

Draft working paper for pre-dissemination peer review only

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**Review of the Coefficient of Variation (CV) for the Moving Average
Discard Estimation Methodology**

*Fisheries Statistics Office
Northeast Region
National Marine Fisheries Service*

A working paper in support of the Discard Estimation Methodology Review

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Review of the Coefficient of Variation (CV) for the Moving Average Discard Estimation Methodology

This analysis reviews the CV of the discard estimate for a moving average methodology that was considered for estimating discards for the groundfish fishery under Amendment 16 starting May 1, 2010. Discard rates were estimated using observer data and applied to groundfish Vessel Trip Report (VTR) data. CVs were calculated for several moving average periods for the Georges Bank (GB) yellowtail flounder (YT) fishery.

Data Sources

Observer Data: Groundfish observer data from the Observer Database Management System were used in this analysis including trip landing date, the sum of all species landed and sum of yellowtail discarded. Hauls were selected that towed during the groundfish fishing year 2008 (FY08) in the GBYT stock area (statistical areas 522, 525, 551, 552, 561, 562) and used large mesh otter trawl gear (northeast gear codes 050, 056, 059, 052, 054, 057). The YT discarded was non-regulatory discards only (excluding fish disposition codes 014, 063). Four hundred six (406) trip records were selected having total non-regulatory YT discards of 29 metric tons (T) and total kept-all of 3,299 T.

VTR Data: Vessel trip report data used in this analysis including last catch sold date during the trip and the sum of all species landed. Selected trips sold during FY08 and fished in the GBYT stock area (statistical areas 522, 525, 551, 552, 561, 562) and used large mesh otter trawl gear (VTR gear codes PTB, OTO, OTC, OTR, OTF, OHS). Thirteen hundred thirty-three (1,333) trip records were selected, having total kept-all of 13,261 T.

Methodology

Estimated Discard Mean

The point estimate of the mean discard was calculated by applying moving average discard rates to the VTR kept-all. Self-weighted moving average discard rates were calculated by dividing the sum of the YT discards by the sum of the kept-all for all 406 trips using actual observed landing dates within the N-day moving average period. The result was discard rates that varied by day over the fishing year. This series was run for each N. The discard rates were multiplied by the VTR kept-all by date sold, and the discards summed to estimate total discards. This was the denominator in the CV calculation.

Estimated Discard Variance

The discard variance was estimated using a Monte Carlo simulation model to generate random discard estimates based on bootstrap resampling of both observed trips and fleet trip landings. The model was run for a number of moving average periods of N days.

Observed trips were assigned random dates with replacement within their landing month. Self-weighted moving average discard rates were calculated by dividing the sum of the YT discards by the sum of the kept-all for observed trips using random observed landing dates within the N-day moving average period. The result was discard rates that varied by day over the fishing year being fed into a simulation run.

To force an observer coverage rate of 0.30, six observed trips were randomly removed from the observer data set, resulting in 400 observed trips used in each bootstrap sample.

During the first N days of the simulated fishing year the moving average was not used, rather just one discard ratio of the sum of the observed YT discarded divided by the sum of the observed kept-all was calculated and applied to the first N days of the simulated fishing year. The model was run for N between 2 and 50.

If in the moving average a day had no observed trips to calculate the discard ratio an assumed rate was used. The assumed rate of 0.88% was the overall rate large mesh GBYT discard rate in FY08.

Independently of the randomly assigned landing dates of the observed trips, fleet VTR trips were also randomly assigned dates sold (with replacement) during the same month of the actual date sold. The simulated discard ratio for each date was applied to each trip to generate a trip estimated discard. The estimated discards for the trips were summed and stored as a bootstrap sample of the estimated fleet YT discard.

Ten thousand (10,000) bootstrap iterations were run for each N. All random numbers were from Microsoft Excel version 2002 SP3 uniform pseudorandom number generator. The estimated variance of the discards was calculated as the variance of the 10,000 bootstrap discards.

Estimated Discard CV

The estimated discard CV for each N-period moving average could then be calculated as the square root of the variance divided by the point estimate of the mean fleet discard.

Results

Figure 1 shows CVs declining from 14.6% to 3.3% as N rises from 2 to 50. Even though they are not directly comparable, in general the CVs are low compared to GBYT large mesh CV calculated in the 2009 Stock Assessment¹. Some preliminary runs of the model implied that this may be due to the seasonality assumption constraining the trips to be within their month. The pooling methods used by the Assessment scientists pooled within six month periods, allowing an observed trips to impact all fleet trips within a six month period rather than the one to two month periods in the moving average method. This reasoning would have to be investigated if it is to be confirmed.

Assumptions

The primary assumption of this analysis is that the groundfish fleet will behave in FY10 similarly to FY08. This includes that sector vessels under Amendment 16 will not generally have legal trip limits and therefore are assumed to not have the related regulatory discard.

This analysis also assumes seasonality within each month. It's assumed that trips discard YT and keep commercial species differently from month to month.

This analysis also assumes the same number of fleet trips in FY10 as in FY08 and that observer coverage will be 0.30.

Works Cited

Legault, C. M., Alade, L., and Clark, K. J. *Stock Assessment of Georges Bank Yellowtail Flounder for 2009* (Transboundary Resources Assessment Committee (TRAC), Unpublished Working Paper, 2009), p. 20

Coefficient of Variation (CV) by N

Large Mesh Georges Bank Yellowtail Flounder Estimated Discards, N-Period Self-Weighted Moving Average Method

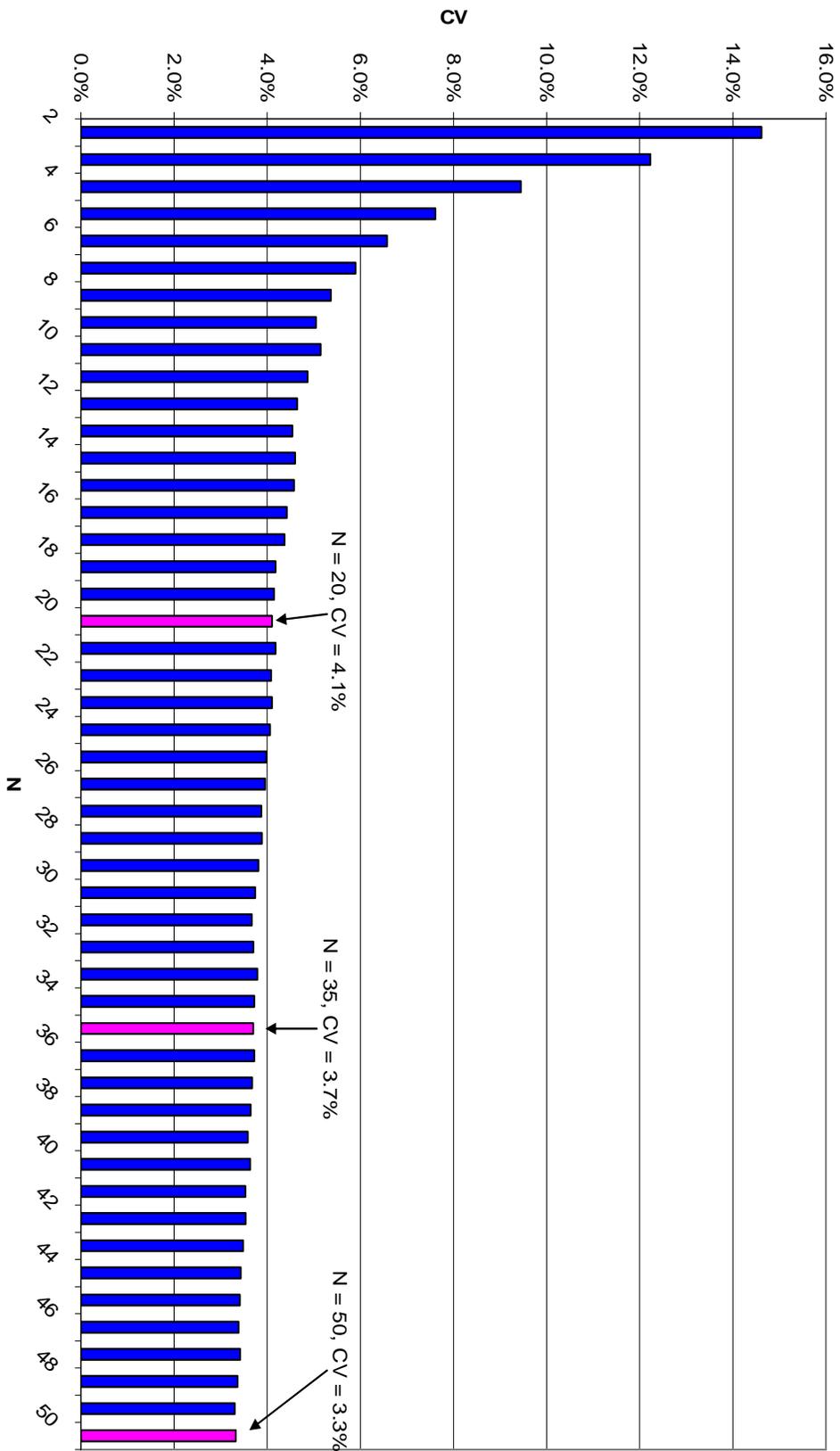


Figure 1