HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON DRIFT GILLNET PERFORMANCE METRICS REVIEW

At the September 2018 meeting, the Council adopted a motion to re-evaluate performance metrics for the large-mesh drift gillnet (DGN) fishery using the regression tree methodology to evaluate bycatch in the fishery as described in Carretta et al. (2017). In addition to using the new methodology to develop revised performance metrics, the Council's motion included three other requests of the Highly Migratory Species Management Team (HMSMT):

1) To evaluate the efficacy of using annual estimates versus multi-year trends to assess bycatch performance.

2) To assess the statistical uncertainty surrounding bycatch estimates under different levels of DGN fishery observer coverage.

3) To propose a process under which bycatch reduction measures would be implemented should the fishery fail to meet bycatch performance metrics established by the Council. This task would include the identification of specific bycatch reduction measures.

Application of the Regression Tree Methodology for Finfish Species

In Carretta et al., the regression tree methodology is applied to marine mammal and sea turtle species to produce bycatch estimates. However, the Council motion tasks the HMSMT to adapt this methodology to finfish species. On their February 22, 2019, webinar, the HMSMT heard a report by Dr. Jonathan Sweeney regarding progress towards adapting the regression tree methodology to produce bycatch estimates for these finfish species, presenting preliminary results for three test-case species (striped marlin, blue marlin, and smooth hammerhead). During September 2018 Council discussion, the motion maker specified revision of the "hammerhead shark" metric to include only scalloped hammerhead shark and remove smooth hammerhead shark from the metric due to a lower conservation risk for that species and because it is marketable. However, since there have been no observed interactions with scalloped hammerhead shark in the DGN fishery, that species could not be evaluated under the regression tree methodology. Therefore, smooth hammerhead was evaluated as a representative shark species. Results of this preliminary analysis indicate that variables which are correlated with bycatch rates can be reliably identified when there is a sufficient number of historic bycatch observations. For example, for the three test-case species, bycatch presence was correctly classified for 70-90% of the fishing sets where bycatch was known to occur, a measurable improvement upon the expected success rate if random guessing was used to identify which fishing sets had observed bycatch for these species. The HMSMT anticipates completing necessary work to produce finfish bycatch performance metrics in time for presentation at the June 2019 Council meeting.

Annual Estimates vs. Multi-year Trends

The Council requested an evaluation of both annual estimates and multi-year trends as measures of DGN bycatch performance. The HMSMT discussed possible alternative definitions of multi-year trends that could be used and feels that a time series of bycatch rate estimates may better

indicate trends in bycatch performance than a time series of annual totals. Declining effort could drive a downtrend in annual totals even if the bycatch rate remained the same over time.

The HMSMT is exploring an approach to describe multi-year trends in bycatch per unit effort (BPUE) as an alternative to using annual estimates of total bycatch. This approach would translate observer data into charts displaying a time series of BPUE estimates along with upper range limits to identify points when BPUE was exceptionally high. Exceptional points can be analyzed to identify causes which may have resulted in a spike in bycatch and provide the basis for possible remedies. The HMSMT plans to prepare estimates of BPUE trends for the June 2019 Council meeting for the Council to review.

Statistical Uncertainty of Observer Coverage Levels

At this point, the relationship between sample size (coverage level) and precision has only been quantified for ratio estimators of unobserved bycatch. Since the Council wishes to evaluate bycatch performance of the DGN fishery using regression tree estimation, the HMSMT has been working to develop a methodology to measure the effect of observer coverage levels on the uncertainty in regression tree estimates of total bycatch. The HMSMT expects to complete this work in time for presentation at the June 2019 Council meeting.

Bycatch Reduction Measures

The HMSMT feels that at this time they cannot recommend specific management approaches for the Council to take should performance metrics be exceeded to a level where the Council deems action is needed. Without context to evaluate any future observed interactions or knowledge of which species are involved, any currently prescribed response would be speculative and potentially inefficient to address the situation. However, the HMSMT recommends the following general process.

To determine whether bycatch reduction measures are needed, the Council's biennial management process offers the necessary framework. DGN performance metric updates are provided to the Council in June each year. At the June meeting the Council can schedule action for the next biennial process, which begins at the September meeting in even years. Under the biennial framework, the Council could outline procedures for making in-season management decisions.

Regarding decisions on whether to take management action, the HMSMT suggests that any effort to develop bycatch reduction measures should begin with an assessment of the reasons for the increase in bycatch. For any species in question, a number of factors may affect BPUE, including but not limited to (1) changes in the timing or location of fishing effort; (2) variation in environmental factors that influence the presence or absence of the bycatch species; (3) changes in the overall abundance of the bycatch species; (4) changes in the fishing gear; (5) changes in how the gear is fished. Some of these causes may reflect temporary random variation in natural processes which cannot be controlled through bycatch reduction measures, in which case a management response may be inappropriate.

Decisions of whether to adopt bycatch reduction measures are best informed by a multi-year trend analysis. One or two observed rare event interactions out of many thousands of observed fishing sets may reflect temporary factors which will naturally revert to normal levels, rather than deterioration in DGN bycatch performance. The HMSMT will bring suggestions to the Council in June regarding the period of time over which an increase in BPUE rate may be indicative of the need for additional regulation.

The HMSMT further notes that DGN bycatch *mortality* as a share of total human-caused mortality for any of the included species should be considered before deciding whether to undertake bycatch reduction measures. Attempting to reduce or eliminate bycatch for species where DGN bycatch has minimal population mortality impacts may be unnecessary.

References

Carretta, J.V., J.E. Moore, and K.A. Forney. 2017. Regression tree and ratio estimates of marine mammal, sea turtle, and seabird bycatch in the California drift gillnet fishery: 1990-2015. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-568. 83 p. doi:10.7289/V5/TM-SWFSC-568.

PFMC
03/10/19