

APPENDIX I

DETAILS ON SAMPLING AND ESTIMATION PROCEDURES

SAMPLING PROCEDURES

MRIP Intercept Frame

The APAIS is an ongoing intercept creel survey that is currently conducted by NMFS and its state partners on the East and Gulf Coasts (except Texas), in Hawaii, and in Puerto Rico. For the locations where it is conducted, the APAIS represents a very consistent intercept-based sample frame for marine anglers. The APAIS uses a multi-stage, stratified cluster sampling design that is based on fishing effort at available public access fishing sites within a coastal county. Over 4,200 active sites are included in a master site list for all the states covered by the APAIS. Each year, the sample is allocated across sites in proportion to historical fishing effort at each site. Sites that historically have higher use are sampled at higher rates than those with lower use. The sample is stratified by state, two-month wave, type of day (weekday or weekend) and fishing mode (for-hire boats, private boats, and shore). The primary sampling unit is a specific site-day combination within a state and wave. For the shore mode, secondary sampling units are anglers; for the boat modes, secondary sampling units are boat trips and tertiary units are anglers. For each site-day, interviewers are assigned to a specific site and to a specific mode of fishing. Sampling for private/rental and party/charter modes is conducted after the angler's fishing day has been completed. Sampling for the shore mode may be conducted when at least two-thirds of the fishing for the day has been completed.⁶

In 2011, sample weights that reflect the complex nature of the survey became available with the APAIS data. In previous years, simple random sampling was assumed during estimation procedures that could lead to potentially biased average catch estimates or other estimates based on the data. The newly available weights include information on effort from the CHTS so that summing over the weights will now provide an estimate of total fishing effort by strata (Breidt et al., 2012). In addition to this improvement in the survey, a number of other survey refinements are being instituted starting in 2013 that will improve the sampling design and reduce the potential for bias. For example, previous to 2013 interviewers were allowed to visit two adjacent, alternate sites if a minimum number of interviews could not be obtained at the original site assignment. Alternative sites will no longer be part of the sampling design and instead, sites will be grouped into clusters of 1-3 sites with known probabilities of selection that can be used to calculate survey weights.

License Frame

The states of Texas, California, Oregon, Washington, and Alaska, do not participate in the MRIP, and instead provide NMFS directly with estimates of catch and fishing effort based on surveys conducted by their respective state agencies or regional fisheries commissions. In all license frame states, sampling was conducted on a monthly or wave basis to correspond to the MRIP survey and in an effort to capture seasonality in trip expenditures. Across the license frame states, the target sample was allocated based on both historical effort in previous years, sample sizes from the 2006 NES, and overall survey budget.

In Alaska, the sample frame consisted of licenses valid for use during 2011 and Alaska Permanent Identification Card (PID) holders and was provided by the Alaska Department of Fish and Game on a two-month basis starting in April. Each wave, new license holders were added to the previous wave's sample frame, so that over the course of the year, the sample frame increased. The PID card is a free lifetime license available to Alaska residents age sixty and over. The sample frame was stratified into three groups: PID holders, residents, and non-residents and then allocated proportionally to the number of records in each strata for each wave. Within a stratum, the sample was randomly drawn. Due to low fishing activity in the months of January and February, the first sample for Alaska included all licenses purchased through the

⁶ For more information on the APAIS and other MRIP surveys, please visit <http://www.st.nmfs.noaa.gov/recreational-fisheries/in-depth/our-surveys-counting-catch-and-effort/survey-materials/index>.

end of Wave 2 (April 30). Once, the sample was drawn, a brief telephone screening survey was conducted because Alaska licenses and PID cards are valid for both freshwater and marine. Anglers who had taken a marine fishing trip in the previous 2 months were determined to be eligible.⁷ Due to the high number of license records without phone number information, (72%), a reverse-matching service was used to obtain enough additional phone numbers to obtain the required sample. A maximum of ten attempts were made to contact anglers (ICF Macro, Inc. 2012).

For California, Oregon, and Washington, the sample frame for the NES was assembled in cooperation with these states and the Pacific Marine Fisheries Commission. For these states, CIC Research, Inc. conducted all aspects of the survey data collection for the NES. In California, the NES sample frame was based on the sample frames used for the California Recreational Fisheries Survey (CRFS). Like MRIP, the CRFS is actually a series of surveys. Details of the CRFS methodology are available on the California Department of Fish and Wildlife (CDFG) web site.⁸ Anglers who went fishing in California during 2011 were recruited by one of three methods: 1) as part of the on-going CRFS monthly telephone survey of licensed anglers conducted by the Pacific States Marine Fisheries Commission, 2) through an additional brief telephone NES screening survey of license holders, and 3) as part of the on-going monthly CRFS angler intercept survey (CIC Research, Inc., 2012). For each of the three recruitment methods, anglers were asked if they were willing to participate in a follow up mail survey on their expenditures. If they agreed, then they were asked for both their mailing address and their email address and were included in the NES sample. The sample frame for the CRFS telephone license survey is comprised of all valid license holders for that month. The license types include lifetime, annual and daily (1, 2 and ten day). The sample frame for the brief additional survey, consisted of those anglers who purchased a license in a ZIP code contiguous to the shoreline that was valid during the survey. Based on consultation with CDFG, it was believed that the likelihood of contacting a marine fishing household was significantly higher in those counties. In California, because a fishing license covers both freshwater and marine fishing, anglers who were contacted by phone were only eligible for the NES if they indicated that they had taken a marine fishing trip in the prior month.

The CRFS intercept survey was used to increase the number of anglers recruited from beach/bank and man-made modes. Anglers in these modes are under-represented in telephone license survey, but more importantly, use of the intercept survey enabled recruitment of man-made mode anglers who do not need a license to fish on California's piers, jetties, and other man-made fishing structures. During the summer months, additional for-hire and private boat anglers were also recruited through the intercept survey that was conducted by the CDFG.

Oregon has no on-going telephone or intercept survey of licensed anglers, so all NES participants were recruited through a brief NES telephone screening survey (CIC Research, Inc., 2012). Like California, Oregon has no license valid for fishing only in marine, so the sample was made up of only those anglers who purchased their license in a ZIP code contiguous to the coast. The sample frame consisted of those anglers who purchased a license in these coastal areas that was valid during the survey month. The sample was stratified by resident status. Due to historically low fishing effort in the winter months (January/February and November/December), sampling was conducted only for the months of March through October. Samples for the telephone screening survey were drawn on a monthly basis, and anglers who had stated that they had gone marine fishing in the previous two months were eligible for the NES survey (CIC Research, Inc., 2012).

In Washington, anglers were recruited as part of the on-going bi-monthly survey of licensed anglers conducted by the Pacific States Marine Fisheries Commission and through an additional brief telephone screening survey to identify and recruit anglers who had been fishing in the past two months (CIC Research,

⁷ In Wave 6, the time period for eligibility was increased to the past 6 months due to very low fishing effort after mid-September.

⁸ <http://www.dfg.ca.gov/marine/crfs.asp>

Inc., 2012). The PSMFC telephone survey is a stratified survey based on license type (Kraig, E. 2011). As in California and Oregon, there was an additional brief telephone survey based on a sample frame that consisted of anglers who purchased a valid 2011 license in a ZIP code contiguous to the shoreline during the survey wave. Both marine only and combination fishing licenses were eligible for the additional sample (CIC Research, Inc., 2012). The additional sample was stratified on only on resident status. As in California and Oregon, anglers who had taken a marine fishing trip in the prior two months were eligible for the NES. As with Oregon, sampling occurred for the months of March through October due to low winter fishing effort.

Texas has a number of different types of licenses that are valid for marine fishing. All licenses that were valid for marine fishing in 2011 formed the sample frame. The Texas license frame was supplied by the Texas Department of Parks and Wildlife on a bi-monthly basis. Telephone pre-screening to determine eligibility was considered as in the West Coast and Alaska, but given the size of the sample frame, would have been too costly. Instead, a stratified sample was designed to maximize the chances of reaching eligible anglers by oversampling certain license types while keeping costs within budget. A survey of license holders for License Year (LY) 2010 by Texas Parks and Wildlife Department (TPWD) found that anglers with a resident combination license fished in marine 45 percent of the time, and anglers who hold a resident all-water license fished in marine 41 percent of the time. These percentages, information on license counts for the license year 2010, and the cost per survey sent were used to optimally allocate sample to the different license strata. Lifetime license holders were also included in the sample, and were categorized into different strata, using descriptive information from the TPWD license database (ICF Macro, Inc., 2012). The Texas licenses were categorized into the following five groups (percentages in parentheses indicate the sample proportions within a resident category):

- Resident fishing and hunting combination (39.9%),
- Resident all-water (38.6%),
- Resident marine (21.6%),
- Non-resident all-water (64.1%), and
- Non-resident marine (35.9%).

In Hawaii, it was necessary to augment the sample from the angler intercept survey in order to include for-hire anglers and to ensure adequate sample sizes in all modes. For-hire vessels in Hawaii are required to report catch and effort data as a condition of their commercial permit. To avoid additional survey burden and expense, the intercept survey therefore does not survey anglers in the for-hire mode. Additionally, given the geography of the multiple islands, it is often hard to reach shore anglers through the intercept survey alone. To address these issues, three additional methods were used to obtain survey respondents. A license frame sample was drawn from NMFS's National Marine Angler Registry database for all anglers who registered for 2011 and indicated that they may fish in Hawaii. The sample was stratified into residents and non-residents based on home mailing address and then within a wave; the sample was allocated in proportion to the number of records in each stratum. As with Alaska, the database grew cumulatively over the year (ICF Macro, Inc. 2012). Second, names and contact information for charter customers were obtained from a number of charter captains and charter organizations. Third, anglers were contacted at a sample of tackle shops and asked for their contact information for participation in the NES (ICF Macro, Inc. 2012). Charter effort was based on the number of charter trips reported by licensed commercial charter vessels and an average of 4 passengers per trip was used to calculate number of angler trips. Over 99% of these trips were estimated to be from non-residents (Hospital, 2012). Further details of the survey procedures and sampling frames are available in ICF Macro, Inc. (2012), and CIC Research, Inc. (2012).

Additional Estimation Details

In order to estimate mean trip expenditures per day, total expenditures were either divided by the number of days spent fishing (for all fishing related expenditures) or the number of nights away (e.g, lodging, meals).

In the 2006 NES, anglers were asked how many other people their expenditure included and the total expense was then divided by the number of people. Focus group testing done for the 2011 survey showed that this question often resulted in confusion and it was therefore eliminated in 2011. The calculation of mean angler-trip expenditure should be unaffected however, assuming that anglers who did not personally spend money report a zero expenditure on the survey.

For anglers who left the trip expenditure questions as a whole missing, but otherwise answered questions on either the intercept form or the mail version of the survey, sample weights were adjusted for non-response within their appropriate sampling strata by dividing the base weights by the inverse of the response rate within the same strata. This method assumes that anglers who did not respond had the same expenditure characteristics as those who did respond, within the same survey strata, and that there is random non-response within strata. Similarly, for the estimation of mean durable goods for the intercept based sample, the sample weights were adjusted to account for non-response to the mail portion of the survey.

APPENDIX II

NON-RESPONSE SURVEY

Statistical tests were conducted to examine the potential effects of non-response bias. First, to examine potential differences between non-respondents and respondents, 10% of the mail survey non-respondents were re-contacted by telephone and asked about some of their demographic characteristics and their expenditures on fishing gear, fishing tackle, and fishing rods and reels. Differences between respondents and non-respondents were analyzed using Proc surveyreg in SAS version 9.3. This procedure is able to deal with the stratified sample design and survey weights that were used in this study. The null hypothesis for the tests was no difference in means across the treatment variables. A t-test was used to determine statistical significance.

No significant differences in means were found for the expenditures on rods and reels compared across respondents (\$351) and non-respondents (\$386). Similarly, there were no significant differences in expenditures on other tackle for responders (\$292) versus non-responders (\$331). No significant differences were found for income, education level, or gender. Both groups had an average household income level between \$60,000 to \$79,000 for 2010. For both groups, the average education level was a high school diploma with some additional college work. Both groups were primarily male anglers.

The null hypothesis of no difference in means between respondents and non-respondents was rejected for the variables representing avidity, ethnicity, and hours worked per week. Participants in the mail survey had a higher mean 12-month avidity of 37 days while the non-response telephone survey participants had a mean 12-month avidity of 35 days, however the difference was only significant at the $p=.06$ level. There was slightly more diversity among race in terms of responders than non-responders. However, language barriers may have limited minority participation in the non-response telephone survey since it was conducted only in English. Non-responders reported working 38 hours per week on average versus 31 days for responders, and this difference was statistically significant at the $p=.01$ level.

Although the significance tests showed differences in means for avidity, ethnicity, and hours worked, no additional adjustments (beyond a reallocation of sample weights from the non-responders to the responders as previously described) were made for non-response since the null hypothesis for the expenditure variables tested could not be rejected at the 95% level.