumed to be SBRM coverage and were fully resampled in each simulation without increasing coverage. Within each simulation, a CV was calculated for the catch cap based on the specified coverage level. This process was repeated 1,000 times for each proposed coverage level, which yielded a distribution of simulated CVs. Table 2 summarizes the mean CV from those distributions for each proposed coverage level, and Table 3 provides the simulated results if a 25 mt trip exemption existed. This process was repeated for each catch cap and year.

Due to the amount of observer data available within each catch cap different approaches were taken in order to obtain a minimum sampling pool. Haddock Catch Cap strata yielded higher numbers of observed trips within each year allowing for simulation of observed trips within each fishing year, observer data from multiple fishing years were not grouped. However, due to the GB Haddock AM closure in 2015 a small number (n<10) of observed trips were simulated. The RHS Catch Cap strata yielded smaller amounts of observed trips and needed to be combined across 2014 and 2015 into a single resampling group that was used to simulate 2014 and 2015 based on their respective effort profiles (total trips in strata for each year). Even after grouping 2014 and 2015, the RHS SNE Midwater Trawl Catch Cap had a small number (n<10) of trips to simulate. The RHS SNE Bottom Trawl Catch Cap also suffered from a small number of observed trips to simulate from when the 25 mt trip exemption was applied (this was not the case when the 25 mt trip exemption was removed).

For catch caps where all of the effort is comprised of Category A /B herring vessels, the CV should converge to zero in 100% coverage scenarios. This was the case for all catch caps confined to midwater trawl trips except for RHS SNE Midwater Trawl, which includes non-Category A/B vessels. The effect of mixed permit categories in RHS SNE Midwater Trawl Catch Cap is that proposed IFM coverage will not cover all trips in that catch cap at 100% coverage of Category A/B vessels and results in the CV not converging to zero. The effect is more pronounced in the RHS SNE Bottom Trawl Catch Cap where on average 38% of 2014-2015 trips were by non-Category A/B vessels.

The 25 mt trip exemption has a similar effect as the Category A/B permit IFM coverage criteria because it allows for a certain number of trips within each catch cap to go unobserved and therefore impacts the simulated CV. This effect is demonstrated in Table 3 and impacts all catch caps (GOM Haddock is not impacted because the CV is always zero due to no observed incidental haddock catch). The effect is much more pronounced in catch caps comprised of trips that yield smaller catches. The effect is very small in the GB Haddock Catch Cap where there trips tend to be consistently above 25 mt compared to the RHS Catch Caps where trip catches are either small or more variable.

Table 2. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage

Catch Cap	Fishing Year[1]	Simulated Mean CV (%)			
		25% Coverage	50% Coverage	75% Coverage	100% Coverage
Haddock: GB Midwater Trawl	2011	25.8%	14.8%	8.6%	0.0%
	2012	24.2%	14.9%	8.8%	0.0%
	2013	26.4%	15.5%	9.1%	0.0%
	2014	21.7%	12.5%	7.2%	0.0%
	2015[3]**	22.7%	13.1%	7.5%	0.0%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015[3]**	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	63.2%	39.5%	22.7%	0.0%
	2015[3]	62.4%	41.8%	24.9%	0.0%
Herring-RHS: GOM Midwater Trawl	2014*	64.3%	39.1%	22.8%	0.0%
	2015[3]	61.1%	35.3%	20.8%	0.0%
Herring-RHS: SNE Bottom Trawl	2014*	24.1%	17.3%	13.2%	9.8%
	2015[3]	28.0%	18.6%	13.3%	9.2%
Herring-RHS: SNE Midwater Trawl	2014*	23.0%	13.6%	8.5%	3.9%
	2015[3]	22.7%	13.1%	7.5%	0.0%

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April
[3]Fishing Year 2015 data are PRELIMINARY
*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December, 4 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

Table 3. Alternative 2.2: Simulated mean CV at 25%, 50%, 75% and 100% ASM coverage with 25 mt trip exemption

Catch Cap	Fishing Year[1]	Simulated Mean CV (%)			
		25% Coverage	50% Coverage	75% Coverage	100% Coverage
Haddock: GB Midwater Trawl	2011	25.4%	15.0%	8.9%	2.4%
	2012	24.8%	15.4%	9.7%	4.0%
	2013	26.1%	15.5%	9.3%	2.2%
	2014	22.2%	12.9%	7.6%	2.2%
	2015[3]**	23.1%	13.5%	8.1%	2.7%
Haddock: GOM Midwater Trawl	2011	0.0%	0.0%	0.0%	0.0%
	2012	0.0%	0.0%	0.0%	0.0%
	2013	0.0%	0.0%	0.0%	0.0%
	2014*	0.0%	0.0%	0.0%	0.0%
	2015[3]**	0.0%	0.0%	0.0%	0.0%
Herring-RHS: CC Midwater Trawl	2014*	61.9%	39.7%	23.4%	4.5%
	2015[3]	63.7%	42.0%	24.2%	5.0%
Herring-RHS: GOM Midwater Trawl	2014*	62.8%	41.8%	25.8%	11.5%
	2015[3]	63.6%	39.8%	25.0%	13.4%
Herring-RHS: SNE Bottom Trawl	2014*	24.2%	17.5%	14.1%	11.5%
	2015[3]	24.8%	19.3%	15.4%	12.6%
Herring-RHS: SNE Midwater Trawl	2014*	32.5%	21.7%	16.2%	12.4%
	2015[3]	34.3%	22.1%	15.9%	11.5%

Source: GARFO Quota Monitoring Database as of 5/22/2016
[1]Catch cap fishing year: river herring/shad = calendar year; haddock = May-April
[3]Fishing Year 2015 data are PRELIMINARY
*2014 Herring RHS fishing year partially covered by RHS Catch Caps which was implemented on December 4, 2014
**2015 GB Haddock fishing year truncated due to the closure of the GB Haddock AM Area on October 22, 2015

Figures 3 and 4 detail the simulation results by year and catch cap. The dotted line represents the mean simulated CV based on increasing Category A/B vessel coverage, while the solid line indicates the same simulation with the 25 mt trip exemption applied. The grey area around the solid and dashed lines represents the two standard error envelope around the mean simulated CV. It is important to understand that these are simulated CVs, therefore by their nature there is a range of resulting CVs for each coverage rate. The variability of the simulated CV (expressed by the standard error) is related to the variability of the underlying incidental catch data. The overlap (black dots on Figures 3 and 4) between the realized CV for these catch caps and the range of simulated CVs is a good indicator of that variability. All realized CVs fell within +/- 2 standard errors of the mean simulated CV, which implies the simulation is reasonable within that margin of error. For catch caps, the realized CV does not closely track the mean simulated CV. This effect is likely due to underlying variability in incidental catch data and/or small numbers of observed trips. The simulated GOM Haddock CV Catch Cap was not shown because no haddock catch was observed from 2011-2015.

Overall, the GB Haddock Catch Cap, RHS SNE Bottom Trawl, and RHS SNE Midwater Trawl catch caps yielded a mean simulated CV < 30% for all simulated years at or below a 25% coverage rate.

The performance was nearly identical under the 25 mt trip exemption option with the exception of RHS SNE Midwater Trawl Catch Cap, which shows the simulated mean CV slightly increase above 30%. RHS CC Midwater Trawl and RHS GOM Midwater Trawl Catch Caps were the only catch caps that clearly did not reduce below 30% at a 25% observer coverage rate. Given the broad range in the simulated CV for these caps (wide standard error envelope) it is difficult to draw strong conclusions from these results. Furthermore the relatively short (2 years) worth of data available from the RHS Catch Caps adds to this difficulty.

The simulated CV results must be interpreted as an estimate of what may happen in the future based on existing information. The simulations were based on past fishing behavior and observed incidental catch from within the catch caps. Therefore, they may not hold if either factor changes in the future.
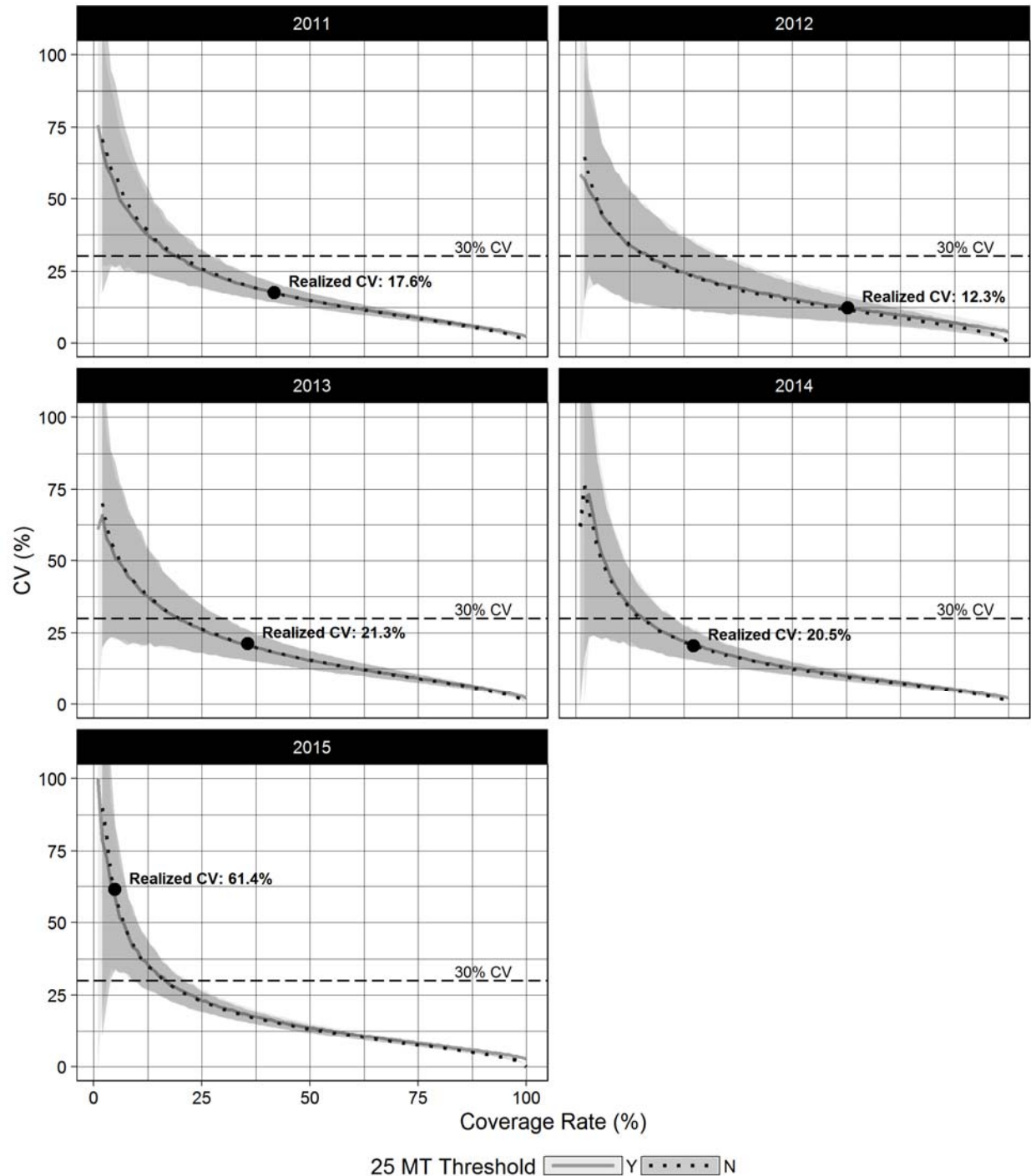
FIGURE 3. 2011-2015 SIMULATED GB HADDOCK CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.
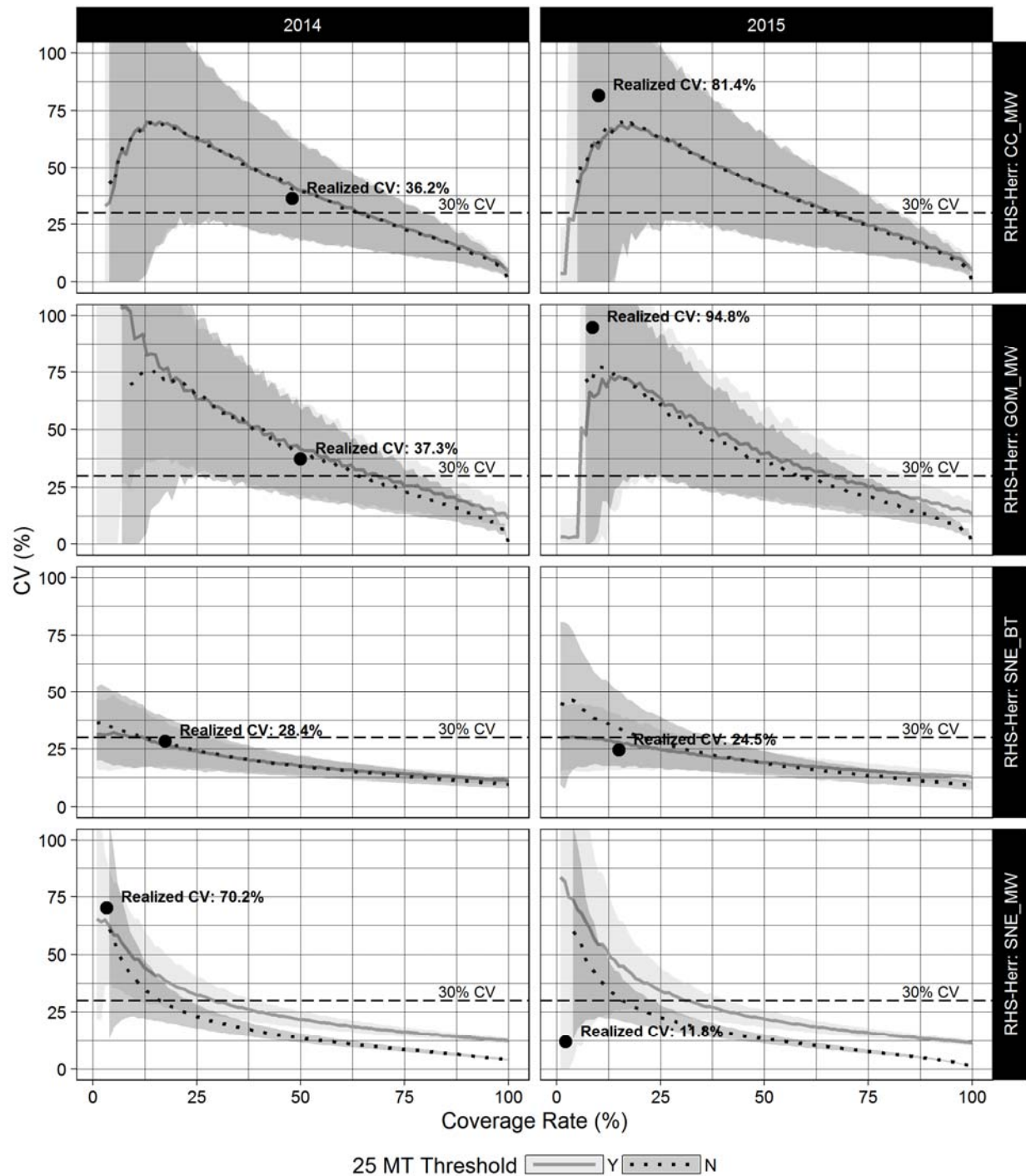
FIGURE 4. 2014-2015 SIMULATED RHS CATCH CAP MEAN CV (+/- 2 STANDARD ERRORS) IN RESPONSE TO INCREASING OBSERVER COVERAGE ON CATEGORY A/B HERRING VESSELS, WITH REALIZED CV FOR EACH FISHING YEAR (BLACK DOT). INCLUDES 25 MT TRIP EXEMPTION OPTION.