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# Washington and Oregon Saltwater Sportfishing Surveys

## Methodology and Results

September 2013

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# Washington and Oregon Saltwater Sportfishing Surveys

## Methodology and Results

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September 2013

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# Executive Summary

The Northwest Fisheries Science Center administered surveys to saltwater anglers in Washington and Oregon during 2006 and 2007. These surveys gathered data on the preferences, trips, expenditures, and demographic characteristics of saltwater anglers in the two states. These data are essential to economic models that measure the value of the fishery. In addition, the data collected here can be used to measure the economic impact on regional economies, as well as provide a basis for predicting angler effort. This document describes the survey methods employed and uses these data to characterize the fishery participants.

The surveys were administered by mail in 2-month waves to approximately 8,000 anglers in each state. Participants were selected randomly from the population of adult anglers who purchased any license that enabled them to fish in salt water during the license year. We implemented the data collection following the first edition of Dillman's book, Mail and Internet Surveys, and used a modified protocol with up to six total contacts: an initial telephone screening survey, a notice letter for the mail survey, the first mailing of the complete survey package, a reminder postcard, the second mailing of the survey package, and the third and final mailing of the survey package.

The surveys collected data in four sections: 1) recent fishing trips, 2) detailed information on the last trip taken, 3) discrete choice experiment questions, and 4) demographic information. Focus groups and one-on-one interviews were used to select the attributes and levels of the discrete choice experiment questions in order to ensure that the fishing trips presented in those questions were contextually realistic and presented the respondents with no excessive cognitive difficulties.

Due to an oversampling of nonresident anglers in each state, results are provided separately for population segments determined by residency status and state. Fishing is the most important recreational activity for 35–45% of each segment of the population, and 86–93% consider fishing either the most important activity or are indifferent between fishing and other recreational activities. When comparing freshwater fishing to saltwater fishing, there is a noticeable difference between the two states. In Oregon, more anglers prefer freshwater fishing, whereas in Washington, more anglers prefer saltwater fishing.

Overall, the general characteristics and preferences of anglers indicate that anglers are a very heterogeneous group. For example, preferences for fishing relative to other recreational activities show an almost equal split of respondents who prefer fishing and respondents who are indifferent. Preferences for saltwater fishing relative to freshwater fishing show a similar degree of variation, as answers are split almost equally between the three categories: prefer salt water, prefer freshwater, and indifferent. This heterogeneity is surprisingly similar across states and residency status.

The majority of anglers in the two states use a private boat most often to fish in salt water. This proportion is largest in Washington and is likely due to the greater ease and safety of saltwater access in the state. The other two fishing modes—charter boat and shore—receive a roughly equal share of primary use among respondents.

The effective overall response rates for Oregon and Washington saltwater anglers are 48% and 51%, respectively. We used a brief telephone survey administered to the same population in order to examine differences to questions asked on both the phone survey and mail survey. Variables that could reliably be gathered over the phone and which had the potential for differences between respondents and nonrespondents were collected from the same underlying population. In most instances, telephone respondent characteristics match closely to mail survey respondents, indicating a low probability of nonresponse bias.

# Acknowledgments

The saltwater sportfishing surveys described in this document were developed through collaboration and consultation with numerous individuals. The following people made important contributions to the survey design or the fielding protocol: Brad Gentner, Gentner Consulting Group; Cindy Thomson, Southwest Fisheries Science Center; and David Layton, Daniel Huppert, Robert Halvorsen, and Gardner Brown, University of Washington. The Oregon Department of Fish and Wildlife and the Washington Department of Fish and Wildlife were extremely helpful in providing data from license databases in order to draw the sample of licensed anglers. The Northwest Fisheries Science Center also thanks all of the sportfishing individuals who volunteered their time for the surveys.

# 1. Introduction

The Washington Sportfishing Survey and the Oregon Sportfishing Survey were administered during 2006 and 2007 by the Northwest Fisheries Science Center. The surveys were mixed-mode surveys, with a short screening survey administered by telephone followed by a more substantial mail survey instrument. These data are essential to economic models that measure the value of the fishery. In addition, the data collected here can be used to measure the economic impact on regional economies, as well as provide a basis for predicting angler effort. This technical memorandum describes the survey methods employed and uses these data to characterize the fishery participants.

Section 2 describes the design, pretesting, and administration of the survey instruments. Responses from the mail survey are presented alongside responses from the telephone survey in Section 3. Section 4 discusses the experimental design in detail. Appendix A, State Recreational Data, describes the sources and characteristics of an available set of simulation data taken from the marine recreational fisheries in Washington and Oregon. Appendix B, Saltwater Sportfishing Survey Documents, contains seven documents including the initial telephone screening survey and one example of the 16-page mail survey instrument.

# 2. Survey Instrument Design and Administration

The Oregon Sportfishing Survey and Washington Sportfishing Survey gathered new data on the preferences, trips, expenditures, and demographic characteristics of saltwater anglers in Oregon and Washington. These data are intended to increase the level of understanding about fishery participants as well as quantify the effects associated with potential changes in the state of the fishery. In particular, understanding the current fishery participants requires a characterization of the level of effort along with information depicting the species targeted, the number and type of trips, general fishing preferences, and trip expenditures.

The Oregon Sportfishing Survey and the Washington Sportfishing Survey collected data in four sections: 1) recent fishing trips, 2) detailed information on the last trip taken, 3) discrete choice experiment questions, and 4) demographic information. The surveys cover all of the saltwater fishing areas of Washington and Oregon. Washington is further broken out into two regions: the Ocean Area and the Inside Area. The Inside Area includes the areas commonly referred to as the Strait of Juan de Fuca, Puget Sound, and San Juan Islands. This distinction was necessary due to the nature of the fishing regulations; while Washington saltwater fishing is separated into 13 Marine Areas for regulatory purposes by the Washington Department of Fish and Wildlife (WDFW), the most significant differences appear when comparing Marine Areas 1–5 (the Ocean Area) with Marine Areas 6–13 (the Inside Area). Estimating the effect of regulatory changes using the discrete choice experiment questions independent of the effect of area fished required explicit acknowledgement of the area fished.[1] See the map in the 16-page mail survey instrument in Appendix B for more detail. The species chosen to be covered in the surveys represent the most commonly targeted species in Oregon and Washington. Both states included Pacific halibut (*Hippoglossus stenolepis*), rockfish (*Sebastes* spp.), lingcod (*Ophiodon elongatus*), Chinook salmon (aka king salmon, *Oncorhynchus tshawytscha*), and coho salmon (aka silver salmon, *O. kisutch*). Washington also included pink salmon (*O. gorbuscha*) in the survey instrument, which become important during the more prolific run in odd-numbered years.

## 2.1. Pretesting

The surveys went through extensive pretesting. During 2005, anglers who held a license within the previous 12 months were sampled in order to recruit participants for survey testing.[2] Though focus groups and one-on-one interviews could be used to gather much of the same information, we chose a sequential process, using focus groups first to provide broad definitions and identify larger issues with the survey instrument. Focus groups were conducted across the

[1] This can be seen more clearly with an example. If the discrete choice experiment questions contained an alternative with a daily limit for rockfish equal to 10, respondents may have automatically assumed that the trip was set somewhere in the Ocean Area; daily limits in the Inside Area were, in general, an order of magnitude lower when the survey instruments were being designed. Without an explicit distinction between the Ocean Area and the Inside Area in the discrete choice questions, attributes related to the area of the trip would have been confounded with the rockfish limit.

[2] Participants were given a participation incentive based on industry standard practices.

two states in order to ensure that differences in regional dialect did not cause inconsistencies with respect to question understanding. Specifically, two focus groups were conducted at each of the following locations: Seattle, Spokane, Astoria, and Portland. The focus groups helped to establish general definitions, determine which attributes were important to anglers, set appropriate levels for these attributes, and refine the layout associated with the mail survey instrument.

Next, one-on-one interviews were conducted with anglers in both states at the following locations: Seattle, Bellingham, Aberdeen, and Portland. Anglers were asked to think aloud in the one-on-one interviews, helping to ensure that questions were answered in a consistent manner across respondents. These interviews also help to identify outliers by eliminating the group dynamics that are potential in focus groups. In total, 56 one-on-one interviews were used to test the two surveys.

## 2.2. Administration

The Oregon Sportfishing Survey and Washington Sportfishing Survey were administered by mail in waves during 2006 and 2007 to approximately 8,000 anglers in each state. Participants were selected randomly from the population of adult anglers who purchased any license that enabled them to fish in salt water during the license year.[3] The mailings were designed to allow the detection of seasonal influences on fishing choices and preferences by sending the surveys out in 2-month waves. Based on a low occurrence of saltwater fishing trips during the winter months, wave one (January and February) and wave six (November and December) were skipped and mailings were focused during higher use periods. The samples were drawn with nonresident license holders constituting 30% of each wave's mailings in order to allow the potential to estimate different preferences, expenditures, and willingness to pay (WTP) for fishing trip attributes for resident and nonresident respondents. We implemented the data collection following Dillman (2000) and used a modified protocol with up to six total contacts: an initial telephone screening survey, a notice letter for the mail survey, the first mailing of the complete survey package, a reminder postcard, the second mailing of the survey package, and the third and final mailing of the survey package. Table 1 provides an outline of the time frame used for mailings.

The first contact was the telephone screening survey (Appendix B). The initial telephone survey was administered to the full sample, and was first used to refine the sample further; as many types of fishing licenses allow for both saltwater and freshwater use, the telephone survey

[3] In Washington, sampled licenses include 1) the annual combination license, 2) the annual saltwater license, and 3) the 1, 2, 3, 4, or 5-day combination licenses. In Oregon, sampled licenses include 1) the annual angling license, 2) the combined angling/hunting license, 3) the senior citizen annual angling license, 4) the senior citizen combined angling/hunting license, 5) the sports pac license, 6) the nonresident annual angling license, 7) 1, 2, 3, 4, and 7-day angling licenses, 8) the resident disabled war veteran angling and hunting license, and 9) the resident pioneer angling and hunting permanent license. For our purposes, it is unfortunate that there are no saltwater licenses in Oregon; all fishing licenses allow use in freshwater and salt water. Angling tags are the closest tie to saltwater fishing records. Anglers are required to purchase a tag to fish for salmon, steelhead (*Oncorhynchus mykiss*), sturgeon (*Acipenser* spp.), or halibut. Since this list does not include two species in our survey, lingcod and rockfish, sampling from the angling tags would potentially lead to a nonrandom sample, so we chose to draw samples instead from the broader category of license holders.

screened anglers in the initial sample who do not fish in salt water. In addition to verifying respondent addresses for later mailings and screening for anglers who have fished in salt water in the last year, the initial telephone survey served the important purpose of collecting information to later test for (and potentially correct for) nonresponse bias. Testing for nonresponse bias requires collecting data on variables thought to vary with saltwater fishing preferences. As these preferences were expected to vary by the frequency with which respondents fish in salt water, the relative importance of substitute recreational activities including freshwater fishing, and the demographic characteristics of respondents, the telephone survey collected these variables. Later mail contacts were sent to anglers who were unable to be reached by phone or those who had fished in salt water within the last 12 months and agreed to a follow-up mail survey.

Within 2 weeks of the telephone survey, a notice letter (Appendix B) for the pending mail survey was mailed. The letter concisely described the survey project, promised confidentiality, and encouraged participation by stressing the importance of every response.

Three days after the notice letter was mailed, the first complete survey package (Appendix B) was mailed. All survey mailings contained a cover letter (which reminded the respondents of the earlier contacts, stressed the importance of the project, and repeated the assurance of confidentiality), one of 50 versions of the survey instrument, and a business reply envelope.

Seven days after the notice letter was mailed, all respondents received a reminder postcard (Appendix B). The postcard provided a gentle reminder to those respondents who had not yet completed the survey and a thank you to respondents who had completed the process.

Three weeks after the notice letter was mailed, the second mailing (cover letter in Appendix B) of the survey package went to those respondents who had not yet returned a completed survey.

The last contact was made 6 weeks after the notice letter was mailed, with the third and final mailing (cover letter in Appendix B) of the survey package to those who had not yet returned a completed survey.

# 3. Survey Responses

## 3.1. Response Rate

The effective response rate is calculated as the number of completed surveys received divided by the total number of surveys sent to saltwater anglers, where our definition of saltwater anglers is limited to those who have fished in salt water within the last 12 months. Based on the sample frame, we did not know whether a given respondent was a valid saltwater angler until we established a contact, as a number of license types allow saltwater fishing while also allowing other uses. License holders who were not reached by the initial telephone survey were also sent mail surveys. Since we did not know how many of these license holders fish in salt water, the total number of surveys sent to saltwater anglers must therefore be estimated. We used the telephone screening survey to determine the percentage of eligible saltwater anglers within the sample frame, then applied this percentage to the calculation of the base in the effective response rates. For each state, this calculation is simply given as

$$Response\ Rate = \left[\frac{Completed_{total} - Completed_{fw}}{\alpha_{sw}(Sent_{total} - Sent_{sw}) + Sent_{sw}}\right], \quad (1)$$

where $\alpha_{sw} = N_{sw}/N_{total}$, *total* refers to the total sample, *sw* (*fw*) refers to the portion of the sample who did (did not) fish in salt water in the last 12 months, and *N* is the size of these subgroups. In order to make the calculation more transparent, we note that $Sent_{total} - Sent_{sw}$ represents the number of mail surveys sent to license holders who were not reached by the telephone survey. The percentage of saltwater anglers in the sample frame is given by $\alpha_{sw}$ and was estimated as 22.6% for Oregon and 48.5% for Washington.

The effective overall response rates for Oregon and Washington are 48% (N = 4,681) and 51% (N = 4,925), respectively. State-level aggregate measures can mask potential differences between segments of these populations and, more importantly, are not valid without first correcting for oversampling of nonresident anglers described earlier. Therefore, in Table 2 and throughout the rest of the document, we list separate results for resident and nonresident anglers within the two states. As expected, response rates for those who were first contacted by telephone and determined to be eligible are significantly higher than the estimated response rates for those who were unable to be reached by phone for all groups of the population. The difference between Washington residents and nonresidents is also expected; the response rate for residents is significantly higher.

While response rates are the standard measure of whether or not the sample is representative of the population of interest, a true test of representativeness requires testing for nonresponse bias.[4] Low response rates increase the likelihood of nonresponse bias, but are not

[4] Nonresponse and nonresponse bias both produce undesirable effects, but these effects differ in severity. Nonresponse that is random within the population is only responsible for inflating the variance of parameter estimates. If nonresponse is systematic within a population and is left uncorrected, the result is more severe: biased estimates. For a good overview of survey nonresponse, see Groves et al. 2002.

by themselves a direct cause for concern; high response rates are typically the result of a carefully administered survey, but are neither necessary nor sufficient to show that nonresponse bias has been eliminated. Based in part on the potential for response rates to be misleading, there seems to be no universally accepted response rate in the literature above which nonresponse bias is no longer a concern, so we must look beyond a simple response rate calculation in order to test the representativeness of our survey data.

As mentioned above, the telephone survey provided the data necessary to test for differences between respondents and nonrespondents. Variables that could reliably be gathered over the phone and which had ex ante expected differences between respondents and nonrespondents were collected from the same population. For example, anglers who fish more often might be more likely to respond to the subsequent mail survey and the resulting estimates of effort, expenditures, and value might therefore be biased. We note that the telephone survey might not be a perfect representation of the true population because refusals are still possible. However, refusals on a short telephone survey are likely to be a subset of the potential refusals on a longer mail survey and, for this reason, the telephone survey is likely a better measure of the underlying population. We use the telephone data set as a comparison to the mail data set wherever possible throughout the rest of this document.

## 3.2. Type of Fishing

In order to understand the relative importance of saltwater fishing in the context of the full set of recreational activities, respondents were asked to compare fishing to other recreational activities and saltwater fishing to freshwater fishing. Table 3 and Table 4 show these results.[5]

Fishing is chosen as the most important recreational activity for 35–45% of each segment of the population, and 86–93% consider fishing either the most important activity or are indifferent between fishing and other recreational activities. When comparing freshwater fishing to saltwater fishing, there is a noticeable difference between the two states. In Oregon, more anglers prefer freshwater fishing, whereas in Washington, more anglers prefer saltwater fishing.[6] Washington has a greater ease and safety of saltwater access due to Puget Sound and this may increase the relative utility of a saltwater fishing trip for the average angler.

Three different modes of fishing are possible in Oregon and Washington: private, charter, or shore. We use the term charter fishing generally to refer to the hiring of a fishing guide and do not, in general, distinguish between the sizes and characteristics of these trips. Our definition of a private boat includes personal property owned directly by the respondent and also includes a boat owned by a family or friend that is accessed by the respondent. The majority of anglers in the two states use a private boat most often to fish in salt water (Table 5 and Table 6). This

[5] Results are comparable between Oregon and Washington only after dropping all respondents who did not fish in salt water within the last 12 months. This is necessary due to differences in the licensing systems in the two states. Oregon does not have a saltwater fishing license; therefore, the random sample is drawn from anyone in Oregon who purchased a fishing license. Since the population of interest is saltwater anglers, we first drop all anglers who did not fish in salt water. This step is applied in all tables uniformly throughout the rest of the document.

[6] However, it is important to keep in mind that the sampled populations are anglers who have fished in salt water in the past 12 months, thus the relative preferences we describe should not be assumed to hold in the larger population of all anglers.

proportion is largest in Washington and is likely due to the greater ease and safety of saltwater access in the state. The other two fishing modes receive a roughly equal share of use among respondents. This question also provides the means for our first examination of nonresponse. There is a great degree of similarity between the telephone and mail survey respondents, indicating a low potential for being affected by nonresponse bias.[7]

Closely related to the choice of mode for an angler is the accessibility of a private boat. Table 7 shows the degrees of private boat ownership and access. Large differences between residents and nonresidents are apparent in the table. As expected, a greater share of residents own their boat (48–61%) than nonresidents (22–34%).[8] This relative difference remains when considering the proportion of anglers who either own or have access to a private boat. It is also evident in Table 7 that a greater share of Washington residents own their boat than Oregon residents.[9] Again, this is likely due to factors like ease and safety of saltwater access.

The frequency of use provides another useful depiction of the fishery. Table 8 shows the average number of saltwater fishing trips taken over the last 12 months from the mail survey, and Table 9 provides a nonresponse comparison by examining the same information from the telephone survey. The distribution of trips is very skewed, with a few anglers fishing almost every day. Therefore, we also include a trimmed mean, as this measure is less sensitive to outliers.[10] The answers in Table 8 and Table 9 are comparable, but it should be noted that the questions were asked in a different format; the telephone survey asked for an aggregate number and the later mail survey asked for this same information broken out by species and geographic location. It is possible for a trip in which an angler targeted both salmon and bottom fish to be listed under both categories, and to therefore be double counted during aggregation. While respondents to the mail survey appear to have taken more trips on average than respondents to the telephone survey in most of the population segments, we cannot say how much of this difference can be attributed to nonresponse and how much of this difference can be attributed to double counting.

Table 10 and Table 11 provide the average number of trips with more detail about the species group targeted. More trips were made targeting salmon than bottom fish across all population segments. However, the size of this difference is largest within the resident populations. The distributions of all trip types are skewed, with considerable differences between calculated means and trimmed means.[11]

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[7] A close examination of the data shows a higher percentage of shore anglers in the Oregon mail survey data and a lower number of charter boat anglers in the Washington survey. There is very little difference observed between the mail and phone samples for private boat anglers. Though these differences do not seem to be very large in practical magnitude, the differences are statistically significant, as the overall test results for Oregon and Washington are $\chi 2 = 15.08$ ($P < .001$) and $\chi 2 = 9.63$ ($P = .008$), respectively.

[8] In both states, these differences are significant. Tests were made comparing the frequency of boat ownership versus the other categories after dropping the missing responses. In Oregon, $\chi 2 = 8.09$ ($P = .005$). In Washington, $\chi 2 = 122.81$ ($P < .001$).

[9] This test was made comparing the frequency of boat ownership versus the other categories after dropping the missing observations. The difference was significant: $\chi 2 = 27.00$ ($P < .001$).

[10] The trimmed mean listed in Table 8 and Table 9 is the mean calculated after dropping the top and bottom 5% from the tails of the distribution.

[11] Again, the trimmed means are calculated as simple means after dropping the bottom and top 5% of the trips.

Space constraints on the Washington survey did not allow us to include this level of detail, so the nonresponse comparison is only possible for Oregon. However, it seems likely that any differences between respondents and nonrespondents would be the same between the two states. While this information provides a more detailed comparison of respondents and nonrespondents, it also suffers from the potential bias of aggregating over different levels of detail. The mail data for Oregon explicitly acknowledged that trips could be for multiple species and asked for saltwater fishing trips broken out by those targeting bottom fish only, salmon only, bottom fish together with salmon, and other trips. In contrast, the telephone survey only asked for trips broken out by those targeting bottom fish and those targeting salmon. Allocating trips in which anglers targeted both bottom fish and salmon to either or both categories is problematic; therefore, we refrain from attempting to make such a comparison here. The only valid comparison we can safely make is one for Oregon nonresidents. Respondents to the mail survey made more salmon-only trips as well as more bottom fish–only trips, so even without allocating the combined bottom fish and salmon trips, it seems they made more trips than nonrespondents.

One question of direct relevance to fishery managers is the relative importance of keeping certain species of fish. For each of the five major saltwater species in our survey, anglers were asked whether they would keep all, most, some, or none of the fish.[12] Table 12 and Table 13 provide this information for Oregon and Washington, respectively.[13] It is apparent that the most important species to keep are Chinook (king) salmon, coho (silver) salmon, and halibut. Among the two remaining species, keeping lingcod is more important than keeping rockfish to most anglers. There are no significant differences between the two states or between residents and nonresidents in terms of this preference ordering.

## 3.3. Most Recent Trip

The highest level of detail for fishing trips is only available for the most recent trip.[14] This is primarily due to memory recall limitations uncovered during survey pretesting. Anglers were unable to recall detailed trip information over the past 12 months, especially the number and weights of fish caught, with any reliable level of confidence.

Angler success on the most recent trip, as measured by the average daily catch per person, is provided in Table 14. In addition to calculating simple means across all trips, the survey also asked anglers to indicate which species were targeted on the most recent trip. This allowed us to also calculate the average catch, conditional on targeting a given species. This can be seen as a more accurate measurement of success. Large differences between the simple and conditional averages are evident, providing a strong justification for eliciting the target species for these surveys. Catch rates are quite consistent across population segments. The highest

[12] We did not collect this information for hatchery and wild salmon separately for a few reasons: 1) the issue of hatchery and wild salmon was in the media prior to sending this survey and we did not want respondents to feel like this was the primary reason for the survey, and 2) in some seasons and areas anglers are not allowed to keep any wild king or silver salmon; asking for information that appears to be self-incriminating is not likely to generate meaningful data.

[13] In Table 12 and throughout the rest of this document, instances in which frequencies do not fully sum to 100 reflect missing values (item nonresponse).

[14] A trip is defined in the survey as the time from when an angler leaves their residence until they return (see third page in the 16-page survey instrument in Appendix B).

catch rates are those for rockfish, with average daily catch rates per person as high as 4.4 fish for Washington residents, conditional on targeting rockfish on the trip. The lowest catch rates are those for halibut and Chinook (king) salmon. It is interesting to note that halibut and king salmon are two of the species for which the importance of keeping a landed fish is relatively high compared with other species, as was seen earlier in Table 12 and Table 13.[15]

The targeted species data also enables us to examine another issue relevant to fishery management: recreational bycatch. Bycatch is often examined in the context of commercial fishing but less commonly measured in a recreational context, primarily because catch and target data are often not asked in conjunction. Fishery managers are extremely aware of recreational bycatch issues, though, as evidenced by full temporal and spatial closures designed to keep sportfishing mortality levels within harvest caps. If bycatch were not seen as an issue, a greater share of recreational closures would instead be species specific. In the data we collect, nonzero catch data for a species that is not targeted represents bycatch. We do not include catch levels above the daily bag limit in our definition of bycatch. An important context for recreational bycatch is bottom fish trips on which rockfish are not targeted but still caught, because rockfish often do not survive being released due to barotrauma.[16] Rockfish bycatch numbers are provided in Table 15. There is some amount of accidental catch in both states and this bycatch is seen while targeting lingcod and halibut. However, the magnitude of bycatch is very small in most cases. The largest bycatch appears for nonresidents in Washington targeting halibut: 1.14 rockfish are caught per person per day.[17]

In order to determine what share of the total expenses and value from the most recent trip can be attributed to saltwater fishing, we asked respondents whether the primary purpose of this trip was for saltwater fishing (Table 16). It is evident that fishing was a secondary concern on some of these trips. In particular, nonresidents may have visited the state on a family vacation or business trip and decided to fish while there. This is true for a large number of trips in Washington, as more trips taken by nonresidents were primarily for reasons other than saltwater fishing. For residents, the vast majority of respondents indicated that the last trip was for saltwater fishing: 82% in Oregon and 83% in Washington.

Next we turn to the expenditures from the most recent saltwater fishing trip. Anglers were asked to provide their personal or household expenditures for a detailed series of categories. They were also asked to provide the number of people covered by each expense. This follow-up question enabled us to more accurately calculate expenditures per person in cases where expenses are shared between people on the fishing trip. Using these data, we calculated the average daily expenditures per person (Table 17).[18] As expected, there were substantial

[15] This is in line with economic intuition: from an angler's perspective, targeted species that are more difficult to successfully land are more important species to retain.

[16] For example, see Jarvis and Lowe 2008.

[17] The difference between residents and nonresidents here is due to one of two reasons. First, residents are probably more likely to realize that when targeting halibut, rockfish are also caught; they are therefore more likely to indicate that trips targeting halibut are also targeting rockfish. Second, this difference could be due to real differences in catch; residents could in fact have more experience and skill in avoiding bycatch.

[18] In Table 17, all means are trimmed at the 5% level. The mode is taken as the mode used most often when a respondent indicated using more than one mode on the last fishing trip. Ties are treated as missing and not included in the table. The fishing cost is divided by the number of days fishing, whereas the travel cost is divided by the total number of days on the trip. Mean lodging costs are calculated conditional on being greater than zero.

differences between the calculated daily fishing cost for charter boat trips, private boat trips, and shore trips; charter boat trips are the most expensive, followed by private boat trips, then shore trips. Travel costs were broken out into three categories determined by the length of the trip: one-day trips, two-day trips, and trips longer than two days. Many trips have an associated fixed cost component and a simple average has a tendency to mask the inverse relationship between the daily transportation cost and the length of the trip. This fixed cost is largest for anglers traveling the longest distances, thus the difference between one-day and multiple-day trips is primarily evident in the nonresident populations.

The stability of the saltwater fishing population base determines, in part, the temporal relevance of these data. The population of interest in this study is all anglers who fished in salt water in the last 12 months and the proportion of anglers who remain in this fishery provides us with a static measure of stability. Specifically, we collected data on the likelihood of fishing in salt water within the state in the next 12 months (Table 18 and Table 19). The overall population is quite stable, as a majority of anglers are likely to remain active in the population over the next 12 months. Washington nonresidents represent the least stable population segment, as more than 20% will probably not saltwater fish in the next 12 months. Without more information, it is difficult to tell whether this truly represents a dynamic population; it is possible that for some nonresidents, saltwater fishing in Washington is a vacation taken once every few years.

The likelihood of saltwater fishing within the state in the next 12 months may influence the individual decision to respond to the survey, so we used the telephone survey to address potential nonresponse. A comparison of Table 18 and Table 19 shows that respondents to the mail survey are more certain than respondents to the phone survey that they will saltwater fish within the state in the next year; the entire distribution of responses is shifted upward toward the case in which respondents are certain to fish.[19] This question represents an instance in which the difference between phone survey respondents and mail survey respondents has the potential to indicate a concern for nonresponse bias. However, a difference in the likelihood of saltwater fishing in the next year may be more closely related to past success (or lack thereof) than to differences in the underlying preferences for standardized levels of fishing trip attributes or expenditures.[20] In addition, the differences observed here are small in practical magnitude. If the noted differences in the likelihood of saltwater fishing were to translate into WTP, it seems likely that the alternative specific constants related to saltwater fishing trips would be most affected in the subsequent choice modeling. Whether or not these differences are large enough to warrant complex reweighting techniques requires a judgment call.[21] We think that reweighting should be reserved for addressing the nonrandom sampling procedure used to draw residents and nonresidents.

[19] For one example of differences between the phone survey and mail survey, we provide test results comparing the proportion of respondents who said they were certain to fish relative to the other categories of responses. For Oregon residents, $\chi 2 = 31.43$ ($P < .001$), for Oregon nonresidents, $\chi 2 = 5.51$ ($P = .0189$), for Washington residents, $\chi 2 = 57.39$ ($P < .001$), and for Washington nonresidents, $\chi 2 = 2.22$ ($P = .1362$).

[20] Survey pretesting in focus groups and one-on-one interviews suggested that a number of the respondents who are unlikely to fish in saltwater in the next 12 months make that decision based in part on past success.

[21] For a discussion of reweighting techniques, see Gelman and Carlin 2002.

## 3.4. Demographics

The anglers in this fishery are overwhelmingly male, with a total of 78–90% of anglers in the population segments. As this number seemed somewhat high, we sought an external check of validity. Sex was not asked in the telephone survey and was only contained in the sample frame for Oregon.[22] Table 20 provides the frequencies for sex from the mail survey and Table 21 provides a nonresponse comparison through use of the sample frame for Oregon. For Oregon, the proportion of male respondents is slightly higher than the proportion in the population.[23]

The age of the respondents within the sample is truncated below 18, due to a desire to sample only adult respondents. Therefore, the sample average is less useful than simple frequencies. We provide Table 22 to fully illustrate the age distribution within the sample. This question was also asked in the telephone survey and these data are provided in Table 23. Comparing Table 22 to Table 23, there appear to be no significant differences in the age distribution between respondents and nonrespondents.[24]

The average household size in the sample is 2.0 adults and 0.7 children for Oregon and 2.0 adults and 0.6 children for Washington (Table 24). These numbers are very consistent across population segments.[25]

The education levels for the sample are provided in Table 25. Specifically, these frequencies represent the highest level of education completed by the respondent. For all population segments, the greatest share of responses are from respondents who had completed a college degree or more, followed by some college, a high school degree, technical school, and the smallest share of responses among the education categories were respondents who attended high school but did not complete the degree. These rankings are consistent across the population segments.

Multiple questions were provided to collect information on household and personal income. First, categorical household income data were obtained from both the mail survey and telephone survey, and are provided in Table 26 and Table 27, respectively. A visual comparison of these tables shows that the income distribution from the telephone survey closely matches that

[22] It was decided that asking whether the respondent was male or female over the phone could have the undesired effect of alienating some respondents.

[23] Calculated confidence intervals for the mail survey proportions do not include the population proportions. The confidence interval for Oregon residents is (.8127, .8717) and the confidence interval for Oregon nonresidents is (.8514, .9474). However, since the population included many licenses bought without the intention of fishing in salt water, we cannot firmly say this is evidence of nonresponse and the difference between these two proportions is very small in practical magnitude.

[24] A formal test comparing the mail sample to the phone sample indicates that there are no significant differences across the age distribution for Washington, $\chi^2 = 3.20$ ($P = 0.78$). In Oregon, there are slightly fewer returns in the 18–29 age group and slightly higher returns in the 30–39 age group in the mail returns, $\chi^2 = 18.36$ ($P = .005$).

[25] It should be noted that one respondent indicated that 47 adults lived in a single household. In order to preserve a meaningful average, this respondent was dropped from the calculations in Table 24.

of the mail survey.[26] These two tables show income distributions that are right-skewed, most likely reflecting the fact that in many populations, income distributions are commonly found to be log-normal. The majority of households have annual incomes that fall between $40,000 and $125,000. Income data appears to also be the most sensitive question, as these questions have the greatest level of item nonresponse among all demographic questions.

Next the mail survey collected information necessary to estimate the personal income of the respondent by first asking whether the respondent worked for pay or profit (Table 28). This question provides more detail than if we had used the age distribution and assumed that respondents who are 65 or older are retired and therefore do not work, as seen by the differences between the proportions of those who do not work to those age 65 or older in Table 22.

A follow-up question to respondents who confirmed that they personally worked for pay or profit elicited an approximate hourly wage (Table 29). These data should represent more accurate estimates of hourly wage rates than alternative calculations that rely on household income, the number of adults in the household, and employment status.

An important goal of this survey was to understand the opportunity cost of a fishing day; therefore, in addition to asking the standard income questions mentioned above, we also collected information on the use of paid or unpaid time off work devoted to fishing (Table 30). Taking time off work to fish could be an indicator of an increased relative preference for fishing, a lower opportunity cost of time off work (lower hourly wage), a family structure that encourages devoting weekends and other time off work to family pursuits other than fishing, or could be the result of several day-of-week regulations which, in some areas, may not allow fishing for certain species on weekends. Table 30 very clearly shows that recreational fishing is an important activity for these respondents, as approximately 50% take paid time off for fishing, 25% take unpaid time off for fishing, and 12% take both unpaid and paid time off for fishing.

## 3.5. General Survey Results: Representativeness

The results from these surveys provide a thorough description of recreational saltwater anglers in the Northwest. The Oregon and Washington surveys were successful in achieving relatively high response rates—48% and 51%, respectively—providing a degree of confidence when applying sample results to the overall population.

We examined the potential for nonresponse bias in more detail through the use of a series of brief questions administered to a wider segment of the population. Differences between respondents and nonrespondents, when found, were documented and used to make a judgment on the necessity of using complex nonresponse correction techniques in order to make inferences about the population. We found this comparison to be a very efficient and simple means to evaluate the degree to which the sample represents the population at large and recommend the inclusion of a brief initial telephone survey to researchers conducting similar mail surveys.

[26] The Oregon mail survey exhibits slightly more responses in the upper end of the income distribution: $\chi 2 = 13.97$ ($P = .052$). The Washington mail survey shows the opposite pattern, with more responses in the lower end of the distribution, and these differences are more statistically significant: $\chi 2 = 43.08$ ($P < .001$).

In most instances, characteristics of telephone survey respondents match those of mail survey respondents, indicating a low probability of nonresponse bias. The greatest potential for bias is evident in responses to the question asking for the likelihood of fishing in salt water within the next 12 months. Respondents are more likely to be certain to fish. Other differences in variables are apparent in the classification of sex (respondents are slightly more likely to be male) and the number of trips (respondents take a greater number of trips). While results indicate that some of the differences between respondents and nonrespondents are statistically significant, none seem to be significant in practical magnitude.

# 4. Experimental Design

This section of the document provides detail on the experimental design used to select the attributes and levels for the discrete choice experiment questions of the surveys. The basic steps involved with the design of our choice experiment were 1) the definition of relevant attributes and attribute levels for the study and 2) the creation of the experimental design.

## 4.1. Definition of Attributes and Levels

Perhaps the most important tools we used to select the attributes for our choice experiment were focus groups and one-on-one interviews with recreational anglers. Gathering information on the relevant attributes that affect trip choice ensured that the appropriate trade-offs were represented in the choice tables given to respondents. Unbelievable attribute levels can cause respondents to lose interest or question the credibility of the survey instrument, which in turn can lead to the use of simplified decision making heuristics, increased item and survey nonresponse, or answers not grounded in reality. Therefore, the attributes and levels selected for inclusion in the experimental design were selected to mimic the types of trips available to saltwater recreational anglers as closely as possible.

In the context of our design, it was necessary to have knowledge of the distribution of weights and catch for each included species, and the fishing costs associated with different types of trips. Focus groups and one-on-one interviews also provided a medium with which to gather information on the possibility of multiple-species trips that should be included in the design. Including the appropriate multiple-species trips serves the dual purpose of adding a degree of realism as well as allowing for the estimation of interactions in the utility function. Finally, one-on-one interviews were used to test the attributes and levels we selected to ensure the fishing trips in the design were contextually realistic and presented the respondents with no excessive cognitive difficulties. Table 31 provides a description of the final attributes and levels we use in the experimental design.

One unique aspect of our choice experiment that can be seen in Table 31 is the large number of attributes. We know of no other choice experiment in the environmental economics literature that attempts to measure the effect of such a large number of attributes. Clearly, estimation becomes increasingly difficult as the number of estimated parameters increases, ceteris paribus, and this puts increasing pressure on the experimental design.

## 4.2. Design Considerations

The process of experimental design refers to systematic selection of the choice sets to include in the survey instrument. The experimental design was generated in two distinct stages: 1) we generated a candidate set consisting of feasible saltwater fishing trips and 2) we paired

members of this candidate set optimally based on the criteria of maximizing the D-efficiency[27] of a choice model. While optimal selection of choice sets in the literature typically refers to some statistical criteria, such as minimizing the variance of the resulting parameter estimates, we treat the phrase more generally and include consideration of the trade-offs that statistical efficiency can have on the cognitive complexity of the choice task, as well as the believability of the choice sets to respondents. In the rest of this section, we compare some of the experimental design techniques in the literature before moving to a detailed description of the methods we used to generate our designs. In all but the most simple of experimental designs, a full factorial approach is not feasible.[28] Some subset from the full combination of possible trips must therefore be selected.

Many strategies have been proposed in the literature for optimally selecting a subset of the full factorial design. A quick review of the environmental economics literature reveals that the majority of the experimental designs are orthogonal main effects designs for linear models, in contrast to the D-optimal designs[29] built for choice models. The bias toward linear designs is perhaps best seen by looking at Lusk and Norwood (2005) who, while testing the performance of a large set of competing experimental designs, completely omit a choice design from consideration. Ferrini and Scarpa (2007) suggest that the profession might not have missed out on a great deal of efficiency in the slow acceptance of the more theoretically correct choice designs. Nonetheless, their work shows that small efficiency gains are a very probable result of using choice designs, as opposed to linear designs, even when lacking good information on the data generating process. This is very much in agreement with the findings from the Monte Carlo experiments in Anderson (2009).

One important decision in the process of experimental design is the consideration of interaction effects. Many applications ignore interaction effects for one reason or another. Main-effects-only designs will tend to perform poorly at the edges of the design space, which might be an important region with respect to changing policies. Lusk and Norwood (2005) show that main-effects designs lead to unbiased welfare estimates, even when the underlying preferences include significant interactions. However, the simulations used to show these results focus on the middle of the design space and assume a utility function with an increasing marginal

[27] D-optimal designs attempt to maximize the efficiency of the resulting parameter estimates by using a criterion referred to as D-efficiency, which uses a function of the geometric mean of the eigenvalues of the information matrix to gauge the relative size of the variance matrix of the resulting parameter estimates (see Equation 2). Using D-efficiency to examine candidate experimental designs is a useful general approach for design selection in choice experiments.

[28] A full factorial design is simply the full representation of all attributes and attribute levels used in the choice experiment to describe the alternatives. They are typically not seen in the literature because the problem blows up quite quickly with even a small design space. For example, in the design we generated for Oregon, the full $2^{1} \cdot 3^{7} \cdot 4^{22}$ factorial involves 76,948,221,758,275,584 total combinations.

[29] See footnote 27.

rate of substitution.[30] We feel that the theoretical justification for including interactions is strong enough to warrant their explicit use in our design selection.[31]

## 4.3. Candidate Set

One common approach to constructing a candidate set is to simply generate the full factorial design and drop unrealistic combinations of attributes.[32] In our context, however, the size of the full factorial design was a limiting factor. In order to overcome this computing limitation, the candidate set was constructed from many smaller designs. These designs included single species trips and all desired combination trips. We use the term combination trip to refer to a trip where anglers target or catch more than one of the following: halibut, rockfish, lingcod, coho (silver) salmon, and Chinook (king) salmon. Combination trips were selected to match the types of trips commonly observed in practice while satisfying space constraints imposed by the survey instrument.[33] Each of these smaller designs was created by maximizing the D-efficiency of a linear model, as given by

$$\text{D-efficiency} = \left[|\Omega|^{1/K}\right]^{-1}, \tag{2}$$

where $K$ is the number of parameters and the covariance matrix , $\Omega$, is given by

$$\Omega = \sigma^2 (X'X)^{-1}. \tag{3}$$

In these small initial designs, we defined the design matrix $X$ to include all potential cross-effects.[34] Following Kuhfeld et al. (1994), a computerized search algorithm was used to find

[30] Interactions become increasingly important as you move closer to the corners of the design space and an increasing marginal rate of substitution is not in general a characteristic of the typical attributes valued in a discrete choice experiment. For these reasons, the conclusions of Lusk and Norwood might not fully generalize.

[31] Omission of interaction terms in the experimental design simply refers to the case in which D-efficiency is calculated using only main effects. This does not preclude the estimation of utility functions containing interactions. However, the variance of interaction parameter estimates will be higher if these terms are not included in the design stage. We think that, in general, preserving the ability to test for interactions during model specification with some degree of power is important. If significant interaction effects are falsely tested out of a model, the accuracy of welfare estimates calculated at the edges of the design space can be compromised. Since one of the major benefits of using discrete choice experiment data is to predict changes in welfare beyond attribute levels that have been observed historically, this limitation seems to outweigh the very low cost of including interactions in the design stage.

[32] We note that in some contexts, a candidate set is not explicitly necessary. If a researcher chooses a linear design from a list of known orthogonal designs, there is no need for a candidate set. If a researcher is using the more theoretically correct choice design, then the most commonly used search algorithms require a candidate set (even if this is simply a full factorial design).

[33] We used the Recreational Fisheries Information Network data (RecFIN 2006) to choose the most important multiple-species trips, which led to selecting all of the possible bottom fish–bottom fish combination trips and all of the salmon-salmon combination trips, but no salmon–bottom fish combination trips. We used a threshold of 15% to signify an important combination trip; if species A was caught on more than 15% of the trips targeting species B, we included combination trips catching both A and B together in the candidate set. Space constraints on the survey instruments allowed no more than two of the following fish types to appear within a single choice set: halibut, lingcod, rockfish, and salmon.

[34] Even if the true model turns out to be linear, Lusk and Norwood (2005) have shown that using designs that include cross-effects results in more accurate WTP estimates. Potential cross-effects were somewhat restricted based on the decision to leave salmon–bottom fish combination trips out of the design. The result is that no bottom fish–salmon cross-effects are identified.

designs that are efficient, but not necessarily orthogonal.[35] We used these fractional factorial designs as building blocks for the candidate set because the full factorial design was too large to implement.

Next we appended these smaller designs into an initial candidate set and eliminated any undesirable or unrealistic trips, defined as trips with catch levels falling outside the credible range derived from focus group testing.[36] To illustrate the procedure, note that trips containing halibut in the candidate set come from a halibut-only design, a halibut-rockfish design, or a halibut-lingcod design. Trips were eliminated at this point if a duplicate trip existed in the candidate set. The last step in creating the candidate set was to eliminate the subset of trips in which it was impossible to uniquely identify which salmon would be kept. The uncertainty in determining which salmon would be kept is a result of the salmon regulations used by fishery managers; grouped regulations do not allow for a unique characterization of the salmon which could be kept on a given trip without additional information.[37] This deleted subset included roughly 30% of the salmon trips in the candidate set. This last step ensured that we could estimate catch and release separately for the discrete choice scenarios for all respondents without gathering separate information on preferences for keeping salmon species and sizes.

## 4.4. Choice Sets

After the candidate set was completed for each state, we turned to the process of pairing the alternatives as choice sets. A search algorithm was used to optimally select 200 choice sets, using the candidate set of trips. Since there are many alternative ways to rank candidate experimental designs, we turn now to the criteria used in the selection process. We followed Zwerina et al. (2005) by using a computerized iterative search algorithm to optimally pair members of this candidate set based on maximizing the D-efficiency of a choice model.[38] Standard discrete choice models, such as the multinomial logit, require knowledge of parameter values to assess the efficiency of a design. McFadden (1974) showed that the maximum likelihood methods for the conditional logit model yield a covariance matrix given by

$$\Omega = (Z'PZ)^{-1} = \left[\sum_{n=1}^{N}\sum_{j=1}^{J_n}\left(z'_{jn}P_{jn}z_{jn}\right)\right]^{-1}, \quad (4)$$

where

$$z_{jn} = x_{jn} - \sum_{i=1}^{J_n}(x_{in}P_{in}), \quad (5)$$

$J_n$ is the number of alternatives in the choice set, and $N$ is the number of choice sets. The covariance matrix described above is a function of the choice probabilities, $P_{in}$, which in turn are a function of the true unknown utility parameters, β. To see this more clearly, note that in the case of the conditional logit model, the choice probabilities are given by

[35] These linear designs were generated in SAS software using the %mktex macro.
[36] For example, a combined salmon catch above six salmon per person per day was described as very rare in focus group testing and was therefore eliminated from the candidate set.
[37] As an example, knowing which fish would be released under a binding total salmon limit would be impossible when catching both Chinook (king) and coho (silver) salmon on the same trip unless one of the more narrowly defined regulations (king salmon limit, wild king salmon limit, silver salmon limit, wild silver salmon limit) had the effect of bringing total salmon catch below the total salmon limit.
[38] The choice sets were formed in SAS software using the %choiceff macro.

$$P_{in}(Y_n|\beta) = \frac{e^{\beta' x_{in}}}{\sum_{j=1}^{J_n} e^{\beta' x_{jn}}}. \quad (6)$$

We must therefore incorporate a set of prior expected values for the parameters of the utility function that vary in the design. These prior values can come from past research or the process of experimental design can be iterated with expected values derived from an earlier iteration.[39] Alternatively, the case in which the sign and magnitude of true parameter values are unknown can be represented as the case where prior values are assumed to be zero. In this case, the covariance matrix for the multinomial logit model simplifies to

$$\Omega = (Z'PZ)^{-1} = \left[\sum_{n=1}^{N} \frac{1}{J_n} \sum_{j=1}^{J_n} \left(z'_{jn} z_{jn}\right)\right]^{-1}, \quad (7)$$

where

$$z_{jn} = x_{jn} - \frac{1}{J_n} \sum_{i=1}^{J_n} x_{in}. \quad (8)$$

Several authors, including Huber and Zwerina (1996) and Carlsson and Martinsson (2003), have tested the consequences of this simplification. The result was an experimental design which required 10–50% more respondents to achieve the level of precision resulting from nonzero unbiased parameter values. Without any prior knowledge of parameter values and a large list of attributes, this is the path we chose. Other work (Anderson 2009) has shown that maximizing the D-efficiency of a choice model with no information about parameter values still provides more accurate WTP estimates than maximizing the D-efficiency of a linear model when the data generating process is unknown to the researcher at the time of the design and typical model selection or model averaging criteria are used. As in the construction of the candidate set, we again included all relevant cross-effects in the design matrix *X*.

D-efficiency can be misleading when used as the only measure of an optimal design. As mentioned above, the D-efficiency of a given design is a function of the unknown parameter values and, perhaps more problematic when working with choice models, the unknown data generating process. A hypothesized model must be specified in the search algorithm in order to make this calculation. Different hypothesized models are likely to lead to different optimal designs. We sought a robust design that was capable of providing efficient parameter estimates under an array of model specifications, rather than a design that only performed well under a single specification. For this purpose, we turned to simulation to provide additional criteria with which to evaluate competing designs.

For each design we 1) constructed a set of theoretically appealing utility functions, 2) generated independent and identically distributed errors from the Type I extreme value distribution,[40] 3) simulated choices, 4) estimated multinomial logit models for each true utility function, 5) stored parameter estimates and t-statistics, 6) repeated steps 1–5 100 times, and

[39] In the context of our surveys, we could have used the first wave of survey mailings to provide expected parameter values that would feed into the experimental design for the second and subsequent waves of survey mailings. However, this sort of updating is quite costly in practice.

[40] To generate the unobservable portion of utility in a realistic manner, we generated error terms from a distribution chosen to mimic fit statistics from prior discrete choice experiment recreational fishing choice studies. Specifically, we added variance to the distribution from which the error terms are drawn until the resulting McFadden's $R^2$ from the estimated logit model was approximately 0.3.

7) stored the bottom 5th, 10th, and 50th percentiles of the (absolute value of) t-statistics. This output was used to focus on key model parameters that proved more difficult to efficiently estimate. While the designs considered at this stage had D-efficiency values that were nearly indistinguishable, there were noticeable differences in the precision of certain parameter values; therefore, the final design was chosen to minimize the number of parameters with low 5th and 10th percentile t-statistics. Results from a simulation such as this help to provide a design robust to potential intricacies in the true data generating process.

The final design was blocked into sets of four, as each of the 50 survey versions has four choice questions. In order to ensure that every respondent would receive trips representing as many trade-offs as possible, we created a blocking variable that was held orthogonal to a set of indicator variables representing the broadly defined trips being compared in each choice set. Each choice set may compare, for example, bottom fishing trips to other bottom fishing trips, bottom fishing trips to salmon fishing trips, or salmon fishing trips to other salmon fishing trips, so an indicator variable representing these choices was held orthogonal to the blocking variable. Other factors held orthogonal included indicator variables representing the species present (halibut, rockfish, lingcod, silver salmon, king salmon) and the three-level factor of cost. Last, each survey version was examined by hand, and some choices that were strictly dominated were slightly edited in order to provide more meaningful trade-offs.

The experimental design discussed here provides the discrete choice experiment questions intended to estimate preferences for fishing trip attributes. While we do not directly estimate preferences here, we note that the intended use of these data is to estimate a model that can simulate and measure the economic effect of changes in the recreational fishery. See Anderson and Lee (2013) and Anderson et al. (2013) for examples of these models. Model simulations require baseline catch data—the most complete of which are collected through creel sampling programs in the two states. We include a description of the sources and characteristics of the creel data that can be used for similar model simulations in Appendix A.

# Tables 1–31

Table 1. Survey timeline.

| Contact | Time between contacts |
|---|---|
| Telephone screening survey | — |
| Notice letter for mail survey | 2 weeks |
| First survey mailing | 3 days |
| Reminder postcard | 4 days |
| Second survey mailing | 2 weeks |
| Third survey mailing | 3 weeks |

Table 2. Detailed effective response rates.

| | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Overall sample | 48<br>N = 3084 | 52<br>N = 1597 | 56<br>N = 3412 | 41<br>N = 1513 |
| No phone contact | 46<br>N = 2700 | 45<br>N = 1505 | 48<br>N = 2398 | 35<br>N = 1300 |
| Phone contact | 55<br>N = 384 | 71<br>N = 92 | 66<br>N = 1,014 | 52<br>N = 213 |

Table 3. Fishing versus other recreation.

| Preferred recreational activity | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Fishing | 45 | 45 | 41 | 35 |
| Other activity | 4 | 7 | 10 | 10 |
| Indifferent | 48 | 45 | 47 | 51 |
| Did not answer | 2 | 3 | 2 | 3 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 4. Saltwater fishing versus freshwater fishing.

| Preferred fishing type | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Saltwater fishing | 25 | 22 | 46 | 32 |
| Freshwater fishing | 34 | 34 | 19 | 22 |
| Indifferent | 36 | 40 | 32 | 42 |
| Did not answer | 4 | 4 | 3 | 4 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 5. Most often used mode from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Mode** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Private | 57 | 50 | 71 | 66 |
| Charter | 14 | 19 | 8 | 13 |
| Shore | 19 | 18 | 15 | 15 |
| Did not answer | 10 | 13 | 6 | 6 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 6. Most often used mode from telephone survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Mode** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Private | 66 | 57 | 75 | 67 |
| Charter | 23 | 17 | 12 | 15 |
| Shore | 10 | 22 | 12 | 17 |
| Did not answer | 1 | 4 | 1 | 1 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 7. Boat access or ownership.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Ease of access** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Own boat | 48 | 34 | 61 | 22 |
| Access boat | 29 | 32 | 22 | 40 |
| Neither | 22 | 31 | 16 | 33 |
| Did not answer | 1 | 3 | 2 | 4 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 8. Average trips last 12 months from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Trips** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Mean | 8.8 | 5.9 | 9.3 | 2.5 |
| Trimmed mean | 6.9 | 4.3 | 7.6 | 1.6 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 9. Average trips last 12 months from telephone survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Trips** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Mean | 7.1 | 3.2 | 7.8 | 2.1 |
| Trimmed mean | 4.4 | 2.1 | 5.8 | 1.5 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 10. Average trips by species group in Oregon.

| Species group targeted | Resident | Nonresident |
|---|---|---|
| Bottom fish | | |
| Mean | 1.8 | 1.0 |
| Trimmed mean | 1.2 | 0.6 |
| Salmon | | |
| Mean | 4.4 | 2.6 |
| Trimmed mean | 3.2 | 1.6 |
| Bottom fish and salmon | | |
| Mean | 1.7 | 1.4 |
| Trimmed mean | 1.0 | 0.7 |
| | N = 448 | N = 155 |

Table 11. Average trips by species group from telephone survey responses.

| Species group targeted | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Bottom fish | | | | |
| Mean | 2.8 | 0.9 | 1.8 | 1.0 |
| Trimmed mean | 1.2 | 0.6 | 1.0 | 0.4 |
| Salmon | | | | |
| Mean | 5.7 | 1.4 | 5.7 | 1.1 |
| Trimmed mean | 2.8 | 1.0 | 3.9 | 0.7 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 12. Importance of keeping fish for Oregon respondents.

| | Resident: I would keep… | | | | Nonresident: I would keep… | | | |
|---|---|---|---|---|---|---|---|---|
| Species | All | Most | Some | None | All | Most | Some | None |
| Halibut | 63 | 15 | 13 | 1 | 57 | 16 | 20 | 3 |
| Rockfish | 37 | 20 | 29 | 6 | 37 | 18 | 29 | 11 |
| Lingcod | 49 | 20 | 19 | 4 | 45 | 16 | 25 | 8 |
| King salmon | 64 | 18 | 11 | 1 | 60 | 21 | 12 | 4 |
| Silver salmon | 62 | 18 | 13 | 2 | 55 | 23 | 15 | 4 |
| | N = 469 | | | | N = 159 | | | |

Table 13. Importance of keeping fish for Washington respondents.

| | Resident: I would keep… | | | | Nonresident: I would keep… | | | |
|---|---|---|---|---|---|---|---|---|
| Species | All | Most | Some | None | All | Most | Some | None |
| Halibut | 64 | 15 | 14 | 2 | 50 | 15 | 21 | 4 |
| Rockfish | 38 | 19 | 28 | 10 | 29 | 15 | 29 | 14 |
| Lingcod | 53 | 18 | 18 | 6 | 40 | 15 | 25 | 10 |
| King salmon | 67 | 18 | 12 | 1 | 56 | 15 | 19 | 4 |
| Silver salmon | 67 | 18 | 12 | 1 | 53 | 15 | 19 | 5 |
| | N = 1,194 | | | | N = 248 | | | |

Table 14. Average daily catch per person.

| Species caught or targeted | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Halibut | | | | |
| Targeted | 0.65 | 0.87 | 0.56 | 0.42 |
| All trips | 0.05 | 0.09 | 0.04 | 0.06 |
| Rockfish | | | | |
| Targeted | 3.79 | 3.92 | 4.42 | 1.76 |
| All trips | 0.97 | 1.20 | 0.76 | 0.47 |
| Lingcod | | | | |
| Targeted | 1.02 | 1.12 | 1.32 | 0.70 |
| All trips | 0.24 | 0.28 | 0.18 | 0.14 |
| King salmon | | | | |
| Targeted | 0.47 | 0.48 | 0.70 | 0.52 |
| All trips | 0.24 | 0.23 | 0.39 | 0.26 |
| Silver salmon | | | | |
| Targeted | 0.92 | 1.35 | 0.98 | 1.04 |
| All trips | 0.30 | 0.39 | 0.58 | 0.41 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 15. Average daily rockfish bycatch per person.

| Rockfish bycatch for species targeted | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Halibut | 0 | 0 | 0 | 1.14 |
| Lingcod | 0.06 | 0 | 0 | 0.08 |
| | N = 43 | N = 11 | N = 74 | N = 24 |

Table 16. Primary purpose of trip.

| Purpose | Oregon | | Washington | |
|---|---|---|---|---|
| | Resident | Nonresident | Resident | Nonresident |
| Fishing | 82 | 60 | 83 | 47 |
| Other | 12 | 36 | 12 | 48 |
| Did not answer | 6 | 4 | 5 | 6 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 17. Average daily expenditures per person on the most recent trip.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Expense type** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Fishing cost | | | | |
| Charter boat | $106.99 | $123.13 | $126.38 | $175.00 |
| | N = 65 | N = 26 | N = 107 | N = 33 |
| Private boat | $45.83 | $36.77 | $44.98 | $29.67 |
| | N = 245 | N = 72 | N = 743 | N = 146 |
| Shore | $18.73 | $33.58 | $18.90 | $15.94 |
| | N = 73 | N = 31 | N = 152 | N = 31 |
| Travel cost | | | | |
| 1-day trip | $18.10 | $59.98 | $12.53 | $72.23 |
| | N = 166 | N = 26 | N = 445 | N = 50 |
| 2-day trip | $16.09 | $33.40 | $16.23 | $33.84 |
| | N = 87 | N = 17 | N = 163 | N = 18 |
| Longer trip | $11.50 | $20.60 | $13.14 | $32.03 |
| | N = 166 | N = 98 | N = 464 | N = 152 |
| Lodging cost | $26.29 | $28.25 | $21.71 | $28.17 |
| | N = 152 | N = 78 | N = 301 | N = 95 |
| Food cost | $14.74 | $20.61 | $11.58 | $16.33 |
| | N = 421 | N = 143 | N = 1,074 | N = 222 |

Table 18. Likelihood of saltwater fishing next 12 months from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Likelihood** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Certain to fish | 61 | 48 | 63 | 23 |
| Very likely | 22 | 26 | 21 | 28 |
| Somewhat likely | 9 | 18 | 11 | 23 |
| Very unlikely | 4 | 5 | 2 | 19 |
| Definitely will not | 0 | 1 | 1 | 5 |
| Did not answer | 3 | 3 | 3 | 3 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 19. Likelihood of saltwater fishing next 12 months from telephone survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Likelihood** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Certain to fish | 42 | 33 | 47 | 17 |
| Very likely | 32 | 26 | 32 | 28 |
| Somewhat likely | 16 | 17 | 12 | 21 |
| Very unlikely | 6 | 16 | 6 | 19 |
| Definitely will not | 3 | 5 | 2 | 14 |
| Did not answer | 2 | 2 | 1 | 1 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 20. Sex distribution from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Sex** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Male | 84 | 90 | 84 | 78 |
| Female | 10 | 8 | 12 | 15 |
| Did not answer | 6 | 3 | 4 | 7 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 21. Sex distribution through use of the sample frame for Oregon.

| **Sex** | **Resident** | **Nonresident** |
|---|---|---|
| Male | 77 | 83 |
| Female | 23 | 17 |
| | N = 411,282 | N = 94,737 |

Table 22. Age distribution from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Age** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| 18–29 | 6 | 7 | 4 | 6 |
| 30–39 | 13 | 12 | 11 | 13 |
| 40–49 | 22 | 20 | 23 | 19 |
| 50–59 | 27 | 27 | 24 | 20 |
| 60–69 | 18 | 21 | 23 | 25 |
| 70–79 | 6 | 8 | 8 | 8 |
| 80 + | 1 | 3 | 2 | 2 |
| Did not answer | 6 | 3 | 5 | 8 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 23. Age distribution from telephone survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Age** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| 18–29 | 6 | 10 | 6 | 8 |
| 30–39 | 13 | 12 | 13 | 14 |
| 40–49 | 24 | 16 | 23 | 21 |
| 50–59 | 24 | 20 | 23 | 23 |
| 60–69 | 21 | 25 | 19 | 17 |
| 70–79 | 7 | 11 | 9 | 9 |
| 80 + | 1 | 1 | 3 | 2 |
| Did not answer | 4 | 5 | 4 | 5 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 24. Mean household size.

| | Oregon | | Washington | |
|---|---|---|---|---|
| | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Adults | 2.00 | 1.98 | 1.95 | 1.96 |
| Children | 0.70 | 0.70 | 0.57 | 0.57 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 25. Highest level of education.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Education** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Some high school | 5 | 3 | 3 | 3 |
| High school graduate | 19 | 14 | 18 | 17 |
| Technical school | 11 | 9 | 9 | 6 |
| Some college | 28 | 19 | 26 | 26 |
| College graduate or more | 30 | 52 | 39 | 42 |
| Did not answer | 6 | 2 | 5 | 7 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 26. Annual household income from mail survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Income ($)** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Less than 20,000 | 4 | 4 | 2 | 4 |
| 20,000–39,999 | 16 | 6 | 9 | 8 |
| 40,000–59,999 | 20 | 20 | 18 | 13 |
| 60,000–79,999 | 18 | 17 | 22 | 17 |
| 80,000–99,999 | 13 | 20 | 15 | 13 |
| 100,000–124,999 | 8 | 8 | 11 | 14 |
| 125,000–149,999 | 5 | 8 | 5 | 8 |
| 150,000 or more | 7 | 16 | 8 | 12 |
| Did not answer | 10 | 2 | 11 | 13 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 27. Annual household income from telephone survey responses.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Income ($)** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Less than 20,000 | 6 | 4 | 5 | 6 |
| 20,000–39,999 | 13 | 13 | 12 | 10 |
| 40,000–59,999 | 18 | 20 | 18 | 18 |
| 60,000–79,999 | 17 | 14 | 16 | 15 |
| 80,000–99,999 | 11 | 11 | 13 | 11 |
| 100,000–124,999 | 10 | 12 | 8 | 9 |
| 125,000–149,999 | 3 | 7 | 4 | 6 |
| 150,000 or more | 4 | 5 | 6 | 9 |
| Did not answer | 17 | 14 | 20 | 15 |
| | N = 384 | N = 92 | N = 1,014 | N = 213 |

Table 28. Work for pay or profit.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Status** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| Do not work | 22 | 26 | 27 | 27 |
| Work part time | 7 | 8 | 7 | 8 |
| Work full time | 63 | 63 | 58 | 56 |
| Did not answer | 8 | 3 | 8 | 8 |
| | N = 469 | N = 159 | N = 1,194 | N = 248 |

Table 29. Personal hourly wage.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Wage ($)** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| 5.00–9.99 | 4 | 2 | 1 | 3 |
| 10.00–14.99 | 13 | 8 | 8 | 12 |
| 15.00–19.99 | 18 | 18 | 13 | 14 |
| 20.00–29.99 | 29 | 23 | 31 | 23 |
| 30.00–49.99 | 17 | 22 | 27 | 21 |
| 50.00 or more | 14 | 23 | 13 | 21 |
| Did not answer | 6 | 4 | 7 | 6 |
| | N = 326 | N = 113 | N = 781 | N = 159 |

Table 30. Time off work for fishing.

| | Oregon | | Washington | |
|---|---|---|---|---|
| **Time off** | **Resident** | **Nonresident** | **Resident** | **Nonresident** |
| No time off | 21 | 15 | 21 | 13 |
| Paid time off | 38 | 53 | 46 | 48 |
| Unpaid time off | 24 | 25 | 22 | 28 |
| Both paid and unpaid | 15 | 7 | 10 | 9 |
| Did not answer | 2 | 0 | 1 | 2 |
| | N = 326 | N = 113 | N = 781 | N = 159 |

Table 31. Experimental design attributes and attribute levels.

| Attribute | Washington inside level[a] | Washington ocean level[a] | Oregon level[a] |
|---|---|---|---|
| Small halibut catch (15 lb) | 1, 2 | 1, 2 | 1, 2 |
| Medium halibut catch (25 lb) | 1, 2 | 1, 2 | 1, 2 |
| Large halibut catch (50 lb) | 1, 2 | 1, 2 | 1, 2 |
| Halibut limit | 1, 2 | 1, 2 | 1, 2 |
| Small lingcod catch (5 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Medium lingcod catch (10 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Large lingcod catch (15 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Lingcod limit | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Small rockfish catch (2 lb) | 1, 2 | 8, 10, 12 | 4, 6, 8 |
| Medium rockfish catch (4 lb) | 1, 2 | 8, 10, 12 | 4, 6, 8 |
| Large rockfish catch (6 lb) | 1, 2 | 8, 10, 12 | 4, 6, 8 |
| Rockfish limit | 1, 2 | 8, 10, 12 | 4, 6, 8 |
| Small wild silver catch (5 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Medium wild silver catch (10 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Large wild silver catch (15 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Wild silver salmon limit | 0, 1, 2 | 0, 1, 2 | 0, 1, 2 |
| Small hatchery silver catch (5 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Medium hatchery silver catch (10 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Large hatchery silver catch (15 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Silver salmon limit | NA | NA | 0 |
| Small wild king catch (10 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Medium wild king catch (20 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Large wild king catch (30 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Wild king salmon limit | 0, 1, 2 | 0, 1, 2 | 0, 1, 2 |
| Small hatchery king catch (10 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Medium hatchery king catch (20 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| Large hatchery king catch (30 lb) | 1, 2, 3 | 1, 2, 3 | 1, 2, 3 |
| King salmon limit | 1, 2 | 1, 2 | 1, 2 |
| Pink salmon catch (3 lb) | 2, 4 | 2, 4 | NA |
| Pink salmon limit | 2, 4 | 2, 4 | NA |
| Total salmon limit | 2, 4 | 2, 4 | 2, 4 |
| Fishing cost[b] | 20, 40, 80 | 20, 40, 80 | 20, 40, 80 |

[a] All attributes listed in table also include a level of "missing" in the design except fishing cost.
[b] Levels shown are for private boat cost. Charter boat cost levels were 85, 125, 175.

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# Appendix A: State Recreational Data

The discrete choice experiment questions in the Washington Sportfishing Survey and the Oregon Sportfishing Survey are intended to provide the data necessary to estimate preferences for fishing trip attributes. These preferences, in turn, can be used to measure the effect of changes in management or ecological conditions. However, the degree of realism in any assessment of changes depends directly on the extent to which the data used in model simulations match the actual conditions in the fishery. This appendix describes the sources and characteristics of an available set of simulation data taken from the marine recreational fisheries in Washington and Oregon.

The data needed for model simulations are the same attributes contained in the experimental design: catch by species and size. Bag limits can be directly simulated for analysis. Taken together with catch, simulated bag limits provide the necessary components from which to calculate release.

Additional detail on the required catch data is necessary. Most theoretical models of recreational fishing in the economic literature feature bag limits that affect utility only when binding.[41] Equivalently, slack bag limits have no effect. Using the average catch per angler over all trips will not, in general, allow measurement of the effect from a change in bag limits, as the average catch per angler is less than the bag limit. In order to conduct simulations under such a framework, a distribution of catch over anglers is needed.

Angler interviews conducted by Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife (ODFW) formed the basis of the simulation data. ODFW's Ocean Recreational Boating Survey (ORBS) is the source of all Oregon data. WDFW's saltwater recreational data collection is split into the Puget Sound Sampling Program and the Ocean Sampling Program, consisting of creel interviews, voluntary trip reports (VTRs), onboard observers, test boats, and biological data. Creel interviews provide the fishing mode, the number of fish caught by species, and the number of fish released by species. Weight data come primarily from a combination of length data and length-to-weight relationships we estimate. All sample lengths for Oregon come from the creel interviews conducted for ORBS. Sample lengths for Washington come from a combination of VTRs, onboard observers, test boats, and creel interviews.

VTRs are submitted by salmon anglers in both the Ocean Area and Inside Area. For our purposes, VTR data provided a source of lengths for coho salmon (aka silver salmon, *Oncorhynchus kisutch*) and Chinook salmon (aka king salmon, *O. tshawytscha*). WDFW places observers on charter boats in the Ocean Area in order to monitor retained and released fish. Observer data provide an additional source of lengths for coho and Chinook salmon caught in the

[41] For examples, see Anderson 1993, Scrogin et al. 2004, and Woodward and Griffin 2003.

Ocean Area. Test boat anglers employed by WDFW use the same fishing methods and fish in the same general locations as the recreational fleet in Puget Sound. For our purposes, test boats provided a source of lengths for Chinook salmon caught in the Inside Area.

Fish sizes in the experimental design (and the variables describing the size of fish in the resulting models estimated on the discrete choice experiment data) are given by weight in pounds. Fish size is only available on a subset of catch data from WDFW and ODFW. Most of the records with size characteristics are limited to length, with a subset containing both length and weight. We used the existing length-weight pairs to construct relationships, through regression, that were then used to impute missing weights.

Table A-1 provides the sources of all lengths and weights in the simulation data. For all combinations of species and areas, there exist length data. In a few cases, the sampling program for a particular species and area combination does not collect any weight data. In these cases, length-to-weight relationships from a neighboring area were used to translate lengths into weights. Length-to-weight relationships borrowed from a neighboring area are denoted as L~W in the table. As an example, the length-to-weight relationship for Pacific halibut in the Ocean Area of Washington was borrowed from the Inside Area.

Next we describe the calculation of released fish. For all bottom fish species, the assumption that larger fish are preferred within a species was sufficient to calculate the number of released fish for any desired daily bag limit. Grouped salmon regulations complicated this calculation for salmon species and, when binding, required knowledge of the trade-offs anglers are willing to make between different sizes and species of salmon that must be released. These trade-offs were determined with the estimated parameters of the econometric model. We assumed that anglers minimized the disutility of releasing fish subject to the set of regulations that are imposed. This assumption, combined with the model estimates for release parameters, uniquely identified release in our simulation data.

The choice experiment data were framed in terms of individual angler attributes, whereas all catch data collected from WDFW and ODFW were framed in terms of a fishing vessel. In order to ensure that randomly drawn simulation data were representative of the levels of catch for an individual angler, we expanded all boat-level data by the number of anglers on the boat in order to arrive at the average catch per angler for each interviewed boat.

In the Oregon data, port sites have unequal sampling rates. Since the choice experiment data were gathered at the state level, we sought a catch distribution representative of marine fishing trips at the same level. Differences in the proportion of sampled trips across ports would have led to a bias as calculated at the state level. In order to correct the unequal port sampling, we expanded all Oregon interviews by the ratio of ODFW-estimated trips to ODFW-sampled trips.

For management purposes, individual rockfish species are broken out for the creel interviews in both states. However, focus group testing indicated that anglers do not commonly differentiate between species of rockfish when forming preferences (independent of the effect of size); therefore, the choice experiment data aggregated all rockfish species together. In order to

match the choice experiment data, we aggregated all rockfish species together to create the simulation data.

Creel interviews with unrealistically high levels of catch were dropped. We defined trips with the top 1% of catch per angler as outliers and removed them from the simulation data set.[42] Table A-2 contains the thresholds we used to qualify outlier levels of catch; creel interviews containing catch per angler exceeding the entries in the table were eliminated from the simulation data set.

The mark status of released salmon in Oregon is not tracked. While all retained Chinook salmon and coho salmon on creel interviews, VTR, onboard observer, and test boat trips are characterized as either marked or unmarked in both states, released salmon are only characterized in Washington. In order to impute the mark rate of released salmon in Oregon, we assumed that the mark rate of released Chinook salmon was the same as the mark rate of retained Chinook, and that all released coho salmon were marked.[43]

There are several limitations to the source data not mentioned above that we acknowledge. Though any increase in the proportion of fish that are characterized by length or weight would be a valuable improvement to the simulation data we gathered, this is especially true with respect to released fish. For a majority of the species and areas in the source data, there were no sizes collected for fish that are released. This required us to assume that the size distribution of released fish was the same as the size distribution of retained fish.[44] While this might not greatly affect an analysis of a change in bag limits, the size of released fish would become increasingly important in an analysis of a change in, for example, minimum size regulations.

Another limitation of the source data is that all creel interviews are conducted at the boat level. Using the boat-level data to create angler-level data masks some of the catch heterogeneity that would be present in data collected at the angler level. While the effect of a change in bag limits measured under this approach will tend to be attenuated, relative to the true individual-level effect, the bias will likely be small in magnitude due to regulations allowing individual anglers to remain fishing until the limits are reached for all anglers on the boat.

In Oregon, the Shore and Estuary Boat Survey was originally designed to sample shore-based fishing trips and boat trips that launch at estuary locations where a majority of trips remain in the estuary and do not proceed to the ocean. That survey is no longer fielded by ODFW and, as a result, some estuary locations are likely to be undersampled. In addition, while there are estuary trips in the sample frame, there are not current effort estimates for estuary trips, requiring the port-level sampling correction described above to rely solely on the ratio of sampled to estimated ocean trips.

[42] As a somewhat extreme example, a trip in one of the creel interviews for the Ocean Area of Washington reported rockfish catch per angler of 110.
[43] These assumptions were based on the recommendations of ODFW sampling program personnel (E. Schindler, ODFW, Newport, OR. Pers. commun., 15 June 2010).
[44] There are some exceptions to this requirement, including VTR, onboard observer, and test boat data.

Figure A-1 is a flowchart illustrating the basic steps used to generate the simulation data described to this point. Length and weight data were combined to form length-to-weight relationships that were used to impute missing weights and create a size distribution for each species. Catch and size distributions were (randomly) combined in order to provide a set of simulated catch, broken out by the sizes in our experimental design. Bag limits and, in the case of some salmon trips, parameters from an econometric model describing the utility of release were applied to the simulated catch in order to produce the final element of the simulation data: catch that must be released.

In order to provide further detail to the general approach we used to conduct simulations with these data, we describe a general example: willingness to pay (WTP) for a change in bag limits. As a starting point, we take the set of simulated catch by weight data, where each row corresponds to a sampled trip, and column entries contain the catch for three sizes of each species. With these data, we 1) draw randomly from the distribution of catch for each respondent who completed our mail surveys, 2) impose baseline bag limits, 3) calculate release, 4) estimate WTP for each type of fishing trip, and 5) repeat the entire process under the changed bag limits, then for any desired statistic of interest (e.g., mean WTP), we must 6) average the results of this process over repeated draws from the distribution of catch. WTP for a change in catch rates is simulated with the same approach, except bag limits are held constant and catch rates are varied.

Table A-1. Sources of lengths and weights in simulation data by species and area.

| | **Washington ocean** | | **Washington inside** | | **Oregon** | |
|---|---|---|---|---|---|---|
| **Species** | **Length** | **Weight** | **Length** | **Weight** | **Length** | **Weight** |
| Pacific halibut (*Hippoglossus stenolepis*) | Creel | L~W[a] inside creel | Creel | Creel | ORBS | L~W inside creel |
| Rockfish (*Sebastes* spp.) | Creel | Creel | Creel | Creel | ORBS | ORBS |
| Lingcod (*Ophiodon elongatus*) | Creel | Creel | Creel | Creel | ORBS | ORBS |
| Coho salmon (*Oncorhynchus kisutch*) | VTR and observer | L~W ORBS | VTR | L~W ORBS | ORBS | ORBS |
| Chinook salmon (*O. tshawytscha*) | VTR and observer | L~W[b] NWFSC | Test boat and VTR | L~W NWFSC | ORBS | L~W NWFSC |

[a] L~W denotes use of a length-to-weight relationship from a neighboring area. For example, L~W inside creel indicates that the length-to-weight relationship estimated on the Inside Area creel interviews was used to translate length data to weight data.

[b] Length-weight pairs for 243 Chinook salmon collected in marine waters from 6 regions (northern coastal British Columbia, northern Georgia Basin, southern Georgia Basin, Puget Sound, Columbia River, northern coastal California), provided by G. Ylitalo and S. O'Neill of the NWFSC, were used to estimate the relationship that allowed us to convert length data to weight data in all three regions. This relationship is represented as L~W NWFSC.

Table A-2. Outlier threshold for catch per angler by species and area.

| Species | Washington ocean | Washington inside | Oregon |
|---|---|---|---|
| Pacific halibut | 3.0 | 1.0 | 1.7 |
| Rockfish | 18.5 | 5.0 | 8.5 |
| Lingcod | 6.0 | 4.0 | 2.7 |
| Coho salmon | 9.5 | 4.5 | 7.0 |
| Chinook salmon | 3.5 | 6.0 | 1.5 |

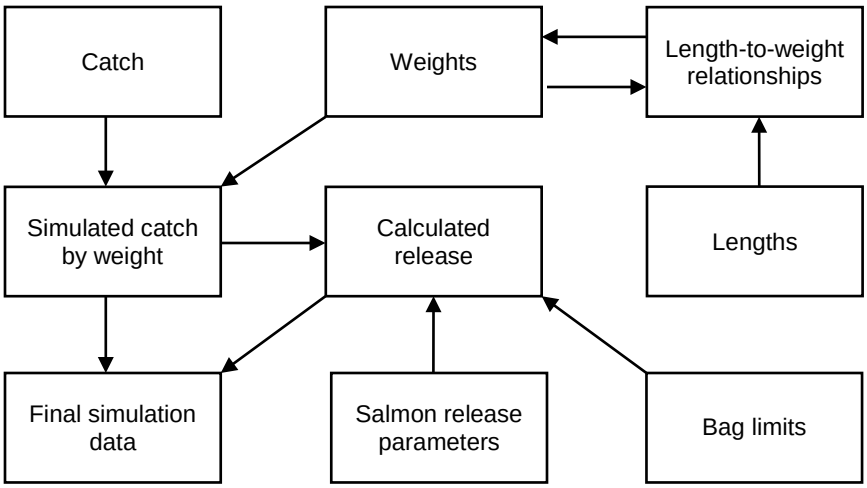



Figure A-1. Steps used to prepare simulation data.

# Appendix B: Saltwater Sportfishing Survey Documents

This appendix contains the following documents from the survey package: 1) the initial telephone screening survey, 2) the notice letter for the mail survey, 3) the cover letter for the first mailing of the complete survey package, 4) one example of the mail survey instrument, 5) the reminder postcard, 6) the cover letter for the second mailing of the complete survey package, and 7) the cover letter for the third and final mailing of the complete survey package. The mail survey instrument is in its original format; the other documents are not.

## PC ECAP Telephone Screening Survey (Washington/Oregon)

**INTRO:**

Hello, my name is _____. I'm calling on behalf of NOAA Fisheries to conduct a brief survey about recreational fishing activities of residents in Washington and Oregon State. Your answers will be used to help fishery managers make informed decisions.

[If asked: NOAA stands for National Oceanic and Atmospheric Administration.]

May I please speak with _____?

01 (SKIP TO Intro 2:) YES, RESPONDENT AVAILABLE/TRANSFERRING
02 (SKIP TO EXIT1) NO, RESPONDENT UNAVAILABLE
03 DK/REFUSED [Schedule callback 1 day out]/SCHEDULE CALLBACK/

**EXIT1:** Thank you, I will call back later. When would be a good time to reach [Respondent]? /SCHEDULE CALLBACK/

[Q: What is NOAA Fisheries? A: NOAA Fisheries is the federal agency responsible for the stewardship of the nation's living marine resources and their habitat.]

[Q: How did you get my name/phone number? A: Your name/telephone number was drawn in a random sample of people who purchased a fishing license in [Washington/Oregon]

[Q: Is this interview confidential? A: This interview is completely confidential. Your name will never be linked to your responses in any way.]

[Q: How long will this interview take? A: The interview takes 4–5 minutes.]

**Intro. 2:** Before we begin, I want to assure you that your answers will be kept completely confidential and this call may be monitored for quality assurance. This is a voluntary statewide study and we appreciate your assistance.

**PHI:** I'm going to read you a few short questions about your sportfishing activities in [Washington/Oregon]. /Insert appropriate state based on area code/

**1.** How many *saltwater* fishing trips have you taken in [Washington/Oregon] in the last 12 months? /Insert appropriate state based on area code/

01 [Enter number of trips] /IF TRIP NUMBER IS 1–365/
02 NO TRIPS
98 DON'T KNOW/NOT SURE
99 REFUSED

[Q: What do you mean by salt water? A: Salt water is defined as waters that include oceans, bays, estuaries and brackish portions of rivers.]

**2.** How many *freshwater* fishing trips have you taken in [Washington/Oregon] in the last 12 months? /Insert appropriate state based on area code/

01 [Enter number of trips] /IF TRIP NUMBER IS 1–365/
02 NO TRIPS
98 DON'T KNOW/NOT SURE
99 REFUSED
/IF BOTH SALTWATER TRIPS = 0 AND FRESHWATER TRIPS = 0, or 01 AND Q2 = DK/REFUSED, SKIP TO ENDING1./

**PH2:** The next few questions will be about your *saltwater* fishing.

**3.** How many *saltwater* fishing trips have you taken in [Washington/Oregon] in the last 12 months where you "targeted" *bottom fish*, such as halibut, rockfish, or lingcod? /Insert appropriate state based on area code/

01 [Enter number of trips] /IF TRIP NUMBER IS 1–365/
02 NO TRIPS
98 DON'T KNOW/NOT SURE
99 REFUSED

[Q: What do you mean by rockfish? A: Rockfish are also called sea bass, red snapper, rock cod, black bass.]

[Q: What do you mean by "targeted?" A: This means you were trying to catch a particular species of fish.]

**4.** How many *saltwater* fishing trips have you taken in [Washington/Oregon] in the last 12 months where you "targeted" *salmon*? /Insert appropriate state based on area code/

01 [Enter number of trips] /IF TRIP NUMBER IS 1–365/
02 NO TRIPS
98 DON'T KNOW/NOT SURE
99 REFUSED

**5.** When you *saltwater* fish in [Washington/Oregon], do you usually fish from…? /Insert appropriate state based on area code/

01 A private boat
02 A charter boat
03 The shore
98 DON'T KNOW/NOT SURE
99 REFUSED

**6.** How likely is it that you will *saltwater* sport fish in [Washington/Oregon] during the next 12 months? /Insert appropriate state based on area code/

01 Certain to fish
02 Very likely
03 Somewhat likely
04 Very unlikely
05 Definitely will not fish
98 DON'T KNOW/NOT SURE
99 REFUSED

**PH3:** So that we can see how your fishing activities compare with those of other people in your state, I'd like to ask you a few demographic questions. Again, please remember all your answers are kept *completely* confidential.

**7.** In what year were you born?

01 [Record year] /1907–1990/
98 DON'T KNOW/NOT SURE
99 REFUSED

**8.** I'm going to read you some income categories. For classification purposes only, please tell me, which of the following income categories best describes your household's total annual income *before taxes* in 2005.

01 Less than $10,000
02 $10,000 to $14,999
03 $15,000 to $24,999
04 $25,000 to $34,999

05 $35,000 to $49,999
06 $50,000 to $74,999
07 $75,000 to $99,999
08 $100,000 to $149,999
09 $150,000 to $199,999
10 $200,000 or more
98 DON'T KNOW/NOT SURE
99 REFUSED

[If respondent refuses: Your answers are completely confidential and will only be used for classification purposes. You will never be identified with your response.]

► GO TO ENDING 2

---

ENDING1:
Thank you very much for your help today.

---

ENDING2:
Thank you very much for your help today. This call is part of a larger research project to help fishery managers learn more about the likes and dislikes of anglers like you. I'd like to send you a short survey in the mail if I could just verify the address I have from your license. I have:

Name _____
Street Address._____
City _____ State _____ Zip _____
Phone _____

[If respondent refuses: Very few anglers were selected for this survey, so your help is critical to its success. Your participation will help provide important information to fishery managers to improve your fishing opportunities. The survey should not take more than 20 minutes to complete. We really appreciate your help.]

Thank you, you will be receiving a short survey in the mail in the next few weeks.

# Notice Letter for the Mail Survey

**Washington Sportfishing Survey**

<Month, Day, Year>
<First Last>
<Street Address>
<City, State Zip>

Dear <First Last>:

A few days from now, you will receive a short questionnaire for an important study being conducted by NOAA Fisheries (National Marine Fisheries Service).

The **Washington Sportfishing Survey** will help us learn more about your interest and success in fishing for bottom fish and saltwater salmon in Washington. This study will be used to improve the management of Washington's recreational fishery through a better understanding of the activities and preferences of anglers like you. Even if you have only fished once, it is important that we hear from you.

We need your help. Your response will provide important information to fishery managers to:

- Improve your sportfishing experience and opportunities, and
- Enhance sound fishery management practices.

Your name was selected at random from anglers who purchased a Washington sportfishing license. Very few anglers were chosen for the study, so your help is critical to its success. We will send you a questionnaire through ORC Macro, a nationally recognized survey research firm who is our partner in conducting the survey. Simply complete the questionnaire and return it in the postage paid envelope provided.

If you would like to learn more about this important survey or have any questions, please call me toll free at 1-866-791-3726.

Thank you very much for your help!

Sincerely,

Todd Lee
Project Director
NOAA Fisheries—Northwest Fisheries Science Center

# Cover Letter for First Mailing of the Complete Survey Package

**Washington Sportfishing Survey**

<Month, Day, Year>
<First Last>
<Street Address>
<City, State Zip>

Dear <First Last>:

Enclosed is the survey we mentioned in our previous letter to you. The **Washington Sportfishing Survey** is being conducted by NOAA Fisheries (National Marine Fisheries Service). This is your chance to help improve Washington's recreational fishery.

Your answers will be used to:

- Help fishery managers understand what anglers like and dislike,
- Enhance your sportfishing experience, and
- Improve fishery management.

Your answers are completely confidential and will be released only as summaries in which no individual's answers can be identified. There are no right or wrong answers and, even if you've only fished one time, it is important that we hear your opinions.

If you have any questions, please call me toll free at 1-866-791-3726.

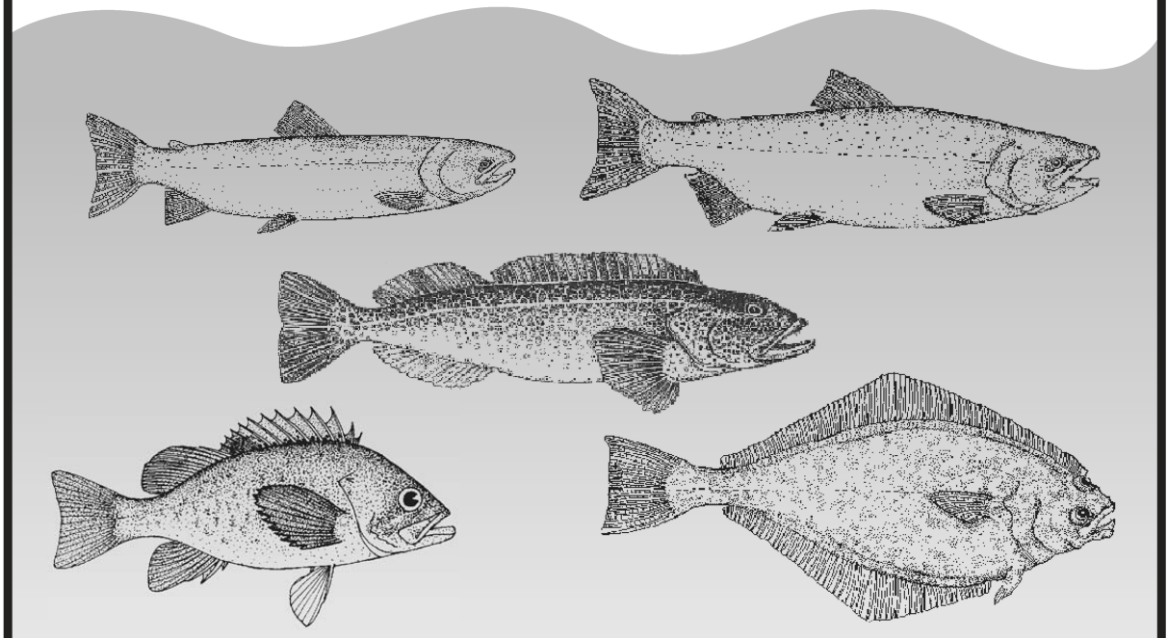
Thank you very much for your help!

Sincerely,

Todd Lee
Project Director
NOAA Fisheries—Northwest Fisheries Science Center

**Mail Survey Instrument (16 pages)**

# Washington Sport Fishing Survey



**Help us improve your sport fishing experience.**

Questions? Call 1-866-791-3726 or email us at Todd.Lee@noaa.gov

Sponsored by
NOAA Fisheries
(National Marine Fisheries Service)

This survey is voluntary.
All responses are anonymous and confidential.

## Popular Washington Saltwater Sport Fish

### Bottomfish

**Pacific Halibut**

- Can usually be fished for from May to August
- Average weight is approximately 20 pounds
- Usually the daily limit is 1
- Some areas may not be open every day of the week

**Rockfish**

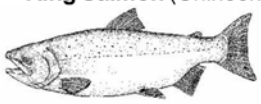
- Can usually be fished for all year or from May to September depending on area fished
- In some areas and seasons, depth restrictions may apply
- Often called rock cod, seabass, black bass, and red snapper
- Includes black, blue, brown, canary, copper, quillback, yelloweye, yellowtail
- Average weight is approximately 3 pounds
- Usually the daily limit is 1, 3, or 10 depending on area fished
- Retention of yelloweye and canary is not currently allowed

**Lingcod**

- Can usually be fished for from March to October or May to June depending on area fished
- In some areas and seasons, depth restrictions may apply
- Average weight is approximately 9 pounds
- Usually the daily limit is 1 or 2 depending on area fished
- Minimum size regulation of 24" or 26" depending on area fished
- Maximum size regulation of 40" in some areas

### King, Silver, and Pink Salmon

**King Salmon** (Chinook)



- Can usually be fished for in saltwater from June to September
- Average weight is approximately 15 pounds
- Usually the daily limit for salmon is 2 (combined), no more than 1 king can be retained
- Minimum size regulation of 22" or 24" in some areas
- Some areas may not be open every day of the week
- Includes blackmouth

**Silver Salmon** (Coho)

- Can usually be fished for in saltwater from June to September
- Average weight is approximately 8 pounds
- Usually the daily limit for salmon is 2 (combined)
- Minimum size regulation of 16" in some areas
- In most areas wild silvers must be released
- Some areas may not be open every day of the week

**Pink Salmon** (Humpy)

- Can usually be fished for in saltwater from June to September
- The majority of pink salmon are caught in odd-numbered years
- Average weight is approximately 4 pounds
- Usually the daily limit for salmon is 2 (combined), some times 2 additional pinks may be kept
- Some areas may not be open every day of the week

### Other Species

- Includes chum salmon (dog), tuna, mackerel, greenling, cabezon, sea-run trout (steelhead and cutthroat), pacific cod (true or grey cod), striped bass, spiny dogfish, sole, perch, sanddab, sturgeon, sharks, flounder, pollock, hake (whiting), herring

## SECTION A: Your Washington Sport Fishing Activities

The questions in this survey are about **YOU** and **YOUR** fishing activities and preferences. Except when asked, please do not include any information from other household members or other fishing party members.

Please print clearly.

*Write numbers as two digits*: 1 trip = 0 1 *Fill in boxes with a* ☑ *or* ☒

**A1** How much do you like fishing compared to other recreational activities?

| | |
|---|---|
| ☐ | Fishing is my favorite recreational activity. |
| ☐ | I like fishing and other recreational activities about the same. |
| ☐ | I like other recreational activites more than fishing. |

**A2** Do you prefer saltwater or freshwater fishing?

| | |
|---|---|
| ☐ | I prefer saltwater fishing. |
| ☐ | I prefer freshwater fishing. |
| ☐ | I do not have a preference or don't know. |

**A3** Have you FRESHWATER sport fished in Washington in the last 12 months?

☐ Yes **Continue** ☐ No **Skip to A4**

Approximately how many days (count partial days as full days) did you freshwater fish in Washington in the last 12 months?

**# Freshwater days** last 12 months: ☐☐

**A4** Have you SALTWATER sport fished in Washington in the last 12 months? (Saltwater is defined as all waters seaward of river or stream mouths, including estuaries, and the Columbia River seaward of the Tongue Point-Rocky Point line.)

☐ Yes **Continue** ☐ No **Skip to Section D on page 15**

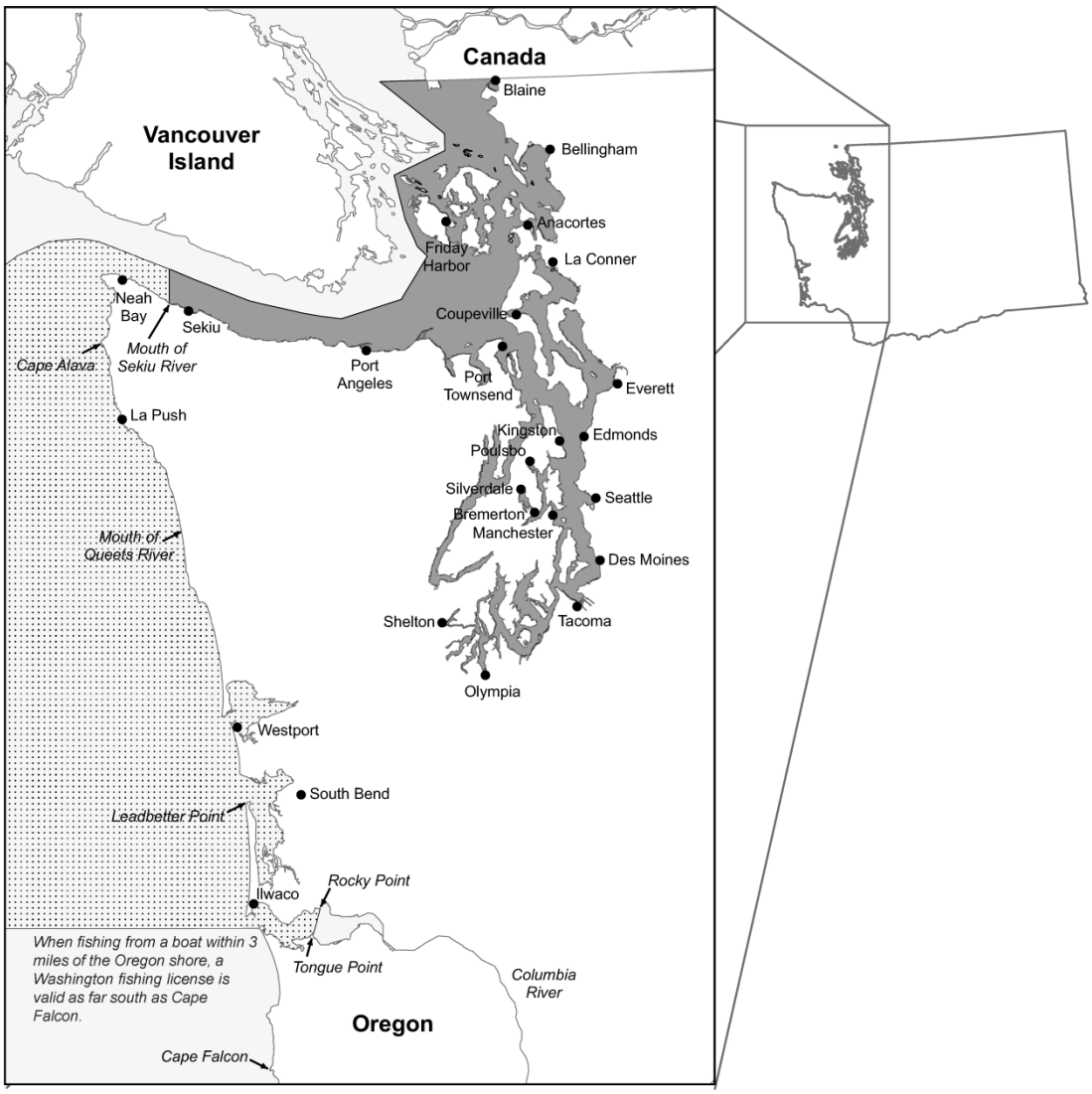
**During the rest of the survey, we only want to know about your SALTWATER fishing**

**A5** Do you ever fish for 2 OR MORE days during a saltwater fishing trip in Washington? A trip is the time from when you leave your residence until you return.

| | |
|---|---|
| ☐ | Yes |
| ☐ | No |

## Washington Saltwater Fishing Areas

Please refer to this map when answering the questions on the next page.




**INSIDE area** (Puget Sound, San Juans, Strait of Juan de Fuca)

**OCEAN area**

Questions? Email us at Todd.Lee@noaa.gov

4

**Please refer to the map on the previous page when answering questions A6-A9.**

**A6** From the INSIDE area ( area on map), have you ever boarded a boat or shore fished for BOTTOMFISH (halibut, rockfish, or lingcod)? **(refer to map on previous page)**

| ☐ | Yes **Provide Location Below** | ☐ | No **Skip to A7** |
|---|---|---|---|

Which one location on the map is closest to the one you most often use in the INSIDE area for BOTTOMFISH? **(mark one location)**

| | | | | |
|---|---|---|---|---|
| ☐ Anacortes | ☐ Des Moines | ☐ Kingston | ☐ Port Angeles | ☐ Sekiu |
| ☐ Bellingham | ☐ Edmonds | ☐ La Conner | ☐ Port Townsend | ☐ Shelton |
| ☐ Blaine | ☐ Everett | ☐ Manchester | ☐ Poulsbo | ☐ Silverdale |
| ☐ Bremerton | ☐ Friday Harbor | ☐ Olympia | ☐ Seattle | ☐ Tacoma |
| ☐ Coupeville | ☐ Other (specify):_____ | | | |

**A7** From the INSIDE area ( area on map), have you ever boarded a boat or shore fished for saltwater SALMON (king, silver, or pink)? **(refer to map on previous page)**

| ☐ | Yes **Provide Location Below** | ☐ | No **Skip to A8** |
|---|---|---|---|

Which one location on the map is closest to the one you most often use in the INSIDE area for saltwater SALMON? **(mark one location)**

| | | | | |
|---|---|---|---|---|
| ☐ Anacortes | ☐ Des Moines | ☐ Kingston | ☐ Port Angeles | ☐ Sekiu |
| ☐ Bellingham | ☐ Edmonds | ☐ La Conner | ☐ Port Townsend | ☐ Shelton |
| ☐ Blaine | ☐ Everett | ☐ Manchester | ☐ Poulsbo | ☐ Silverdale |
| ☐ Bremerton | ☐ Friday Harbor | ☐ Olympia | ☐ Seattle | ☐ Tacoma |
| ☐ Coupeville | ☐ Other (specify):_____ | | | |

**A8** From the OCEAN area ( area on map), have you ever boarded a boat or shore fished for BOTTOMFISH (halibut, rockfish, or lingcod)? **(refer to map on previous page)**

| ☐ | Yes **Provide Location Below** | ☐ | No **Skip to A9** |
|---|---|---|---|

Which one location on the map is closest to the one you most often use in the OCEAN area for BOTTOMFISH? **(mark one location)**

| | |
|---|---|
| ☐ Illwaco | ☐ South Bend / Tokeland |
| ☐ Neah Bay | ☐ Westport |
| ☐ La Push | ☐ Other (specify):_____ |

**A9** From the OCEAN area ( area on map), have you ever boarded a boat or shore fished for saltwater SALMON (king, silver, or pink)? **(refer to map on previous page)**

| ☐ | Yes **Provide Location Below** | ☐ | No **Skip to A10** |
|---|---|---|---|

Which one location on the map is closest to the one you most often use in the OCEAN area for saltwater SALMON? **(mark one location)**

| | |
|---|---|
| ☐ Illwaco | ☐ South Bend / Tokeland |
| ☐ Neah Bay | ☐ Westport |
| ☐ La Push | ☐ Other (specify):_____ |

**A10** Do you currently own or have regular access to a private boat (for example, yours or a friend's) you would use for SALTWATER sport fishing in the INSIDE area? **(mark all that apply)**

| | |
|---|---|
| ☐ | Own |
| ☐ | Access |
| ☐ | Neither |

**A11** Do you currently own or have regular access to a private boat (for example, yours or a friend's) you would use for SALTWATER sport fishing in the OCEAN area? **(mark all that apply)**

| | |
|---|---|
| ☐ | Own |
| ☐ | Access |
| ☐ | Neither |

**A12** Below are some reasons why you may SALTWATER sport fish in Washington. Mark how much you agree or disagree with each statement.

| "I SALTWATER SPORT FISH IN WASHINGTON TO . . . " | Strongly Agree | Agree | Feel Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| . . . Spend time outdoors. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Spend time with family. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Spend time with friends or other people. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Relax. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Eat something I caught myself. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Provide food for me or my family. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Learn more about fishing or improve fishing skills. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Try to catch at least one large fish. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch a lot of fish. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch lingcod. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch rockfish. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch halibut. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater king salmon. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater silver salmon. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater pink salmon. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater chum salmon. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch tuna. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater sea-run cutthroat. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch saltwater sturgeon. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch perch. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . Catch crab. | ☐ | ☐ | ☐ | ☐ | ☐ |
| . . . See marine life. | ☐ | ☐ | ☐ | ☐ | ☐ |

**A13** In the following question you are asked to indicate how important it is to you to keep (rather than release) Washington saltwater fish. **(mark one preference for each species)**

| SALTWATER SPECIES | I would keep ALL of what I'm legally allowed | I would keep MOST of what I'm legally allowed | I would keep SOME of what I'm legally allowed | I would keep NONE of what I'm legally allowed |
|---|---|---|---|---|
| Halibut | ☐ | ☐ | ☐ | ☐ |
| Rockfish | ☐ | ☐ | ☐ | ☐ |
| Lingcod | ☐ | ☐ | ☐ | ☐ |
| King salmon | ☐ | ☐ | ☐ | ☐ |
| Silver salmon | ☐ | ☐ | ☐ | ☐ |
| Other (specify): _____ | ☐ | ☐ | ☐ | ☐ |

**A14** Did you take 2 OR MORE saltwater fishing trips in Washington in the last 12 months?.

☐ Yes **Continue** ☐ No **Skip to Section B on next page**

**A15** Which fish species have you personally targeted or caught on your saltwater fishing trips in the Inside and Ocean areas in the last 12 months? **(mark all that apply)**

| SALTWATER SPECIES | Targeted or Caught in Last 12 Months: INSIDE area | Targeted or Caught in Last 12 Months: OCEAN area |
|---|---|---|
| Halibut | ☐ | ☐ |
| Rockfish | ☐ | ☐ |
| Lingcod | ☐ | ☐ |
| King salmon | ☐ | ☐ |
| Silver salmon | ☐ | ☐ |
| Pink salmon | ☐ | ☐ |
| Chum salmon | ☐ | ☐ |
| Tuna | ☐ | ☐ |
| Sea-run cutthroat | ☐ | ☐ |
| Sturgeon | ☐ | ☐ |
| Perch | ☐ | ☐ |
| Other (specify):_____ | ☐ | ☐ |

**A16** Please tell us the number of trips and days you spent saltwater sport fishing in the Inside and Ocean areas in the last 12 months. **(count partial days as full days)**

| INSIDE / OCEAN | # TRIPS Last 12 Months | # DAYS Fished in Last 12 Months: Private Boat Days | Charter Boat Days | Shore Days |
|---|---|---|---|---|
| Inside Area | ☐☐ | ☐☐ | ☐☐ | ☐☐ |
| Ocean Area | ☐☐ | ☐☐ | ☐☐ | ☐☐ |

Questions? Call Todd Lee toll free at 1-866-791-3726 **7**

## SECTION B: Your Most Recent Washington Saltwater Fishing Trip

**B1** During what month and year did your MOST RECENT SALTWATER fishing trip in Washington begin?

**Month:** ☐☐ **Year:** ☐☐☐☐

**B2** How many DAYS did you spend away from your residence on this saltwater fishing trip? **(count partial days as full days)**

**# Days:** ☐☐

**B3** How many days did you fish during your MOST RECENT SALTWATER TRIP. If you spent part of the day fishing from one mode (private, charter, or shore) and then switched, please count that entire day toward the mode you used longest. **(count partial days as full days)**

| # Days Fished Most Recent Trip | | |
|---|---|---|
| Private Boat Days | Charter Boat Days | Shore Days |
| ☐☐ | ☐☐ | ☐☐ |

**B4** Please mark the location(s) where you boarded a boat or shore fished on your MOST RECENT Washington saltwater fishing trip below. **(mark all that apply)**

| Inside Area Locations | | | | Ocean Area Locations |
|---|---|---|---|---|
| ☐ Anacortes | ☐ Edmonds | ☐ Manchester | ☐ Seattle | ☐ Illwaco |
| ☐ Bellingham | ☐ Everett | ☐ Olympia | ☐ Sekiu | ☐ Neah Bay |
| ☐ Blaine | ☐ Friday Harbor | ☐ Port Angeles | ☐ Shelton | ☐ La Push |
| ☐ Bremerton | ☐ Kingston | ☐ Port Townsend | ☐ Silverdale | ☐ South Bend / Tokeland |
| ☐ Coupeville | ☐ La Conner | ☐ Poulsbo | ☐ Tacoma | ☐ Westport |
| ☐ Des Moines | ☐ Other:_____ | | | ☐ Other:_____ |

**B5** Which saltwater species did you personally target or catch on your MOST RECENT SALTWATER TRIP? **(mark all that apply)**

| SALTWATER SPECIES | Targeted most recent trip (check if yes) | Number Caught and Kept | Number Caught and Released |
|---|---|---|---|
| Halibut | ☐ | ☐☐ | ☐☐ |
| Rockfish | ☐ | ☐☐ | ☐☐ |
| Lingcod | ☐ | ☐☐ | ☐☐ |
| King salmon | ☐ | ☐☐ | ☐☐ |
| Silver salmon | ☐ | ☐☐ | ☐☐ |
| Other (specify):_____ | ☐ | ☐☐ | ☐☐ |
| Other (specify):_____ | ☐ | ☐☐ | ☐☐ |

**B6** Was SALTWATER fishing in Washington the primary purpose of this trip?

| | |
|---|---|
| ☐ | Yes |
| ☐ | No |

8

**B7** About how much money did you or your household spend for this trip in each of the following expense categories? For each expense recorded, indicate the number of people covered by that expense.

| | TYPE OF EXPENDITURE | Expenditures by you or your household (round to nearest dollar) | # of people covered by this expense (including yourself) |
|---|---|---|---|
| Fishing Cost | Charter or guide fees | $ ____ .00 | ____ |
| | Fish filleting fees and tips | $ ____ .00 | ____ |
| | Processing, freezing, or shipping fees paid to fish processing company | $ ____ .00 | ____ |
| | Rods or reels bought or rented especially for this trip | $ ____ .00 | ____ |
| | Bait | $ ____ .00 | ____ |
| | Tackle bought especially for this trip (not including rods or reels) | $ ____ .00 | ____ |
| | Tackle lost on this trip (not including rods or reels) | $ ____ .00 | ____ |
| | Ice | $ ____ .00 | ____ |
| | Fishing derby entry fees | $ ____ .00 | ____ |
| | Boat fuel | $ ____ .00 | ____ |
| | Moorage, launch, haul out, or parking fees for this trip | $ ____ .00 | ____ |
| Transportation | Auto, truck, or RV fuel used | $ ____ .00 | ____ |
| | Auto or RV rental | $ ____ .00 | ____ |
| | Airfare | $ ____ .00 | ____ |
| | Ferry | $ ____ .00 | ____ |
| | Other Transportation:_____ | $ ____ .00 | ____ |
| Lodging / Food | Lodging (trailer parks, campgrounds, hotels, motels, B&B, etc.) | $ ____ .00 | ____ |
| | Food and drink from grocery or convenience stores | $ ____ .00 | ____ |
| | Food and drink from restaurants and bars | $ ____ .00 | ____ |
| | Gifts/souvenirs | $ ____ .00 | ____ |
| | Other:_____ | $ ____ .00 | ____ |

**B8** How likely is it that you will saltwater sport fish in Washington during the next 12 months?

| | |
|---|---|
| ☐ | Certain to fish |
| ☐ | Very likely |
| ☐ | Somewhat likely |
| ☐ | Very unlikely |
| ☐ | Definitely will not fish |

Questions? Call Todd Lee toll-free at 1-866-791-3726 or email us at Todd.Lee@noaa.gov **9**

## SECTION C: Your Washington Saltwater Fishing Trip Preferences

In this section we want to know about your preferences for different types of saltwater fishing trips in Washington. Please use the definitions below when answering C1-C4.

### **DEFINITIONS** for questions C1-C4

- **Boat boarding area:** Either the Inside or Ocean area. If you have fished in the area, the exact boat boarding location would be the one you have used most often (your answer on page 5). Otherwise, assume the exact location within the area would be the one on the map closest to your residence.
- **Catch:** The total number and weight of each species you would expect to catch per day. The weight is before cleaning or filleting. Note: you may not be able to keep all of the catch depending on the listed legal daily limit.
- **Legal daily limit:** The number of fish you are legally allowed to keep per day.
- **Fishing cost:** Your personal share of the daily fishing cost. The fishing costs listed in the tables vary from trip to trip due to uncertainty about the future prices of things like boat fuel and charter operations. This will allow your answers to be used in the future as well as today.

  **Private Boat cost:** If you would use a private boat for the trip, the fishing cost is for bait, ice, tackle, daily moorage or launch fees, and boat fuel. (*Do not use the Private Boat cost unless you own or have regular access to a private boat.*)

  **Charter Boat cost:** If you would use a charter boat for the trip, the fishing cost is for all charter fees and tips and includes the use of fishing tackle and bait. Please treat all charter trips as being taken on the same type of boat and having the same amenities, regardless of the cost.
- **Transportation cost:** The round trip cost associated with traveling to and from the location. Depending on how you would travel, this can include vehicle fuel, airfare, car rental, ferry costs, and parking. This cost is in addition to the listed fishing cost.
- **Lodging cost:** This includes motel and campground fees and should be considered if you would take an overnight trip. This cost is in addition to the listed fishing cost.
- **Trips:** The number of times you leave your residence and return.
- **Days:** The total number of days spent fishing. (count partial days as full days)

**C1** Suppose that you have the choice between two boat fishing trips in the Ocean area (Choice A or Choice B) or not taking a boat fishing trip in the Ocean area (Choice C). Below the table, indicate which of these three choices you like best and second best.

| | | Choice A | Choice B | Choice C |
|---|---|---|---|---|
| Area | Boat boarding area | Ocean area | Ocean area | **Do one of the following** (other than boat fishing in the Ocean area):<br>• Inside area fishing<br>• Saltwater shore fishing<br>• WA freshwater fishing<br>• Non-WA fishing<br>• Do some activity other than fishing |
| Salmon | Catch (weight per fish) | 2 hatchery kings (20 lb.)<br>1 wild king (10 lb.)<br>2 wild kings (20 lb.) | 3 wild kings (20 lb.) | |
| Salmon | Legal daily limit | 4 salmon (combined), release all kings | 2 salmon (combined), no more than 1 king, release wild kings | |
| Cost | Fishing cost (per person per day) + Transportation cost + Lodging cost | **Private:** $80 + auto fuel / air + motel / camp<br>**Charter:** $175 + auto fuel / air + motel / camp | **Private:** $80 + auto fuel / air + motel / camp<br>**Charter:** $175 + auto fuel / air + motel / camp | |

If you were presented these three choices (A, B, C), which one would you choose to do? **(mark only one)**

☐ OCEAN Choice A ☐ OCEAN Choice B ☐ NO OCEAN Fishing Trip Choice C

If your first choice was not available, what would be your second choice? **(mark only one)**

☐ OCEAN Choice A ☐ OCEAN Choice B ☐ NO OCEAN Fishing Trip Choice C

**C1.1** For Choice A and Choice B, would you most often use a charter or private boat? **(mark one for each choice)**

| Choice A | | Choice B | |
|---|---|---|---|
| Private ☐ | Charter ☐ | Private ☐ | Charter ☐ |

**C1.2** If all of your OCEAN area boat fishing during the next 12 months had to be Choice A trips, Choice B trips, or a mix of Choice A and Choice B trips, how many TRIPS, if any, of each choice would you take during the next 12 months? How many total DAYS would you spend fishing for each choice? **(enter 0 if you wouldn't take any trips)**

| Choice A | | Choice B | |
|---|---|---|---|
| Trips next 12 months ☐☐ | Days next 12 months ☐☐ | Trips next 12 months ☐☐ | Days next 12 months ☐☐ |

**C1.3** Which one activity would you most likely do for Choice C? **(mark only one)**

☐ Inside area fishing ☐ Saltwater shore fishing ☐ WA freshwater fishing ☐ Non-WA fishing ☐ Non-fishing activity

Questions? Call Todd Lee toll free at 1-866-791-3726 or email us at Todd.Lee@noaa.gov **11**

**C2** Suppose that you have the choice between two boat fishing trips in the Inside area (Choice A or Choice B) or not taking a boat fishing trip in the Inside area (Choice C). Below the table, indicate which of these three choices you like best and second best.

| | | Choice A | Choice B | Choice C |
|---|---|---|---|---|
| Area | Boat boarding area | Inside area | Inside area | **Do one of the following** (other than boat fishing in the Inside area): • Ocean area fishing • Saltwater shore fishing • WA freshwater fishing • Non-WA fishing • Do some activity other than fishing |
| Halibut | Catch (weight per fish) | 1 halibut (50 lb.) | 2 halibut (15 lb.) | |
| | Legal daily limit | 2 halibut | 1 halibut | |
| Rockfish | Catch (weight per fish) | 2 rockfish (4 lb.)<br>1 rockfish (6 lb.) | not targeted or caught on this trip | |
| | Legal daily limit | 1 rockfish | | |
| Cost | Fishing cost (per person per day) + Transportation cost + Lodging cost | **Private:** $40 + auto fuel / air + motel / camp<br>**Charter:** $125 + auto fuel / air + motel / camp | **Private:** $20 + auto fuel / air + motel / camp<br>**Charter:** $85 + auto fuel / air + motel / camp | |

If you were presented these three choices (A, B, C), which one would you choose to do? **(mark only one)**

☐ INSIDE Choice A ☐ INSIDE Choice B ☐ NO INSIDE Fishing Trip Choice C

If your first choice was not available, what would be your second choice? **(mark only one)**

☐ INSIDE Choice A ☐ INSIDE Choice B ☐ NO INSIDE Fishing Trip Choice C

**C2.1** For Choice A and Choice B, would you most often use a charter or private boat? **(mark one for each choice)**

| Choice A | | Choice B | |
|---|---|---|---|
| Private | Charter | Private | Charter |
| ☐ | ☐ | ☐ | ☐ |

**C2.2** If all of your INSIDE area boat fishing during the next 12 months had to be Choice A trips, Choice B trips, or a mix of Choice A and Choice B trips, how many TRIPS, if any, of each choice would you take during the next 12 months? How many total DAYS would you spend fishing for each choice? **(enter 0 if you wouldn't take any trips)**

| Choice A | | Choice B | |
|---|---|---|---|
| Trips next 12 months | Days next 12 months | Trips next 12 months | Days next 12 months |
| ☐☐ | ☐☐ | ☐☐ | ☐☐ |

**C2.3** Which one activity would you most likely do for Choice C? **(mark only one)**

☐ Ocean area fishing ☐ Saltwater shore fishing ☐ WA freshwater fishing ☐ Non-WA fishing ☐ Non-fishing activity

**C3** Suppose that you have the choice between two boat fishing trips in the Ocean area (Choice A or Choice B) or not taking a boat fishing trip in the Ocean area (Choice C). Below the table, indicate which of these three choices you like best and second best.

| | | Choice A | Choice B | Choice C |
|---|---|---|---|---|
| Area | Boat boarding area | Ocean area | Ocean area | **Do one of the following** (other than boat fishing in the Ocean area): • Inside area fishing • Saltwater shore fishing • WA freshwater fishing • Non-WA fishing • Do some activity other than fishing |
| Salmon | Catch (weight per fish) | 2 hatchery silvers (5 lb.)<br>2 hatchery silvers (10 lb.)<br>2 hatchery silvers (15 lb.) | 3 hatchery silvers (10 lb.)<br>1 wild silver (5 lb.)<br>1 hatchery king (10 lb.) | |
| Salmon | Legal daily limit | 4 salmon (combined) | 4 salmon (combined), release all kings, release wild silvers | |
| Cost | Fishing cost (per person per day) + Transportation cost + Lodging cost | **Private:** $80 + auto fuel / air + motel / camp<br>**Charter:** $175 + auto fuel / air + motel / camp | **Private:** $40 + auto fuel / air + motel / camp<br>**Charter:** $125 + auto fuel / air + motel / camp | |

If you were presented these three choices (A, B, C), which one would you choose to do? **(mark only one)**

☐ OCEAN Choice A ☐ OCEAN Choice B ☐ NO OCEAN Fishing Trip Choice C

If your first choice was not available, what would be your second choice? **(mark only one)**

☐ OCEAN Choice A ☐ OCEAN Choice B ☐ NO OCEAN Fishing Trip Choice C

**C3.1** For Choice A and Choice B, would you most often use a charter or private boat? **(mark one for each choice)**

| Choice A | | Choice B | |
|---|---|---|---|
| Private ☐ | Charter ☐ | Private ☐ | Charter ☐ |

**C3.2** If all of your OCEAN area boat fishing during the next 12 months had to be Choice A trips, Choice B trips, or a mix of Choice A and Choice B trips, how many TRIPS, if any, of each choice would you take during the next 12 months? How many total DAYS would you spend fishing for each choice? **(enter 0 if you wouldn't take any trips)**

| Choice A | | Choice B | |
|---|---|---|---|
| Trips next 12 months ☐☐ | Days next 12 months ☐☐ | Trips next 12 months ☐☐ | Days next 12 months ☐☐ |

**C3.3** Which one activity would you most likely do for Choice C? **(mark only one)**

☐ Inside area fishing ☐ Saltwater shore fishing ☐ WA freshwater fishing ☐ Non-WA fishing ☐ Non-fishing activity

**C4** Suppose that you have the choice between two boat fishing trips in the Inside area (Choice A or Choice B) or not taking a boat fishing trip in the Inside area (Choice C). Below the table, indicate which of these three choices you like best and second best.

| | | Choice A | Choice B | Choice C |
|---|---|---|---|---|
| Area | Boat boarding area | Inside area | Inside area | **Do one of the following** (other than boat fishing in the Inside area):<br>• Ocean area fishing<br>• Saltwater shore fishing<br>• WA freshwater fishing<br>• Non-WA fishing<br>• Do some activity other than fishing |
| Salmon | Catch (weight per fish) | 2 wild kings (10 lb.)<br>1 wild king (30 lb.)<br>1 pink (4 lb.) | 2 pinks (4 lb.) | |
| Salmon | Legal daily limit | 2 salmon (combined), plus 2 additional pinks, no more than 1 king | 4 salmon (combined) | |
| Cost | Fishing cost (per person per day) + Transportation cost + Lodging cost | **Private:** $80 + auto fuel / air + motel / camp<br>**Charter:** $175 + auto fuel / air + motel / camp | **Private:** $80 + auto fuel / air + motel / camp<br>**Charter:** $175 + auto fuel / air + motel / camp | |

If you were presented these three choices (A, B, C), which one would you choose to do? **(mark only one)**

☐ INSIDE Choice A ☐ INSIDE Choice B ☐ NO INSIDE Fishing Trip Choice C

If your first choice was not available, what would be your second choice? **(mark only one)**

☐ INSIDE Choice A ☐ INSIDE Choice B ☐ NO INSIDE Fishing Trip Choice C

**C4.1** For Choice A and Choice B, would you most often use a charter or private boat? **(mark one for each choice)**

| Choice A | | Choice B | |
|---|---|---|---|
| Private ☐ | Charter ☐ | Private ☐ | Charter ☐ |

**C4.2** If all of your INSIDE area boat fishing during the next 12 months had to be Choice A trips, Choice B trips, or a mix of Choice A and Choice B trips, how many TRIPS, if any, of each choice would you take during the next 12 months? How many total DAYS would you spend fishing for each choice? **(enter 0 if you wouldn't take any trips)**

| Choice A | | Choice B | |
|---|---|---|---|
| Trips next 12 months ☐☐ | Days next 12 months ☐☐ | Trips next 12 months ☐☐ | Days next 12 months ☐☐ |

**C4.3** Which one activity would you most likely do for Choice C? **(mark only one)**

☐ Ocean area fishing ☐ Saltwater shore fishing ☐ WA freshwater fishing ☐ Non-WA fishing ☐ Non-fishing activity

## SECTION D: About You and Your Household

The following questions will help us know more about anglers. The information you provide will remain **STRICTLY CONFIDENTIAL,** and you will not be identified with your answers.

**D1** In what year were you born?

**Year:** 1 9 ☐ ☐

**D2** Are you . . . ?

| | |
|---|---|
| ☐ Male | ☐ Female |

**D3** What is the highest level of education you have completed? **(mark one response)**

| | |
|---|---|
| ☐ | Some high school |
| ☐ | High school graduate |
| ☐ | Technical school |
| ☐ | Some college |
| ☐ | College graduate or more |

**D4** How many adults and children (under 18) are there in your household including yourself?

**# Adults:** ☐☐ **# Children:** ☐☐

**D5** Which of the following categories best describes your household's TOTAL annual income before taxes in 2005?

| | | | |
|---|---|---|---|
| ☐ | Less than $20,000 | ☐ | $80,000 - $99,999 |
| ☐ | $20,000 - $39,999 | ☐ | $100,000 - $124,999 |
| ☐ | $40,000 - $59,999 | ☐ | $125,000 - $149,999 |
| ☐ | $60,000 - $79,999 | ☐ | $150,000 or more |

**D6** Do you work for pay or profit?

| | |
|---|---|
| ☐ | I do not work for pay or profit (homemaker, retired, currently unemployed) ➲ **Skip to page 16.** |
| ☐ | I work part time for pay or profit (less than 35 hours per week) |
| ☐ | I work full time for pay or profit (more than 35 hours per week) |

**D7** Approximately what is your personal hourly wage rate?

| | | | |
|---|---|---|---|
| ☐ | $5.00-$9.99 | ☐ | $20.00-$29.99 |
| ☐ | $10.00-$14.99 | ☐ | $30.00-$49.99 |
| ☐ | $15.00-$19.99 | ☐ | $50.00 or more |

**D8** Do you take time off work for fishing? **(mark all that apply)**

| | |
|---|---|
| ☐ | No. |
| ☐ | Yes, I take paid time off (vacation, sick leave). |
| ☐ | Yes, I take unpaid time off. |

Questions? Call Todd Lee toll free at 1-866-791-3726 **15**

# Thank You for Participating!

Please return your completed questionnaire in the envelope provided to:
ORC Macro
Attn: Washington Sport Fishing Survey
126 College Street, Burlington, VT 05401

Please use the space below to make any additional comments you may have. If you have any questions regarding the survey, please call toll free 1-866-791-3726 or email Todd.Lee@noaa.gov.

# Reminder Postcard

**Washington Sportfishing Survey Reminder**
Sponsored by NOAA Fisheries

Last week a questionnaire seeking your opinion about Washington saltwater sportfishing was mailed to you. Your name was selected at random from anglers who purchased a Washington fishing license.

If you have already completed and returned it to us, please accept our sincere thanks. If not, please do so today. The questionnaire has been sent to only a small, but representative, sample of anglers. It is extremely important that yours also be included in the study if the results are to accurately represent the opinions of anglers.

If by some chance you did not receive the questionnaire or it got misplaced, please call 1-866-791-3726

# Cover Letter for Second Mailing of the Complete Survey Package

**Washington Sportfishing Survey**

<Month, Day, Year>
<First Last>
<Street Address>
<City, State Zip>

Dear <First Last>:

About three weeks ago, we sent you a questionnaire that asked you about saltwater sportfishing in Washington. To the best of our knowledge, it has not yet been returned.

The comments of other people who have already responded include a wide variety of fishing experiences and preferences. Many have told us about the fishing they enjoy and about trips they have taken. We think the results are going to be very useful to fishery managers.

We are writing you again because of the importance that your questionnaire has for helping to get accurate results. Your name was drawn through a scientific sampling process in which every individual who purchased a 2005 or 2006 Washington sportfishing license had an equal chance of being selected. Because only a small number of anglers were chosen for the study, your participation is essential if the results are to be truly representative of the opinions, preferences, and activities of all anglers.

- **It doesn't matter how often you've fished, your answers are valuable.**

- **Even if you've never fished in salt water, please return the survey so we can more accurately measure fishing participation.**

We hope you will fill out and return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning a note or blank questionnaire in the enclosed stamped envelope.

Thank you very much for your help.

Sincerely,

Todd Lee
Project Director
NOAA Fisheries—Northwest Fisheries Science Center

P.S. If you have any questions, please call me toll free at 1-866-791-3726.

# Cover Letter for Third and Final Mailing of the Complete Survey Package

**Washington Sportfishing Survey**

<Month, Day, Year>
<First Last>
<Street Address>
<City, State Zip>

Dear <First Last>:

During the last two months, we have sent you several mailings about an important research study we are conducting on sportfishing in Washington. As of today, we have not received your questionnaire. If you have already mailed it to us, we thank you for your assistance.

The purpose of this study is to improve fishery management by providing a more complete picture of participation rates and angler preferences.

The study is drawing to a close, and this is the last contact that will be made with the random sample of people who purchased a Washington sportfishing license in 2005 or 2006. We are sending this final contact because of our concern that people who have not responded may have different experiences and preferences than those who have responded. In order for our results to be accurate, we need to hear from you, regardless of whether you sport fished in salt water or the number of times you fished.

We also want to assure you that your response to this study is voluntary and any responses you give us are confidential.

Finally, we appreciate your willingness to consider our request as we conclude this effort to better understand sportfishing in Washington. Thank you very much.

Sincerely,

Todd Lee
Project Director
NOAA Fisheries—Northwest Fisheries Science Center

P.S. If you have any questions, please call me toll free at 1-866-791-3726.

# Recent NOAA Technical Memorandums

**published by the**

**Northwest Fisheries Science Center**

**NOAA Technical Memorandum NMFS-NWFSC-**

**123** **Ward, E.J., M.J. Ford, R.G. Kope, J.K.B. Ford, L.A. Velez-Espino, C.K. Parken, L.W. LaVoy, M.B. Hanson, and K.C. Balcomb. 2013.** Estimating the impacts of Chinook salmon abundance and prey removal by ocean fishing on Southern Resident killer whale population dynamics. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-123, 71 p. NTIS number PB2013-110079.

**122** **Frame, E., and K. Lefebvre. 2013.** ELISA methods for domoic acid quantification in multiple marine mammal species and sample matrices. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-122, 20 p. NTIS number PB2013-109341.

**121** **Lian, C.E. 2012.** West Coast limited entry groundfish cost earnings survey: Protocol and results for 2008. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-121, 62 p. NTIS number PB2013-104899.

**120** **Pollock, M.M., J.M. Wheaton, N. Bouwes, C. Volk, N. Weber, and C.E. Jordan. 2012.** Working with beaver to restore salmon habitat in the Bridge Creek intensively monitored watershed: Design rationale and hypotheses. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-120, 47 p. NTIS number PB2013-101722.

**119** **Waples, R.S., K. Hindar, and J.J. Hard. 2012.** Genetic risks associated with marine aquaculture. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-119, 149 p. NTIS number PB2013-101344.

**118** **Stout, H.A., P.W. Lawson, D.L. Bottom, T.D. Cooney, M.J. Ford, C.E. Jordan, R.G. Kope, L.M. Kruzic, G.R. Pess, G.H. Reeves, M.D. Scheuerell, T.C. Wainwright, R.S. Waples, E. Ward, L.A. Weitkamp, J.G. Williams, and T.H. Williams. 2012.** Scientific conclusions of the status review for Oregon coast coho salmon (*Oncorhynchus kisutch*). U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-118, 242 p. NTIS number PB2012-113458.

**117** **Maynard, D.J., T.A. Flagg, W.C. McAuley, D.A. Frost, B. Kluver, M.R. Wastel, J.E. Colt, and W.W. Dickhoff. 2012.** Fish culture technology and practices for captive broodstock rearing of ESA-listed salmon stocks. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-117, 65 p. NTIS number PB2012-110667.

**116** **Lian, C.E. 2012.** West Coast open access groundfish and salmon troller survey: Protocol and results for 2005 and 2006. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-116, 52 p. NTIS number PB2012-107486.

**Most NOAA Technical Memorandums NMFS-NWFSC are available at the Northwest Fisheries Science Center Web site, http://www.nwfsc.noaa.gov**