

**NMFS Report: EM Guidelines and Manual
Prepared by NMFS West Coast Regional Office
PFMC Meeting, March 2-11, 2021**

NMFS is providing this report to support the Council's review and discussion of the draft 2021 Electronic Monitoring (EM) Program Guidelines and Manual at its March 2021 meeting. This agenda item is intended to satisfy the requirements of the regulations at 50 CFR 660.600(b) for NMFS to consult with the Council on the Guidelines and the level of video review, a component of the Manual. This report summarizes the current status of the draft documents. This report also details NMFS's proposal for how EM service providers would conduct the primary review¹ of the EM video and sensor data for fixed gear and bottom trawl trips, including the sampling rate (level of video review), sampling unit, and EM-to-logbook comparison business rules. Following this Council meeting, NMFS will finalize and post the documents to our website and publish notice of their availability in the Federal Register.

EM Program Guidelines

NMFS has prepared draft Vessel Monitoring Plan Guidelines (VMP) and EM Service Plan Guidelines for review and input by the Council and its advisory bodies. The guidelines are intended to be used by EM service providers and vessel owners in preparing their 2021 applications to participate in the EM program in 2022. NMFS will use these guidelines to evaluate proposed service and vessel monitoring plans. It is important to note that the guidelines are not requirements, but EM service providers and vessel owners should be prepared to address the best practices and, if they do not employ them, explain why, what alternative method would be used, and why it is equivalent. In this way, the guidelines allow NMFS to consider alternative, but equivalent methods of meeting the various requirements proposed through the plans. A few notes about the documents:

- **EM Service Plan Guidelines** - the draft 2021 EM Service Plan Guidelines are unchanged from the final 2020 version published on our [website](#). NMFS did not receive any comments on the 2020 version, so no changes have been made.
- **VMP Guidelines** - the VMP guidelines were not finalized in 2020 because implementation of the EM program was delayed. The last version of the draft VMP guidelines the Council saw was in [November 2019](#). NMFS did not receive any comments on the November 2019 draft, so no changes have been made.

EM Program Manual and Video Review Protocols

NMFS last published the draft EM Program Manual on our [website](#) in July 2020. NMFS has not revised the document since that time pending finalizing protocols for the primary video review, which NMFS is consulting with the Council on at this meeting. NMFS previously outlined two possible approaches to the primary video review at the November 2019 Council meeting (see [Agenda Item H.3.a NMFS Report 4](#)) and at our [July 2020 webinar](#). Following further analysis of EM EFP data by Pacific States Marine Fisheries Commission (PSMFC), NMFS has revised its

¹ Primary video review is the video review conducted by a vessel's service provider. The secondary review is the video review conducted by NMFS.

previous recommendations for the sampling rate (aka level of video review) and the sampling unit (haul vs. trip-based), and has additional recommendations on revising the EM-to-logbook comparison business rules for the 2022 fishing year. We describe our recommendations, how they differ from previous recommendations and why, in the remainder of this report. Additional background on the video review protocol is available in the November 2019 report and is not repeated here.

Sampling Units and Rates

Shorebased Whiting, MSCV, and Non-whiting Midwater Trawl (Maximized Retention)

NMFS is recommending that shorebased whiting and non-whiting midwater trawl (maximized retention trips), and mothership catcher vessel (MSCV) trips have a 100 percent review rate. The Council’s Groundfish Electronic Monitoring Policy Advisory Committee (GEMPAC) and Groundfish Management Team (GMT) supported this recommendation at the November 2019 meeting. The Council did not comment on the level of video review at that time. Therefore, NMFS is not recommending any changes to this sampling rate.

Non-whiting Midwater Trawl (Optimized Retention), Bottom Trawl, and Fixed Gear

NMFS is recommending that non-whiting midwater trawl (optimized retention), bottom trawl, and fixed gear trips have an initial review rate of 25 percent of hauls from each trip, with a minimum of 1 haul per trip, and additional review based on performance. This is consistent with our recommendation at the November 2019 Council meeting. This recommendation was supported by the GMT and GEMPAC at that time, although the GEMPAC recommended an initial 10-25 percent review rate. The Council did not comment on the review rates at that time.

At the November 2019 GEMPAC meeting, the idea was raised that the review rate for bottom trawl, non-whiting midwater trawl, and fixed gear be based on trips rather than hauls. For example, the initial review rate would be 25 percent of trips, rather than 25 percent of hauls on each trip. This approach, dubbed “trip-based review,” would simplify the video review because it would not require haul-level matching and resolution of discrepancies between numbering of hauls in the logbook and EM data. The EM-to-logbook comparison would instead be based on total poundage for each species at the trip level. It was also thought that comparisons at the trip level would allow some smaller discrepancies between the logbook and EM data at the haul level to “cancel each other out” and, thereby, make it easier for trips to pass the logbook audit. Based on initial discussions, we revised the draft EM Program Manual to incorporate a trip-based sampling rate, rather than haul-based, in the July 2020 version. Over the course of 2020, we further discussed the trip-based approach internally and worked with PSMFC to conduct additional analysis to compare the haul and trip-based approaches. Based on those results, we are recommending against a trip-based approach and returning to our original recommendation of a haul-based approach.

Although the trip-based approach does simplify some aspects of the primary review, it raises other issues which are resolved by the haul-based approach.

- Contrary to our initial assumptions, PSMFC's analysis showed that the trip-level review was more difficult for vessels to pass than the haul-level review, and resulted in higher failure rates. 18%-39% of bottom trawl trips and 47%-69% of fixed gear trips passed the trip-based review, compared to 33%-68% of trips overall in the haul-based review. The reason for this result is not clear, but could be because more data is being compared at the trip level, leading to more discrepancies.
- Review of a subsample of hauls on each trip would be expected to be a greater deterrent against any potential observation effect than review of a subsample of trips. Even though cameras are recording on 100 percent of EM trips, the incentive against misreporting is still based on the probability of detection, which is determined by the initial sampling rate.
- Fishing behavior likely changes less within a trip than between trips. In this way, reviewing a subset of hauls on a trip would be expected to be a more accurate subsample of that trip than a subsample of trips would be of other non-reviewed trips. To address this issue, trip-based review rates would need to be further stratified to account for changes in season, depth, gear, or other metrics that would be likely to affect encounter rates with species of interest.
- In the haul-based approach, if the subsample of hauls that is reviewed does not meet criteria, then the remaining hauls of the trip are reviewed. In addition to providing more accurate estimates of discards, reviewing additional hauls from the trip provides a financial incentive for the captain to improve reporting on future trips. This incentive model is credited with the success of the EM program in British Columbia.

It is not clear how such an incentive structure could be applied in a trip-based model. If a selected trip does not meet criteria, the EM data could be used in lieu of logbook data to debit discards for that trip. But it is not clear what additional video should then be reviewed to address the data quality issues that were identified. Assuming the selected trips are a representative subsample of all trips means that there are unreviewed trips that have the same data quality issues as those that were reviewed. Providers could review previous trips by the same vessel, assuming that the problematic behavior has been present until it was identified and corrected by the provider. Using the same rationale, providers could review video forward in time of trips already taken. However, given the time lag between when trips are taken and when they are reviewed by the provider, it could be several weeks and several trips before the captain receives feedback from the review and has an opportunity to implement changes. In this way, the number of additional trips reviewed after a single trip fails the logbook audit would require trade-offs between data quality and the financial impact to the vessel, and it is not clear where the appropriate balance would be. In contrast, in the haul-based approach, each trip is evaluated on its own merits and only those trips where the initial review reveals data quality issues trigger additional review to correct those errors. Thus, the haul-based approach addresses the data quality, incentive, and fairness goals of the primary review.

For these reasons discussed above, NMFS is recommending using the haul-based approach for review of non-whiting (optimized retention), bottom trawl, and fixed gear trips.

With respect to the 25 percent initial review rate, bottom trawl trips have an average of 7-8 hauls per trip and pot gear trips have an average of 13-15 hauls per trip (based on 2018-2019 observer data). An initial review rate of 25 percent, with a minimum of one haul per trip, would result in an average of 2 and 4 hauls being selected for review per trip for bottom trawl and fixed gear, respectively. This initial review rate could provide a substantial cost savings from the video review for bottom trawl and fixed gear vessels, relative to 100 percent review, and would not undermine the quality of data used for management. PSMFC simulated 25 percent, 33 percent, and 50 percent review rates and found that there was not a substantial difference in the resulting total discard estimates (PSMFC 2017).

NMFS does not recommend a lower review rate of 10 percent at this time, as suggested by the GEMPAC in their November 2019 report. A 10 percent initial review rate would result in an average of 1 rather than 2 hauls being initially reviewed on bottom trawl trips, and 2 rather than 4 hauls on fixed gear trips, depending on the number of hauls per trip. The smaller the subsample, the higher the risk that the reviewed haul(s) are not representative of the entire trip. Given the uncertainty in how behavior will change going from 100 percent to 25 percent review, and that NMFS is also recommending changes to the business rules used for the EM-to-logbook comparison business rules in the next section, NMFS believes a more precautionary approach is necessary at this time. We believe that the 25 percent initial review rate balances the need to maintain sufficient data quality from the EM program to ensure individual accountability for catch, which is the purpose of the 100 percent monitoring required by the Trawl Program, while providing cost savings and efficiencies to participating vessels and providers, an objective of the EM program. NMFS and the Council could reconsider the initial review rate for a future fishing year, once data from the new less-than-100-percent sampling regime is available for analysis.

We want to caution the Council and fishery participants that 25 percent is an initial review rate and that actual review rates for each vessel will depend on individual vessel performance. PSMFC's analysis showed that most trips would fail the initial video review, particularly bottom trawl trips, regardless of the review rate or criteria applied (PSMFC 2019). To address this issue, NMFS is recommending changes to the EM-to-logbook comparison business rules in the next section of this report, to prevent trips from triggering additional review based on small discrepancies. NMFS will also plan on conducting additional training with EM captains on specific discard issues to help captains improve their performance in preparation for 2022.

EM-to-Logbook Comparison Business Rules

NMFS is recommending the following changes be made to the criteria to determine whether a logbook has “passed” the initial review for non-whiting midwater trawl (optimized retention), bottom trawl, and fixed gear trips. NMFS is not recommending any changes to the criteria for whiting and maximized retention trips. These criteria would also serve as the business rules for which source of data (EM or logbook) will be used to debit the vessel account, if a logbook does not pass the initial review. Table 1 shows the old criteria used under the EM EFP program and the recommended new criteria.

Table 1. Recommended EM/Logbook comparison criteria compared to EM EFP criteria

Type of Mismatch	IFQ Species/Group	Old Rule	New Rule
LB > EM	All IFQ species/groups	Use LB	“Pass” Use LB
LB < EM	Cowcod rockfish South of 40°10'N, yelloweye rockfish	Use EM	If LB < EM by more than 10% or 2 lb of the EM estimate, trigger additional review, and use EM.
LB < EM	All other IFQ species/groups	If LB < EM, by more than 10% of the EM estimate, then use EM.	If LB < EM by more than 25% or 5 lb of the EM estimate, trigger additional review, and use EM.
If no EM estimate* (e.g., due to EM system failure)	All IFQ species/groups	Use LB	Use LB

*If there is no video to review from the initially selected haul, the provider would be directed to select a different haul to review. If no video is available from the entire trip, the LB would be used to debit the vessel account, and NMFS would follow up to investigate the EM system outage.

The comparison criteria should allow for some amount of difference between logbook and EM estimates, because both values are visual estimates made by different individuals so some amount of variation is to be expected (aka “noise”). Captains and video reviewers cannot reasonably be expected to eliminate noise in their estimates, so the captain should not be penalized for it by triggering additional video review. However, the comparison criteria should prevent other variations in discard estimates that could otherwise be prevented through better performance by the vessel, to minimize uncertainty in the data used to debit vessel accounts and to ensure accountability for catch. In developing the initial business rules, NMFS identified the following criteria for an appropriate standard.

1. The standard should be based on a comparison of weights, rather than counts, because the IFQ fishery and cooperative allocations are managed by weight.
2. The standard should allow for some difference between logbook and EM estimates. EM estimates are intended to be an independent, unbiased estimate of discards, but they are still estimates and have some inherent uncertainty. In addition, a small allowable difference creates an incentive for captains to report correctly to have their own data used for management.
3. The program data is being used to account for catch of IFQ species, so there is a need to minimize uncertainty in discard estimates and to consider different rules for overfished and non-overfished species.
4. The standard should be rigorous enough to minimize uncertainty, but should not be so challenging as to be unattainable.

The results of PSMFC's analysis in their 2019 report suggests that the existing business rules being used for the EM EFP may be too difficult to achieve and, therefore, would not meet criteria 2 and 4 above in the regulatory regime. PSMFC compared logbook and EM estimates using 3 different sets of criteria and 3 review rates (25%, 33%, and 50%). The most rigorous criteria matched the existing business rules being used in the EM EFP, and two additional sets of criteria provided for larger margins of difference between the logbook and EM:

- High: within 10% or 2 pounds for all species
- Mid: within 10% or 2 pounds for species of management concern (see detail below); within 25% or 5 pounds for all others
- Low: within 25% or 5 pounds for species of management concern; within 50% or 10 pounds for all others

At 100% review rate, 25%-48% of trips passed the criteria and 52%-75% of trips failed. At the lower review rates, 33-68% of trips passed, and 32%-67% of trips failed. There are a few possible reasons for this result. It could be that captains and crew are not trying to meet the criteria since there has not been a financial incentive to do so because NMFS is funding the video review during the EFP. While this may be the case for some vessels, it is unlikely to be the case for all. In addition, there has been some incentive to be close to the EM estimates in order to avoid being "surprised" with additional discard debits if the LB is replaced by the video estimates after the video review, which can be several weeks after the trip. Assuming that the majority of vessel crews are making a good faith effort to accurately report discards, the results suggest that even vessel crews that are trying to meet the standards are having trouble doing so. This could mean that the criteria are too difficult for captains to meet and may not be sufficiently preventing "noise" from triggering a trip to fail.

To examine what may be causing so many trips to fail, PSMFC conducted an additional analysis in fall 2020 to see how many trips met the different criteria. The results are shown in Tables 2 and 3 below (Note: these results are based on a trip-based sampling rate, but are still informative in a haul-based approach). Table 2 shows how many trips met the rule that no more than 10 pounds of discards could be listed as "unidentified" by the video reviewer. PSMFC used this rule as an indicator of compliance with image quality and catch handling requirements. Using 2016-2018 EM EFP data, 57%-82% of bottom trawl trips met this criteria, meaning they had less than 10 pounds of unidentified fish. No fixed gear trips had unidentified fish, likely because non-sablefish discards are so few that they can be held up to the camera to enable species identification. Appendix A in PSMFC's report shows that unidentified fish are a small proportion of overall discards. Therefore, modifying or eliminating this business rule could allow more trips to pass the initial review without substantially impacting discard estimates. In addition, image quality and catch handling issues are reported on the drive report, providing NMFS and the EM service provider another avenue to address such issues without triggering additional video review and expense for the vessel.

Table 2. Number and proportion of trips meeting unidentified species rule compared to all rules.

Fishery	Year	Total Trips	Trips Meet Both Unid and High Species Criteria		Trips Meet Unid Rule	
Bottom Trawl	2016	108	42	39%	90	83%
	2017	167	44	26%	120	72%
	2018	175	32	18%	99	57%
Pot	2016	70	48	69%	70	100%
	2017	82	41	50%	82	100%
	2018	66	31	47%	66	100%

Table 3. Proportion of trips meeting weight difference rule compared to all rules.

Fishery	Year	Total Trips	Trips Meet Both Unid and High Species Criteria	Trips Meet Species Weight Difference Rules		
				High	Mid	Low
Bottom Trawl	2016	108	39%	43%	61%	74%
	2017	167	26%	34%	47%	70%
	2018	175	18%	26%	47%	72%
Pot	2016	70	69%	69%	84%	90%
	2017	82	50%	50%	56%	71%
	2018	66	47%	47%	62%	77%

Table 3 shows how many trips met the weight difference rules according to the 3 criteria: low, mid, and high. Generally, a greater percentage of fixed gear trips meet the weight difference rules, at all levels, compared to bottom trawl trips. This is likely because of the difference in volume of catch and catch handling between the two gear types. Modifying the weight difference rules from the existing 10% (high criteria) to something less restrictive would allow more trips of both gear types to pass the logbook audit, but would make a significant difference for bottom trawl. Just a change from the low to mid criteria (10% to 25% for non-rebuilding species) changes bottom trawl pass rates from 26%-43% to 47%-61%. In addition, an earlier version of PSMFC’s report showed that although the percent difference between logbook and EM estimates could be large, the majority of differences were small amounts. This suggests that the comparison criteria could be revised to be less restrictive, while still minimizing uncertainty in discard estimates. Obviously, using the low criteria would allow even more trips to pass. However, at the low criteria estimates of non-rebuilding species can vary up to 50%, which seems to defeat the purpose of using EM to validate logbooks at all.

For these reasons, NMFS is recommending using the “mid criteria” used by PSMFC in the 2019 analysis, but modifying or eliminating the “unidentified species” rule. NMFS believes the mid criteria strikes the right balance between maintaining a rigorous standard for discard estimates, while providing cost savings and a continued incentive to EM participants. NMFS is recommending that species still under rebuilding, yelloweye rockfish and cowcod rockfish south

of 40°10'N be defined as “species of management concern” as defined in PSMFC’s report, where the standard would be 10% or 2 pounds for these species. The standard for all other species would be 25% or 5 pounds. The Council and NMFS may wish to consider additional species to apply the more rigorous standard too, such as species with high value and high attainment or small allocations, such as sablefish north of 36°N, petrale sole, or Pacific halibut.

Halibut DMRs

Another aspect of the video review protocol that needs to be finalized is the discard mortality rate (DMR) that will be applied to halibut discards when video review is less than 100 percent. Currently in the EM EFP program, a DMR is calculated for each halibut using the amount of time the halibut was on deck, recorded by the video reviewer, and a formula developed by PSMFC. This method was approved by the International Pacific Halibut Commission (IPHC) in an [October 2017 letter](#). The time-on-deck method would still work for halibut that are seen during the video review, but it is not clear how discard mortality should be extrapolated for halibut on hauls that are not reviewed. The GMT developed 3 options for extrapolating halibut DMRs in its [November 2017 Report 2](#), Options A-C below. The GEMPAC added Option D in its edits to the draft EM Program Manual in [November 2019](#).

- Option A – Use the 90% EM DMR associated with dead viability for all halibut.
- Option B – Mandatory review/audit for hauls with halibut discards.
- Option C – Vessel-specific EM DMR based on previous observer and/or EM viabilities.
- Option D – Use vessel specific DMR using average weight/length/time on deck developed by EM Provider for reviewed hauls and apply to all unviewed hauls with halibut on trip.

NMFS had an initial meeting with IPHC staff on the above options in February 2021. NMFS and IPHC staff are investigating ways to implement individual vessel DMRs based on the data available from the video review. We expect to have an update for the Council on these discussions at a future meeting.