

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

The Highly Migratory Species Management Team (HMSMT) discussed the Pacific Fishery Management Council's (Council's) intent in requesting a multiyear trend analysis for the species and species groups included in the Council performance metrics list. Figure 1 in the June 2019 HMSMT Report on this topic ([Agenda Item J.4.a, Supplemental HMSMT Report 1](#)) is representative of the HMSMT's earlier interpretation of the Council request to characterize the average performance of the vessels in the fleet. The HMSMT applied this approach to data through 2019 to produce updated examples of finfish bycatch per unit effort (BPUE) trends for discussion (see Figure 5). The figure shows estimated BPUE in each year compared to warning and action lines to indicate whether bycatch rates exceed the historic range of variation. The black line for each species or species group shown in Figure 5 represents BPUE in each year, computed as the estimated total bycatch for that year divided by total fleet effort. The action and warning lines are calculated using both average effort over the entire history of the fleet (i.e. the methodology described at the end of [Agenda Item J.4.a, Supplemental HMSMT Report, June 2019](#)) and using effort in the most recent calendar year to compute the standard error for developing warning and action lines. The HMSMT included both sets of thresholds in Figure 5 for comparison (Curr = solid lines versus Avg = dashed lines). Given the steep decline in effort over the history of the fleet, current effort would more appropriately characterize the level of uncertainty in recent BPUE estimates.

In light of Council interest in a trend analysis to determine if bycatch levels due to DGN fleet operation are increasing and recent advice from SWFSC Marine Mammal and Turtle Division scientist Jim Carretta, the HMSMT has developed a new multiyear trend approach based on a moving average (MA) of estimated total bycatch. Mr. Carretta indicated that BPUE is not appropriate for considering fleet-level bycatch impacts of the fishery, because it does not consider overall fishing effort or the possibility that a small number of observed interactions may drastically affect BPUE, particularly for species where bycatch occurs as rare events.

Figures 1-4 compare 5-year and 10-year MAs of regression tree estimates of total bycatch to the most recent performance metric for that species (Calendar Year 2019 Regression Tree Performance Metric values in HMSMT Report under [F.4.a, HMSMT Report 1](#)) for each species or species group in the Council request. The HMSMT notes that there has been a drastic downward trend in total bycatch for most species or species groups included for performance metrics, and none of the metrics have been exceeded since 2017 on a 5-year MA basis or since 2009 on a 10-year MA basis.

The HMSMT reminds the Council that the performance metric lines in the figures are not population-based standards, such as Potential Biological Removal for marine mammals, but are rather based on the highest observed bycatch for the period from 2004-2013. This period occurred after the Marine Mammal Protection Act and Endangered Species Act management measures

became effective for the fishery (in the late 1990s and in 2001, respectively). Therefore, the HMSMT regards these metrics as highly conservative, as they reflect a period after DGN bycatch was already substantially reduced. The Council could task the HMSMT with developing warning and action lines in reference to the performance metric, formulated to consider random variation in 5-year and 10-year MA trends. The HMSMT did not have sufficient time to fully develop the methodology at this point, given that it was first developed and tested during the June HMSMT meeting.

The HMSMT discussed the appropriate period of years to include in a multiyear trend analysis of total bycatch. Using too short of a period may result in excessive sensitivity to short-term random variation in observed bycatch, making it difficult to adequately capture trends, similar to that in the annual Total Bycatch Estimates shown in the trend figures. Conversely, averaging over too long of a period may result in an overly flat trend that does not adequately capture any recent changes in bycatch impacts. Work by SWFSC Marine Mammal and Turtle Division (MMTD) scientists Jim Carretta and Dr. Jeffrey Moore ([“Recommendations for pooling annual bycatch estimates when events are rare”](#)) suggests that for species where bycatch occurs as rare events, periods longer than 5 years may be necessary to adequately capture bycatch trends. By contrast, for more frequently caught bycatch species, shorter periods may be sufficient to smooth short-term random fluctuations in observed bycatch rates while adequately characterizing recent changes in bycatch. For either a 5-year or 10-year averaging period, a significant upturn in bycatch will show up as an increase in the slope of the trend line, albeit more pronounced in the case of a 5-year average. If the Council wishes, the HMSMT could provide more input on the appropriate averaging period for different species at a future Council meeting.

The HMSMT further discussed the alternative variable selection procedure in use by the SWFSC MMTD to produce regression tree estimates of bycatch for non-fish species included in the Council’s list of species for performance metrics. For clarification, finfish bycatch estimates shown in Table 1 of the advanced briefing book HMSMT report under this agenda item were produced using the old methodology, while Table 2 for non-fish species were produced using the new methodology. Preliminary attempts to produce estimates for finfish are currently under review. While changing to this methodology would better align the approaches for producing finfish and non-fish bycatch estimates, the HMSMT does not expect a substantive change to finfish estimates which enter the performance metrics under the new variable selection procedure. If the Council chooses, the HMSMT could provide a comparison between estimates produced by the old and new variable selection procedures at a future Council meeting.

Literature referenced:

Carretta, J.V. and Moore, J.E., 2014. Recommendations for pooling annual bycatch estimates when events are rare. NOAA Technical Memorandum.

Figure 1. DGN Total Annual Bycatch Trends for Finfish Species

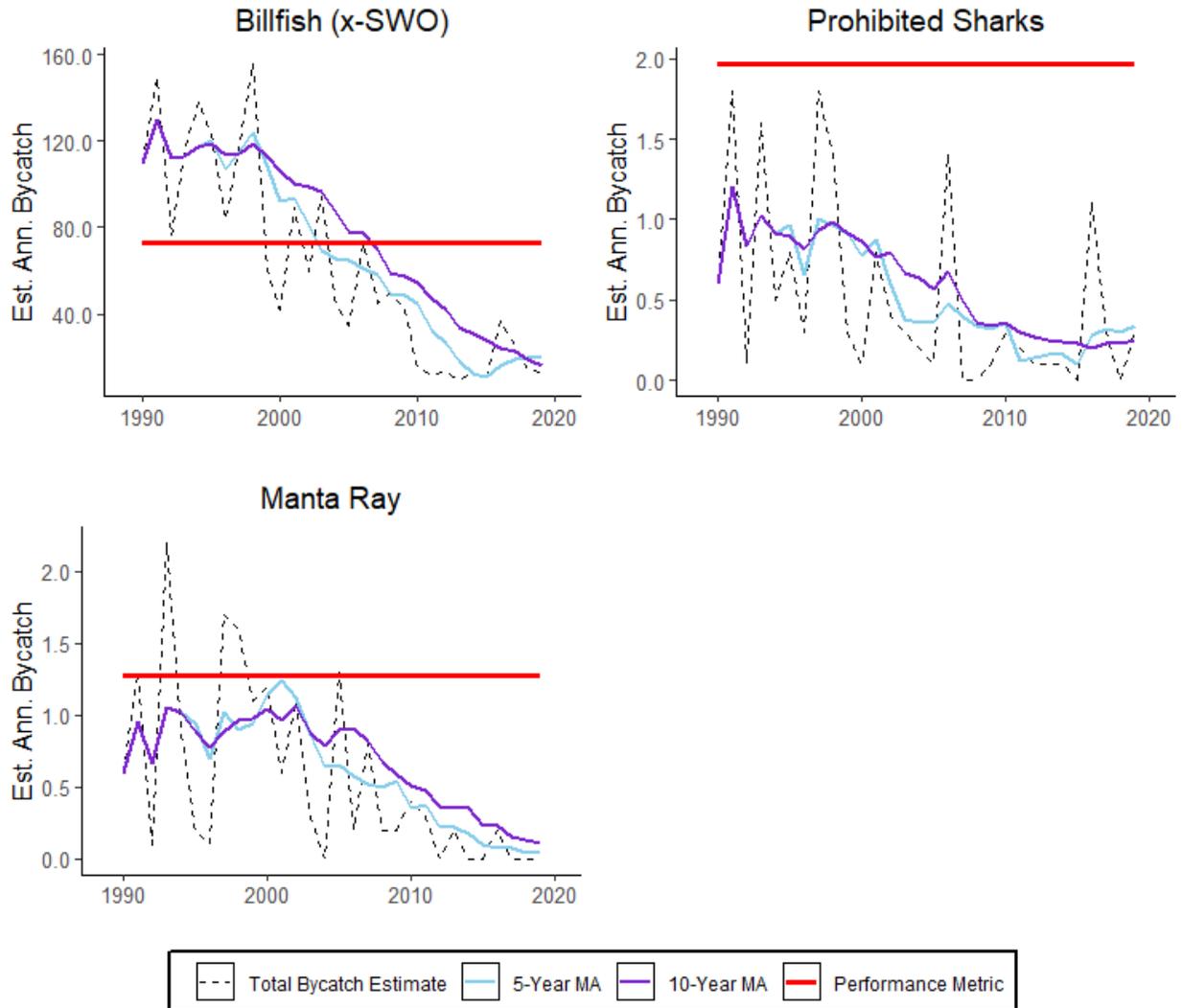


Figure 2. DGN Total Annual Bycatch Trends for Dolphin Species

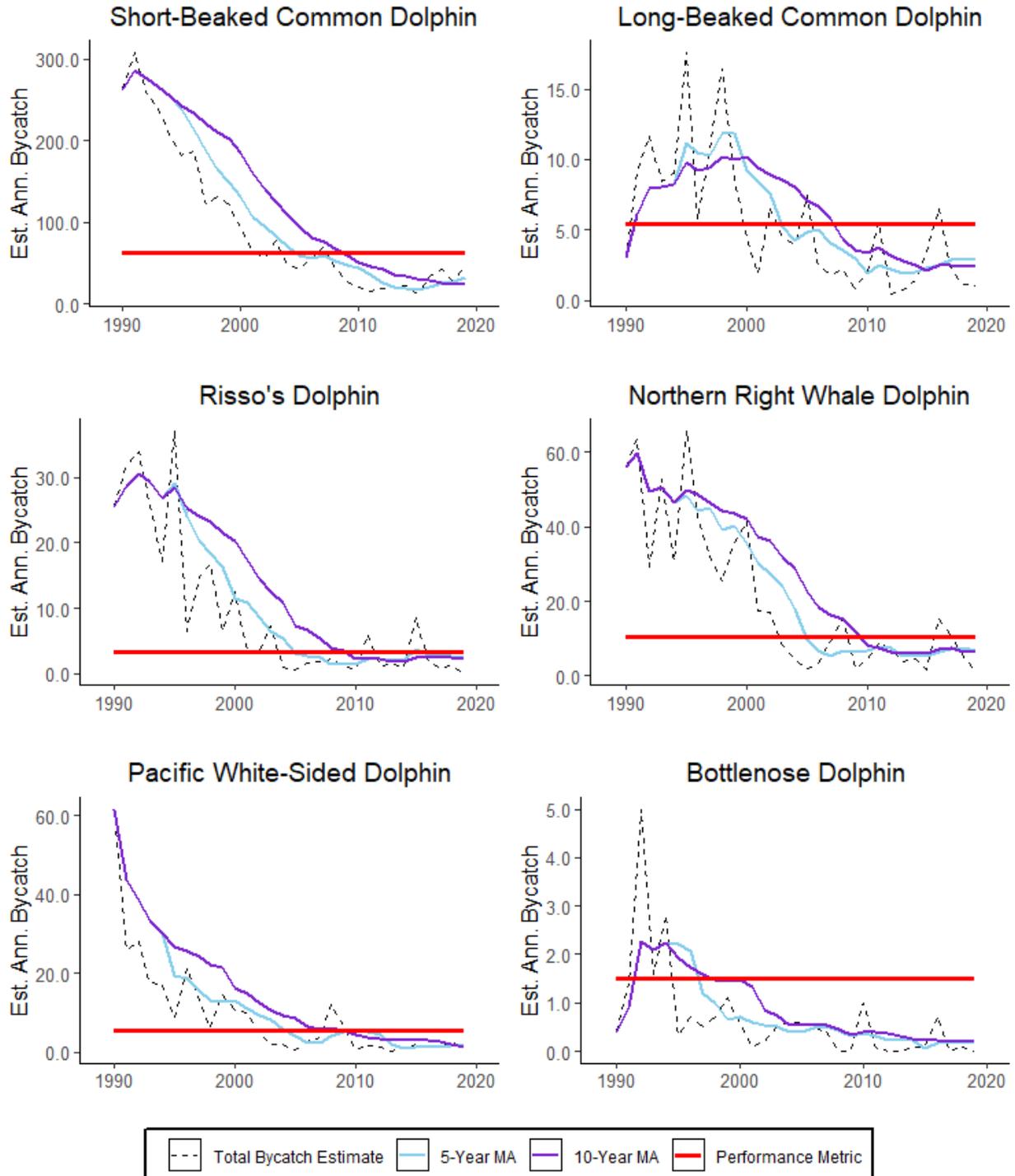


Figure 3. DGN Total Annual Bycatch Trends for Whale Species

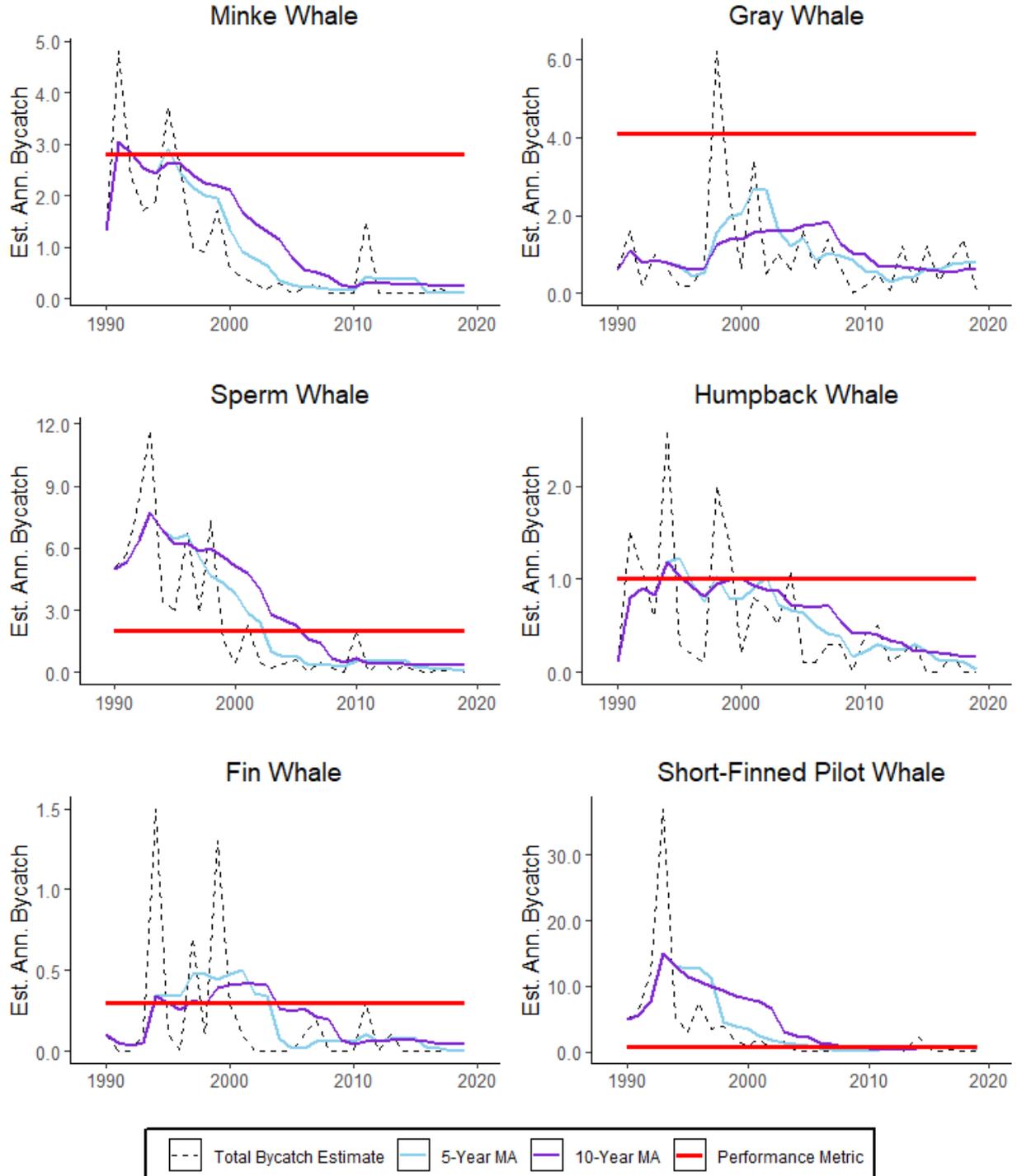


Figure 4. DGN Total Annual Bycatch Trends for Sea Turtle Species

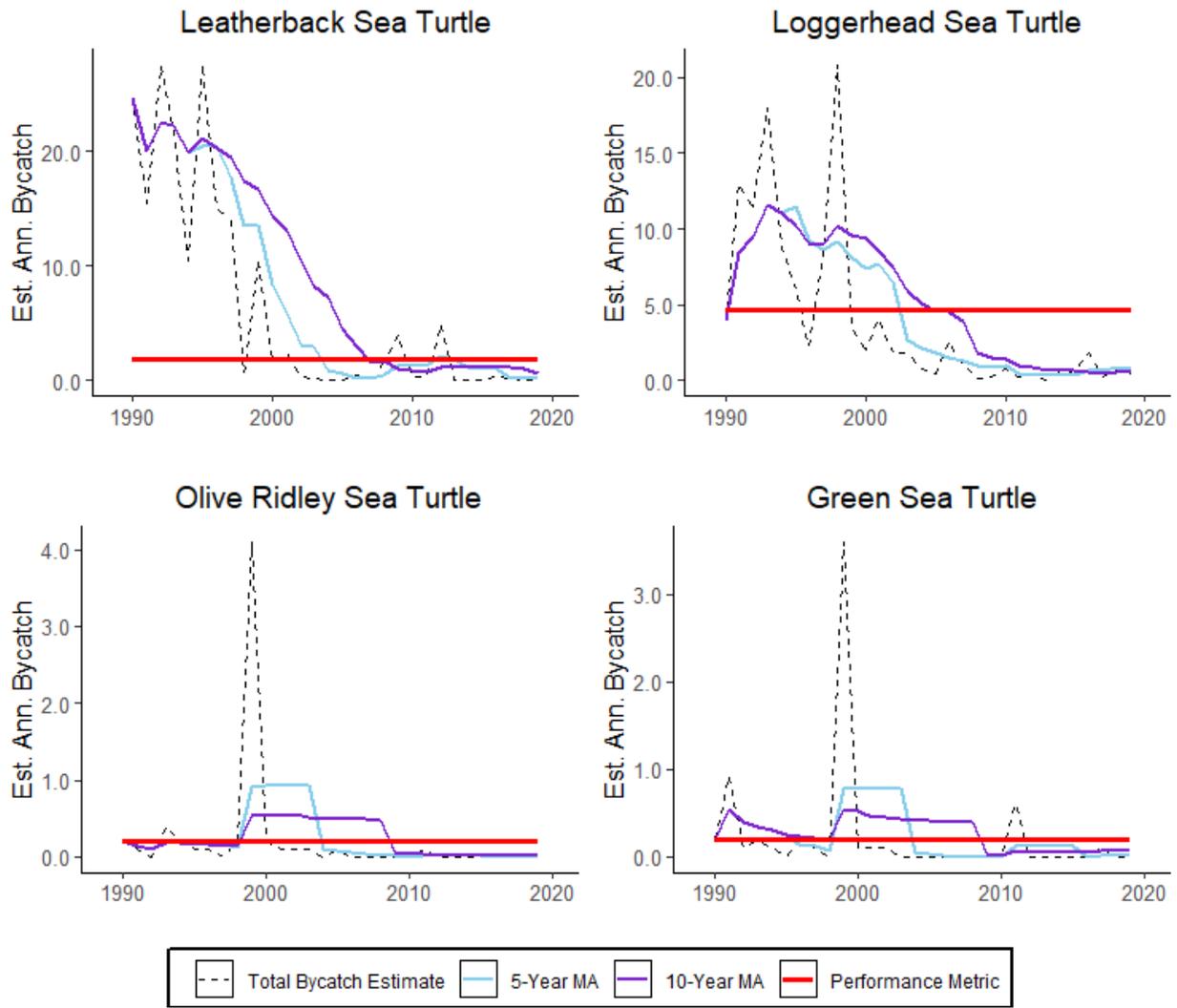
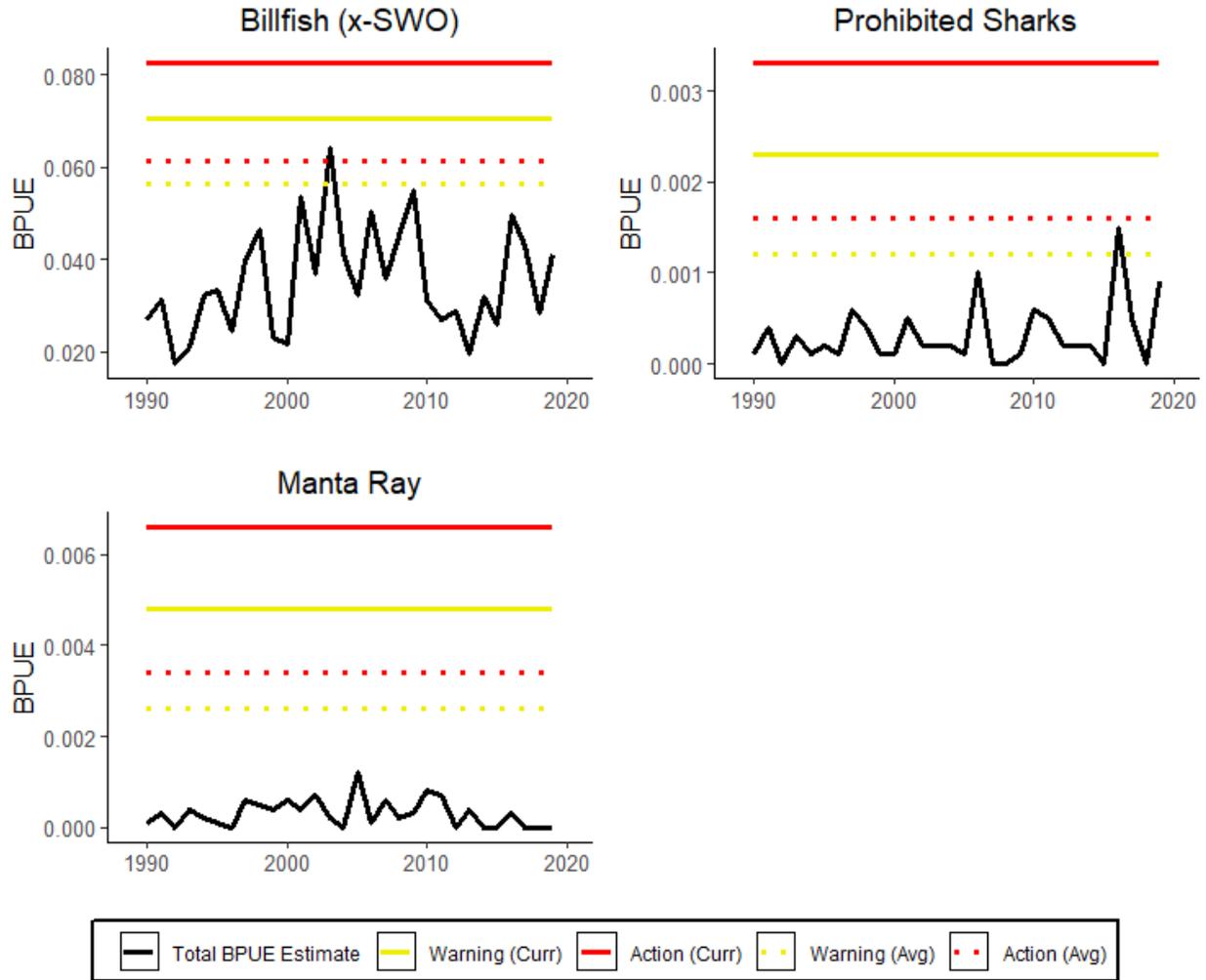


Figure 5. DGN BPUE Analysis for Finfish Species



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