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## Appendix B: Preparing Estimation Weights

### Extensive Margin

We use the inverse probability sample weights developed by Abbott et al. (2018) in our extensive margin model estimation, as well as in scaling the extensive margin policy simulations up to the full headboat sector. These weights are products of three inverse probability weights to collectively account for selection along dimensions of survey version, survey non-response, and spatiotemporal variables – thereby producing estimates that are as representative of the population of Gulf of Mexico headboat anglers as possible.

The first component of these estimation weights is the inverse probability that a respondent received the survey version that they did. Anglers in Texas, Alabama, and Northwest Florida encounter more red snapper than gag grouper, so respondents who filled out onboard surveys in those regions received the red snapper version of the follow-up survey with 80% probability and the gag grouper version with 20% probability. Anglers in Southwest Florida encounter relatively more gag grouper, and so received the gag grouper version with 80% probability and the red snapper version with 20% probability. We use only the red snapper surveys, so this first part of the extensive margin weights is  $0.80^{-1}$  for Texas, Alabama, and NW Florida anglers, and  $0.20^{-1}$  for SW Florida anglers.

The second component of the estimation weights controls for non-response bias, where non-response is defined as either failing to complete the Internet survey or failing to provide a valid email address on the initial onboard survey. We estimate a logistic regression of survey completion (i.e., whether an individual provided a valid email address on their onboard survey and completed the follow-up survey) on gender, age, income, years of experience an angler has fishing in the GOM, how often an individual goes fishing, and a dummy for home state

(Alabama, Florida, Texas, Louisiana/Mississippi, other) to predict the probability that each respondent would have completed the survey. The inverse of these “propensity scores” control for non-response bias based on selection-on-observables assumptions.

The third and final component of the estimation weights is spatial-temporal post-stratification survey weights which ensure the spatial and temporal distribution of the respondents to the onboard survey (after adjusting for survey non-response and survey version) reflects the headboat angler population. Abbott et al. (2018) used logbook data from all Gulf Headboat vessels to account for the percentage of total anglers who took trips during each of the four seasons (January through May, June, July through August, September through December) and four regions (Texas, Alabama, NW Florida, SW Florida) included in the sample. We then use these percentages to compute spatial-temporal post-stratification survey weights – effectively up-weighting responses in space-time cells that are underrepresented in our sample while down-weighting responses in cells that are overrepresented.

The final weights for the trip choice model are the product of these three components, normalized in the sample.

### **Intensive Margin**

The intensive margin model estimates per-trip demand for red snapper retention for those respondents who chose one of the two trip alternatives in at least one of the fee version choice experiments. Thus, the probability of appearing in the intensive margin estimation sample is the product of the probability of being included in the extensive margin sample (captured by the inverse of the extensive margin estimation weights described above) and the probability of having chosen to take a trip on the fee version choice experiments.

We use the final mixed logit model (Table 3, column 3) to generate estimated

probabilities that each individual  $i$  would have chosen to take a trip on the fee version choice scenarios. The probability that individual  $i$  chooses to take one or the other of the fee version trips is the complement of the probability that they choose the outside (no-trip) option,  $Pr(Opt-out)$ . Our final intensive margin estimation weights are, therefore, the product of the extensive margin estimation weights (above) and  $[1 - Pr(Opt-out)]^{-1}$ . We also estimated the censored Poisson using the extensive margin weights, but it had no notable effect. The estimation results from this alternative weighting are available upon request.

## References

Abbott, J. K., P. Lloyd-Smith, D. Willard, and W. Adamowicz. 2018. "Status-Quo Management of Marine Recreational Fisheries Undermines Angler Welfare." *Proceedings of the National Academy of Sciences* 115 (36): 8948–8953.