

GROUND FISH MANAGEMENT TEAM REPORT ON ELECTRONIC MONITORING- PRELIMINARY PACIFIC HALIBUT DISCARD MORTALITY RATES AND THIRD PARTY REVIEW

The Groundfish Management Team (GMT) has developed an approach for applying alternative Pacific halibut discard mortality rates (DMRs) for bottom trawl trips operating under electronic monitoring (EM) based on the modeling done by Ms. Aileen Smith of the Pacific States Marine Fisheries Commission (PSMFC; [Agenda Item E.6., Attachment 1, September 2017](#)). This report outlines our EM DMR proposal for a formal Scientific and Statistical Committee (SSC) review in November, with additional requests for analyses.

The GMT notes that the Groundfish Electronic Monitoring Policy Advisory Committee (GEMPAC) had recommended DMRs for both bottom trawl and midwater trawl trips; however, the proposed EM DMRs and the accompanying analysis by PSMFC ([Agenda Item E.6., Attachment 1, September 2017](#)) and the West Coast Groundfish Observer Program (WCGOP; [Agenda Item E.6., Attachment E.1.b, Supplemental NMFS NWFSC Report 3](#)) only applies to bottom trawl.

Background

For observed trawl trips, vessel accounts are debited individual bycatch quota (IBQ) for Pacific halibut north of 40° 10' N. latitude based on the viability of the fish that the observer reports: excellent = 20 percent mortality; poor = 55 percent mortality; and dead = 90 percent mortality. These rates are also used in estimating mortality coastwide in the [WCGOP Annual Pacific Halibut Mortality reports](#). The GMT does not propose changing these viability DMRs since they are already established for use in management and are endorsed by the International Pacific Halibut Commission (IPHC); but rather, we used the viability data from observed trips to inform our proposed EM DMR.

In contrast to observed trips, EM trips are instead currently assigned 90 percent mortality (corresponding with dead viability category used for observed trips) due to the inability of video reviewers to assess the condition of the halibut. Given that the EM DMR is conservative compared to the observer approach, and because halibut bycatch can be constraining, the Council requested development of alternative EM DMRs that better reflect the estimated mortality of the halibut discarded on EM trips, and more closely align with the rates used on observed trips.

Following the April 2017 meeting, the GMT learned that Ms. Aileen Smith of the PSMFC had already developed models that evaluate factors affecting viability on observed trips. Since she used the same modeling approach we proposed in April ([Agenda Item F.2.a, Supplemental GMT Report, April 2017](#)), we subsequently worked with her to develop an approach for applying alternative EM DMRs. The GMT notes that this alternative could be applied to both IBQ inseason accounting and post-season coastwide mortality estimates for WCGOP.¹

¹ Pacific halibut is managed as a set aside for south of 40° 10' N. latitude.

Methods

Ms. Smith conducted single and multi-variate modeling (i.e., ordinal regression, which is similar to the more familiar logistic regression, and classification trees) to evaluate factors that affect halibut viability from observed bottom trawl trips ([Agenda Item E.6.a, Attachment 1](#)). Halibut viability and related predictors were recorded for 12,729 individual halibut collected from 3,566 hauls on 55 vessels. It was apparent per her modeling that halibut mortality is predominantly affected by time on deck. Influences of other variables that were considered are relatively minor (i.e., fish length, tow duration, tow depth, fish weight of tow, ratio of spiny finned fish in tow) for three reasons: (1) adding haul duration only improved the classification tree error rate by one percent; (2) models with more variables than time on deck alone had only slightly better Akaike information criterion (AIC) scores²; and (3) the more complicated models than time on deck only were more parsimonious (i.e. had a lower AIC score) after new 2016 data had been added.

As such, the alternative EM DMRs developed by the GMT are based solely on time on deck given that more complex approaches could have little benefit (e.g., could be akin to chasing noise), and would complicate IBQ accounting.

Proposed DMRs for EM bottom trawl trips

As mentioned above, the viability approach used for observed trips does not work for EM since video reviewers cannot detect viability; however, it can be assumed that mortality from EM trips should be representative of observed trips, under similar discarding conditions and practices.

For any given time on deck, there is a probability that a halibut could be of excellent, poor, or dead viability (all of which sum to one) and that longer times on deck correspond with higher mortality (Figure 1).

² AIC scores provide a relative score of the quality of a model within a group of models. The score considers the trade-offs between goodness of fit and added complexity. The lower the score, the better the capability of the model to predict.

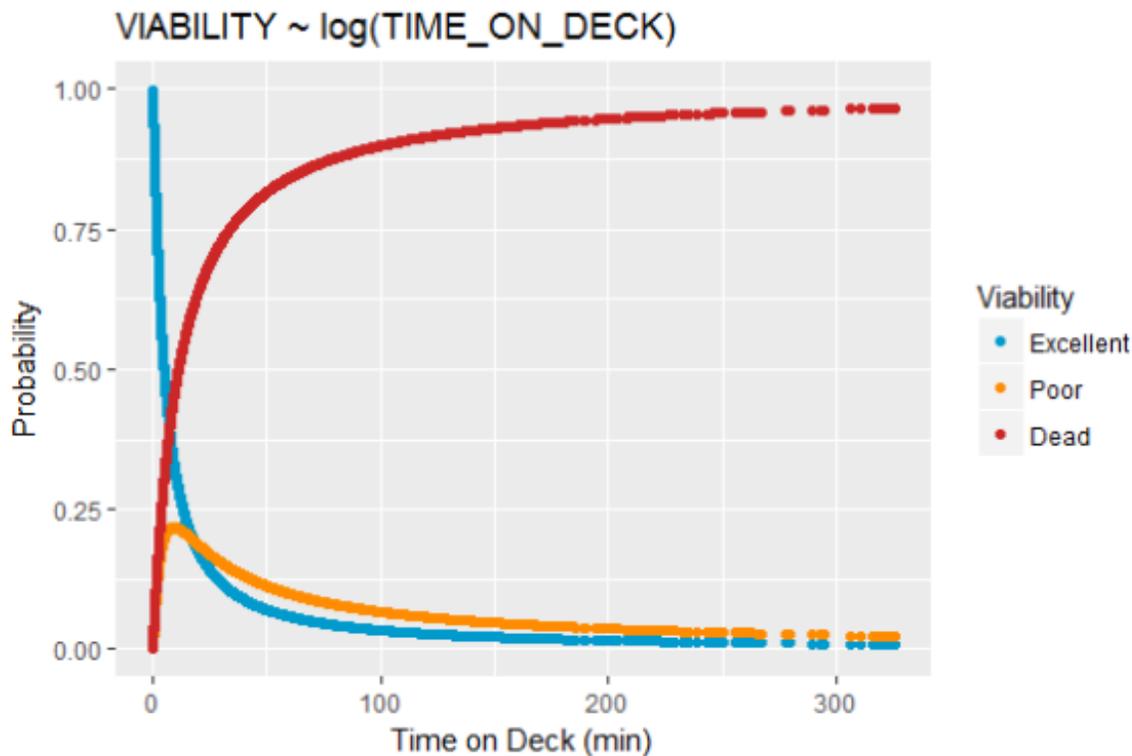


Figure 1: The modeled relationship between time on deck and the probability of each of the three viability conditions currently recorded by observers. For every given time interval, the probabilities sum to one, and these probabilities of each viability condition were weighted by their respective DMRs for our proposed “blended” EM DMRs (Figure 2).

Since there are three viability types, each with a different mortality rate and probability across time on deck, the GMT created a blended formula for an alternative EM DMR for each minute of time on deck by weighting the probability of each viability by its respective DMR. In other words, the approach is very similar to a weighted average based on the probability functions that change throughout time. The proposed DMR formula based on time on deck is as follows, and the minute-specific rates are shown in Figure 2.

$$DMR = ProbabilityExcellent*.20 + ProbabilityPoor*.55 + ProbabilityDead*.90$$

For example, at five minutes of time on deck the DMR is 49.6% = (47.7% *ProbabilityExcellent* * 20% *ExcellentDMR*) + (20.2% *ProbabilityPoor* * 55% *PoorDMR*) + (32.1% *ProbabilityDead* * 90% *DeadDMR*)

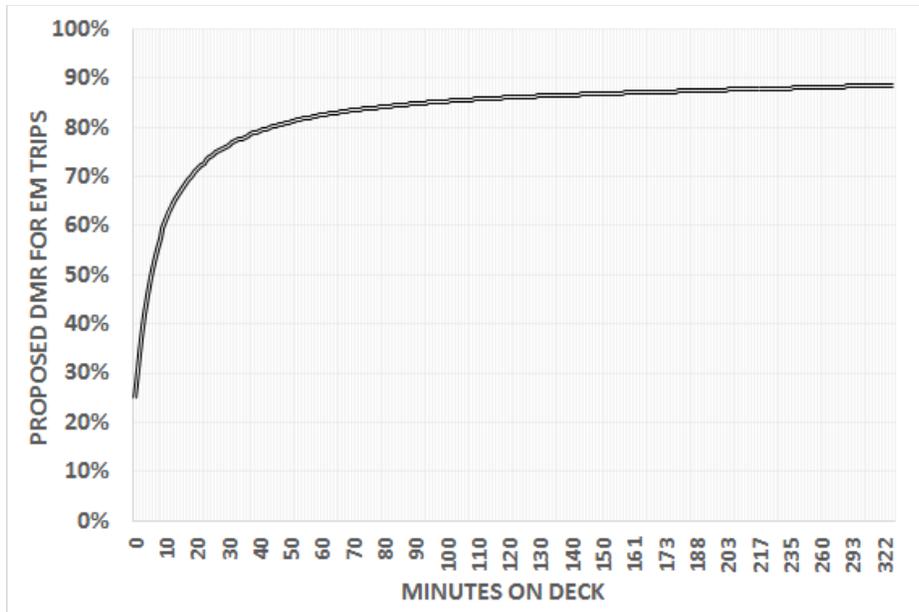


Figure 2: The GMT's alternative EM DMRs based on time on deck.

Implications of adopting the proposed DMRs for EM bottom trawl trips

A main topic of note is that since time on deck is not a perfect predictor (i.e., overlap in the viability probabilities driven by other factors), the DMRs of individual halibut discards will differ between the current observer approach and the proposed EM approach. For example, there will be instances where a healthy viability halibut from EM trips would be given higher DMRs than if an observer were aboard and vice versa. While these discrepancies would “average out” for fleet-wide estimates of discard mortality, industry should be aware that there will be discrepancies to individual fish.

As with all discard mortality rates, there is uncertainty regarding the true discard mortality as opposed to what could be used in management. As such, the Council could add precautionary buffers to the proposed EM DMRs, if endorsed by the SSC (described in Supplemental GMT Report 2). Note that the proposed EM DMRs are scientifically neutral in that they are based on the assumption that mortality rates from EM trips are similar to observed trips under the same time on deck conditions.

Additional factors for consideration

The GMT has already received feedback regarding the proposed EM DMRs from the GEMPAC, Groundfish Electronic Monitoring Technical Advisory Committee, IPHC, WCGOP, National Marine Fisheries Service, and individuals from the SSC. Some of the suggested topics for further consideration have been: (1) approaches for applying EM DMRs if less than a 100 percent EM coverage rate were adopted (i.e., audits); (2) investigation to whether different types of bottom trawl (e.g., small roller vs large roller) affect DMRs; (3) as a means to validate or ground-truth the EM DMR proposal, compare if discard mortality estimates from EM observed trips using the viability approach are similar or different to had the EM DMR approach been used; (4) whether or not this approach would be applicable for both north of 40°10' N. latitude where halibut are an

IBQ stock and to the south where they are instead a set-aside species; (5) investigation into available midwater trawl halibut mortality data and applicability of proposed EM DMR; and (6) exploration of the geographic location of the PSMFC data used in the analysis.

The GMT will work collaboratively with PSMFC and WCGOP in the upcoming months to investigate these requests along with any others that arise. Again, the purpose of this report is to solicit feedback to improve our proposed EM DMRs methodology prior to a formal SSC review.

Conclusion

The GMT recommends that the Council task the SSC with reviewing the GMT Alternative in November.

PFMC
09/13/17