Marine Areas 11 and 13
Mark-Selective Recreational Chinook Fishery,
Summer 2008

Post-season Report

REVISED DRAFT

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EXECUTIVE SUMMARY

Background and Overview

The Washington Department of Fish and Wildlife (WDFW) implemented mark-selective Chinook fisheries (MSFs) in Marine Areas 11 (June 1-Sept. 30) and 13 (May 1-Sept. 30) for the second time during the summer of 2008. Consistent with the 2004 Puget Sound Chinook Harvest Management Plan (Puget Sound Indian Tribes and WDFW 2004) and the intent of previous Puget Sound/Strait of Juan de Fuca mark-selective Chinook fisheries, the primary goal for these fisheries was to provide meaningful opportunity to the recreational angling public while minimally impacting ESA-listed Puget Sound Chinook salmon.

WDFW's Puget Sound Sampling Unit (PSSU) implemented an intensive monitoring program in Area 11 in order to collect the data needed to provide in-season catch estimates and to estimate key parameters characterizing the fishery and its impacts on unmarked salmon. Area 11 sampling activities included dockside creel sampling, test fishing, and on-the-water effort surveys. Among other parameters, Area 11 efforts emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted Chinook population, *ii*) the total number of Chinook salmon harvested (by size [legal or sublegal] and mark-status [marked or unmarked] group), *iii*) the total number of Chinook salmon released (by size/mark-status group), *iv*) the coded-wire tag- (CWT) and/or DNA-based stock composition of marked and unmarked Chinook mortalities[1], and *v*) the total mortality of marked and unmarked double index tag (DIT) CWT stocks. In contrast, a reduced sampling program was employed in Area 13 for logistical reasons. Area 13 monitoring activities included sampling for the estimation of: *i*) mark rates (based on voluntary trip reports provided by private anglers), *ii*) indices of Chinook salmon encounters and angling effort (i.e., sample-frame observations, not fishery totals), and *iii*) the age, length, and CWT composition of landed catch.

Area 11 Summary

Creel samplers staffed six different access sites (two on any given sampling day) on 85 of the 122 days that Area 11was open to Chinook retention under mark-selective regulations. Samplers interviewed an estimated 26% of all anglers fishing in the area (n = 17,131 anglers). Additionally, they sampled an estimated 28% (n = 2,063) of all marked Chinook harvested during the fishery. Other PSSU staff conducted 13 on-the-water effort surveys (6 on weekdays, 7 on weekends), and spent 82 days (609 hours) on the water pursuing Chinook using test-fishing methods, in support of Area 11 monitoring efforts.

Based on the combination of sampling activities, we estimated that nearly 66,000 trips were completed by Area 11 anglers between June 1st and September 30th. With a season-wide CPUE of 0.10 Chinook retained per angler trip, these anglers harvested a grand total of 7,377 marked Chinook during the fishery. Anglers additionally released an estimated 5,379

[1] Though the necessary tissue samples have been collected, DNA-based estimates of stock composition are presently unavailable for Puget Sound/Strait of Juan de Fuca mark-selective fisheries. In the present report, CWT-based (unexpanded) estimates of the stock composition of marked Chinook harvest are provided.

Chinook (3,056 marked, 2,322 unmarked). Overall, 2008 catch rates were similar to those observed in Area 11 during the summer of 2007; both catch and effort totals were substantially lower in 2008 compared to 2007.

During the four-month Area 11 fishery, harvested Chinook averaged 73 cm (range: 26 to 97 cm) in total length and were larger than the legal minimum size limit (≥22 in or 56 cm TL) in most instances (dockside marked Chinook observations, >99% of legal size). Further, more than four-fifths of all harvested individuals were 3-year olds (i.e., brood year 2005). In addition to taking length measurements and scale samples, ramp samplers recovered 155 CWTs from marked Chinook harvested in Area 11. The majority of these recoveries (58%) were from South Puget Sound facilities, primarily Lakewood complex, Voight's Creek, and Nisqually hatcheries.

Over the entire Area 11 season, test fishers encountered 112 Chinook salmon, 71% of which were marked (all sizes) and 85% of which were of legal size (both mark-status groups). With a "CPUE" (legal-marked Chinook *encounters* / angler trip) of 0.49, test fishers encountered legal-marked Chinook at a substantially higher rate than did the private recreational fleet. Test-fishery Chinook total lengths were similar for the two mark-status groups, averaging 70 cm (marked and unmarked mean; range: 21-93 cm). For the four-month season combined, we estimated the size/mark-status composition at 71% legal-marked (LM), 14% legal-unmarked (LU), 12% sublegal-marked (SM), and 2% sublegal-unmarked (SU).

By combining dockside-sampling results (i.e., legal-marked Chinook harvest estimates) and test fishery encounters data, we generated size/mark-status group-specific estimates of encounters and mortalities for Area 11. In total, 12,703 Chinook were encountered (retained and released) during the Area 11 fishery, with 8,365 of these being legal-marked, 2,017 legal-unmarked, 2,069 sublegal-marked, and 252 sublegal-unmarked individuals. Among released encounters, an estimated 163 legal-marked, 300 legal-unmarked, 394 sublegal-marked, and 50 sublegal-unmarked Chinook (906 overall) were estimated to have died due to handling and release effects of the Area 11 fishery. Thus, in total, 7,934 marked (93% due to direct harvest) and 371 unmarked Chinook mortalities occurred as a result of the Area 11 MSF. Overall, estimated impacts were similar to (legal-marked harvest) or considerably less than (sublegal encounters or mortalities) what was expected based on pre-season Fishery Regulation Assessment Model runs (model run 2108). Finally, regarding impacts of MSFs on the coded-wire tag (CWT) program, we estimated that 20 unmarked Chinook belonging to double-index tag (DIT) groups may have died due to the handling-and-release impacts of respective Area 11 MSF.

Area 13 Summary

Between May 1st and September 30th, 2008, samplers conducted Baseline sampling[2] at 22 different sites used to access the Area 13 MSF. As a result, samplers acquired catch (kept and

[2] The Area 13 fishery was monitored using a reduced, Baseline sampling approach. While this approach does not provide a means for generating in- or immediately post-season estimates of *fishery total* catch and effort, these sampling observations (i.e., CPUE) will be combined with catch record card (CRC) data to obtain these values at a later time.

released) and effort information about nearly 3,100 completed angler trips. Over all interviews, ramp samplers observed anglers harvest a total of 180 Chinook (179 marked, 1 unmarked) and recorded 392 angler-reported Chinook releases (109 marked, 54 unmarked, and 229 of unknown mark status). Given these observations, we estimated the season-wide Area 13 CPUE at 0.06 Chinook retained per angler trip, a value that was low in general and less than half of what was observed during 2007.

During the five-month Area 13 fishery, harvested Chinook averaged 74 cm (range: 54 to 99 cm) in total length and were larger than the legal minimum size limit ($\geq$22 in or 56 cm TL) in most instances (>99% of 170 marked fish). Further, 85% of all harvested individuals were 3-year olds (i.e., brood year 2005). In addition to collecting length data and scales, ramp samplers recovered eight CWTs from marked Chinook harvested in Area 13, the majority of which were from South Puget Sound facilities (two North Puget Sound tags were also recovered).

Though we did not test fish in Area 13 during its mark-selective Chinook season, we estimated the overall and legal-sized mark rate based on angler-supplied voluntary trip reports (VTRs). In total, 20 separate VTRs were returned, providing size/mark-status details on 42 individual Area 13 Chinook encounters. Though VTR coverage was not seasonally extensive (i.e., most returns were for May and June), VTR-supplied data, in combination with dockside interview results, suggest that high (i.e., 60-80%) mark rates were present throughout the Area 13 MSF. However, Area 13 VTR results also illustrate the need for taking measures to obtain as broad of a cross section as possible when using this self-selected sampling medium.

INTRODUCTION

In recent years, abundant runs of hatchery Chinook salmon (*Oncorhynchus tshawytscha*) have been mixed with depressed runs of wild Chinook salmon in the marine environments of the Puget Sound and Strait of Juan de Fuca. Providing recreational anglers with opportunities to harvest abundant hatchery stocks while simultaneously protecting weaker, wild stocks has proven to be a significant conservation and management challenge. The combination of large-scale hatchery marking (i.e., fin clipping) programs and mark-selective harvest regulations makes it possible for anglers to pursue and harvest hatchery Chinook salmon while minimally impacting wild salmon populations. In such "mark-selective fisheries" (MSFs), anglers are generally allowed to retain adipose-fin clipped ("marked") hatchery fish and are required to release unharmed any unclipped ("unmarked", predominantly wild) salmon encountered[3].

Since the first marine selective Chinook fishery occurred in Marine Catch Areas 5 and 6 (Strait of Juan de Fuca) in 2003 (WDFW 2008a), mark-selective Chinook salmon fishing regulations have been implemented on a pilot basis in multiple Puget Sound Marine Catch Areas during both summer and winter seasons. As of the close of the 2006-07 fishing season, pilot *summer* selective Chinook seasons have occurred in Areas 5 and 6 for five years (2003-2007; WDFW 2008a) and in Areas 9, 10, 11, and 13 for one year (2007; WDFW 2007a and 2007b); pilot *winter* selective Chinook fisheries have occurred in Areas 8-1 and 8-2 for two complete seasons (2005-06 and 2006-07; WDFW 2008b). During the summer of 2008, the Washington Department of Fish and Wildlife (WDFW) implemented summer mark-selective Chinook fisheries in Areas 11 (June 1-September 30, 2008) and 13 (May 1-September 30, 2008) for the second time. Consistent with the 2004 Puget Sound Chinook Harvest Management Plan (Puget Sound Indian Tribes and WDFW 2004) and the intent of previous mark-selective Chinook fisheries, the primary goal for these pilot fisheries was to provide meaningful opportunity to the recreational angling public while minimally impacting ESA-listed Puget Sound Chinook salmon.

Given the pilot nature of the Areas 11 and 13 mark-selective Chinook fisheries, WDFW's Puget Sound Sampling Unit was tasked with implementing an intensive monitoring program during the entirety of their respective four- and five-month summer seasons. As per State–Tribal agreement (WDFW and NWIFC 2008), our primary goal was to collect the data needed to estimate key parameters characterizing these fisheries and their impacts on unmarked salmon. For the Area 11 fishery, we tailored sampling efforts so that we could reliably estimate: *i*) the mark rate of the targeted Chinook population (based on test fishing), *ii*) *fishery-total* angling effort and Chinook salmon encounters (harvest + releases) and mortalities (by size/mark-status class), *iii*) the coded-wire tag- (CWT) and/or DNA-based

[3]The regulations specific to the 2008 Areas 11 and 13 mark-selective fisheries allowed for the retention of up to two legal-sized ($\geq$22 inches [56 cm]) marked Chinook salmon per day and required the immediate release of all unmarked or sublegal Chinook. Additionally, anglers were: *i*) required to use single-point, barbless hooks while fishing for salmon, *ii*) held to a combined (all salmon species) two-fish daily limit during the Areas 11 and 13 mark-selective fisheries, and *iii*) held to a handling rule that prevented them from bringing unmarked and/or sublegal Chinook aboard their vessels.

stock composition of marked and unmarked Chinook mortalities[4], and *iv*) *fishery-total* mortality of marked and unmarked double index tag (DIT) CWT stocks. For the Area 13 fishery, we employed a reduced monitoring program, which included sampling for the estimation of: *i*) mark rates (based on voluntary trip reports provided by private anglers), *ii*) indices of Chinook encounters and angling effort (i.e., sample frame-observations, not fishery totals[5]), and *iii*) the CWT composition of landed catch. In both areas, we acquired and analyzed relevant data characterizing other aspects of the pilot fishery, including descriptors of fishing success (catch [landed Chinook] per unit effort, CPUE), the length and age composition of encountered Chinook, and the overall intensity of our sampling efforts.

In the following pages, we report the results generated through our Areas 11 and 13 monitoring activities, separately. We first provide a brief review of our in-season sampling and post-season assessment methods and then present detailed results for each component of our selective-fishery monitoring program, by area. Area 11 results are then presented, according to the following sequence: *i*) the intensity (i.e., spatial and temporal coverage) of sampling efforts is described; *ii*) estimates of fishery characteristics obtained from creel survey data are reviewed; *iii*) the results from our recreational test fishery are presented; and *iv*) total fishery impacts—estimated based on the combination of creel and test fishery data—are reviewed and compared with pre-season expectations (i.e., based on Fishery Regulation Assessment Model [FRAM] predictions). Next, we review our Area 13 results, inclusive of the first two items in the Area 11 results sequence. Finally, we provide a detailed description of our estimation scheme as well as additional and relevant data in a series of appendices (i.e., sample-rate tables and sampling summaries; age composition tables [for landed catch and test fishery encounters]; and raw CWT recoveries).

Marine Catch Area and Fishery Descriptions

At just over 80 square miles (205 km^2), Area 11 encompasses the central-south Puget Sound marine waters extending from the northern end of Vashon Island southward to the northernmost Tacoma Narrows Bridge, including the marine waters of Colvos Passage on the western shore of Vashon Island (**Figure 1-1**). Extending southward from the northernmost Narrows Bridge, Marine Area 13 includes all marine waters (~125+ mi^2 [320 km^2]) in the southern terminus of Puget Sound (**Figure 1-2**). Marine Area 13 is geographically more complex than Area 11 and includes several islands, inlets, and passageways. Given their proximity to urban centers (Tacoma [Area 11] and Olympia [Area 13]), both areas 11 and 13 draw appreciable local, tourist, and charter-based angling effort during summer months. In addition to Chinook salmon, these anglers pursue and encounter coho salmon (*O. kisutch*) and, during odd years, pink salmon (*O. gorbuscha*). During the summer of 2008, Areas 11 and 13 were open under mark-selective Chinook harvest regulations from June 1 to September 30 and May 1 to September 30, respectively.

[4] Though the necessary tissue samples have been collected, DNA-based estimates of stock composition are presently unavailable for Puget Sound/Strait of Juan de Fuca mark-selective fisheries. In the present report, CWT-based (unexpanded) estimates of the stock composition of marked Chinook harvest are provided.

[5] Within two years of the fishery's close, baseline-sampling observations of CPUE will be combined catch record card (CRC) return data to produce *fishery total* catch and effort estimates for Area 13.

AREA 11 METHODS

Monitoring Program Overview

Our sampling program for the Area 11 fishery incorporated comprehensive and complementary data collection strategies, including dockside angler interviews (with catch sampling), on-the-water (instantaneous) effort surveys, test-fishery-based sampling, and voluntary reports of completed trips provided by charter boats and private anglers (**Figure 2**). Although we provide a brief review the field and analytical methods associated with our sampling efforts here, we refer the reader to WDFW (2007b or 2008b) for additional detail.

Catch and Effort: Sampling and Estimation

We collected data on total catch (observed harvest and reported releases[6]) and total angling effort using a two-stage stratified cluster sample design. At the first stage, we selected five sample days from three temporal strata (weekday [Monday-Thursday], with $n = 2$ days sampled; Friday, with $n = 1$ day sampled; and weekend [Saturday-Sunday], with $n = 2$ days sampled) during each week of the fishery. On each selected sample day, we selected two access points (i.e., public ramps, boathouses, etc.) from our Area 11 sample frames for creel sampling. Access site (i.e., cluster) selection was achieved at the second stage using a probability-proportional-to-size (PPS) sampling algorithm (the Yates-Grundy or "natural" method, Cochran 1977). The measure of size used in PPS sampling was equivalent to the fraction of total sample-frame effort attributed to a given site; this quantity was estimated using data collected during instantaneous on-the-water surveys (i.e., "boat surveys") conducted routinely during the course of the fishery. Our sample frame included all moderate-to-high-effort public boat launch facilities that are used to access Area 11 (Armeni Public Ramp, Gig Harbor Ramp, Narrows Marina [Boathouse, Ramp, and Rental], Point Defiance Boathouse, Point Defiance Public Ramp, and Redondo Ramp). Given that some effort was excluded from our sample frame (i.e., private and/or low-effort access sites), we also estimated the out-of-frame effort proportion from boat survey data and accounted for this quantity in estimates of fishery-wide totals (e.g., catch and effort).

At access sites selected for sampling on scheduled sample days, samplers interviewed *all* anglers exiting the fishery. During interviews, samplers acquired data on trip duration, trip intent (i.e., targeted species), fishing method(s) employed (downrigger or diver trolling, jigging, mooching, or other), and fish encountered (kept and/or released, by species). When an interviewed party possessed Chinook or coho salmon, samplers inspected them for CWTs using wand detectors, and collected snouts from CWT+ individuals for later lab processing. Additionally, samplers took length measurements (fork and total) and scale samples from landed Chinook.

[6] In a recent evaluation of bias in mark-selective fishery parameter estimates, Conrad and McHugh (2008) concluded that recall errors likely cause bias in interview-based estimates of total salmon *releases*. Thus, although estimates of total salmon releases based solely on angler-reported data were generated for this report (**Appendices H**), we focus exclusively on bias-corrected "Method 2" estimates of Chinook encounters (and releases) in our review of the Area 11 fishery.

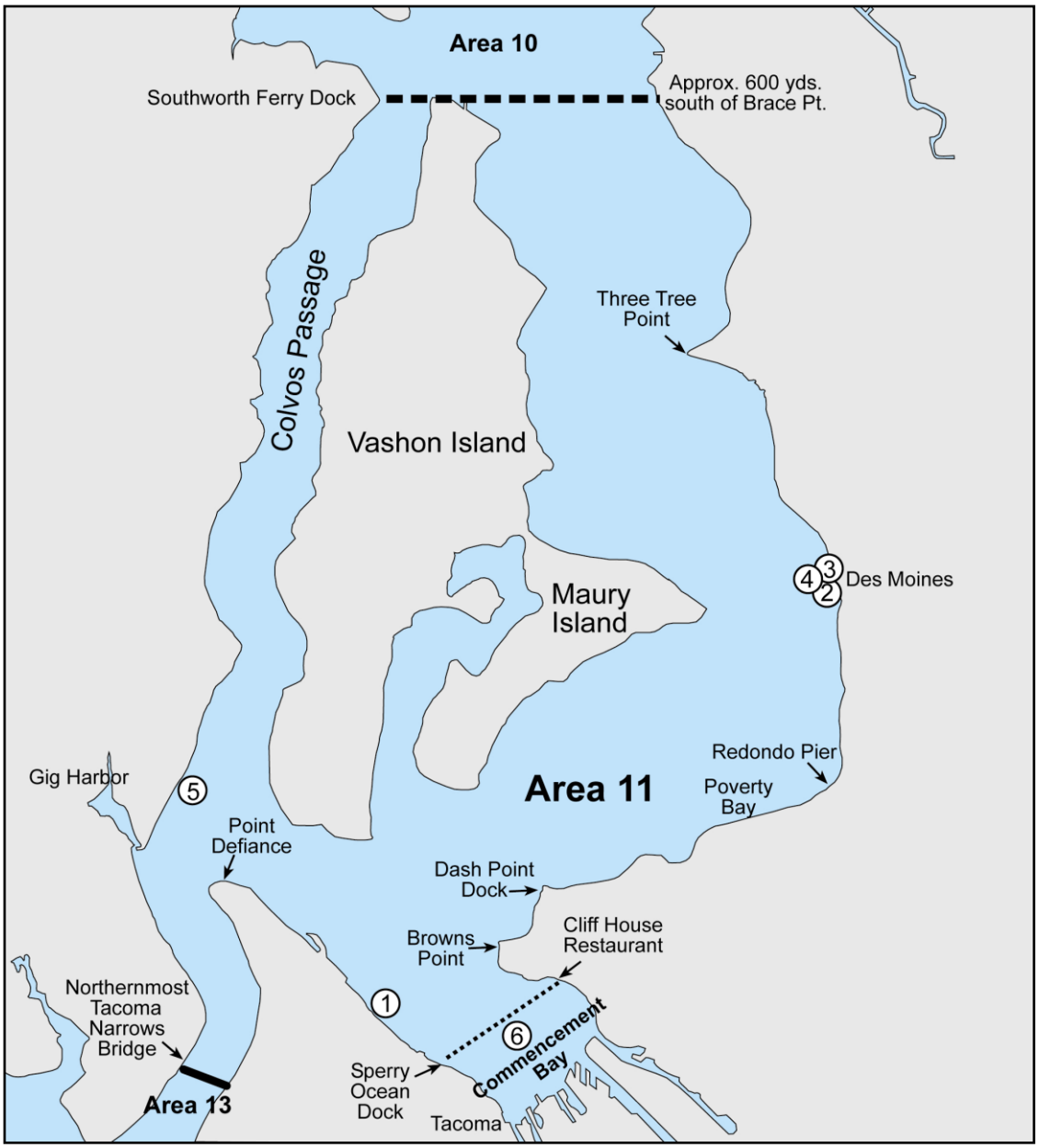

Figure 1-1. Map of Marine Catch Area 11 in Puget Sound, where the second season of the pilot selective Chinook fishery occurred from June 1-September 30, 2008. Note that the circled numbers in this figure correspond to special-area regulations for the 2008-09 fishing season (see 2008/2009 WDFW Sport Fishing Rules for details).

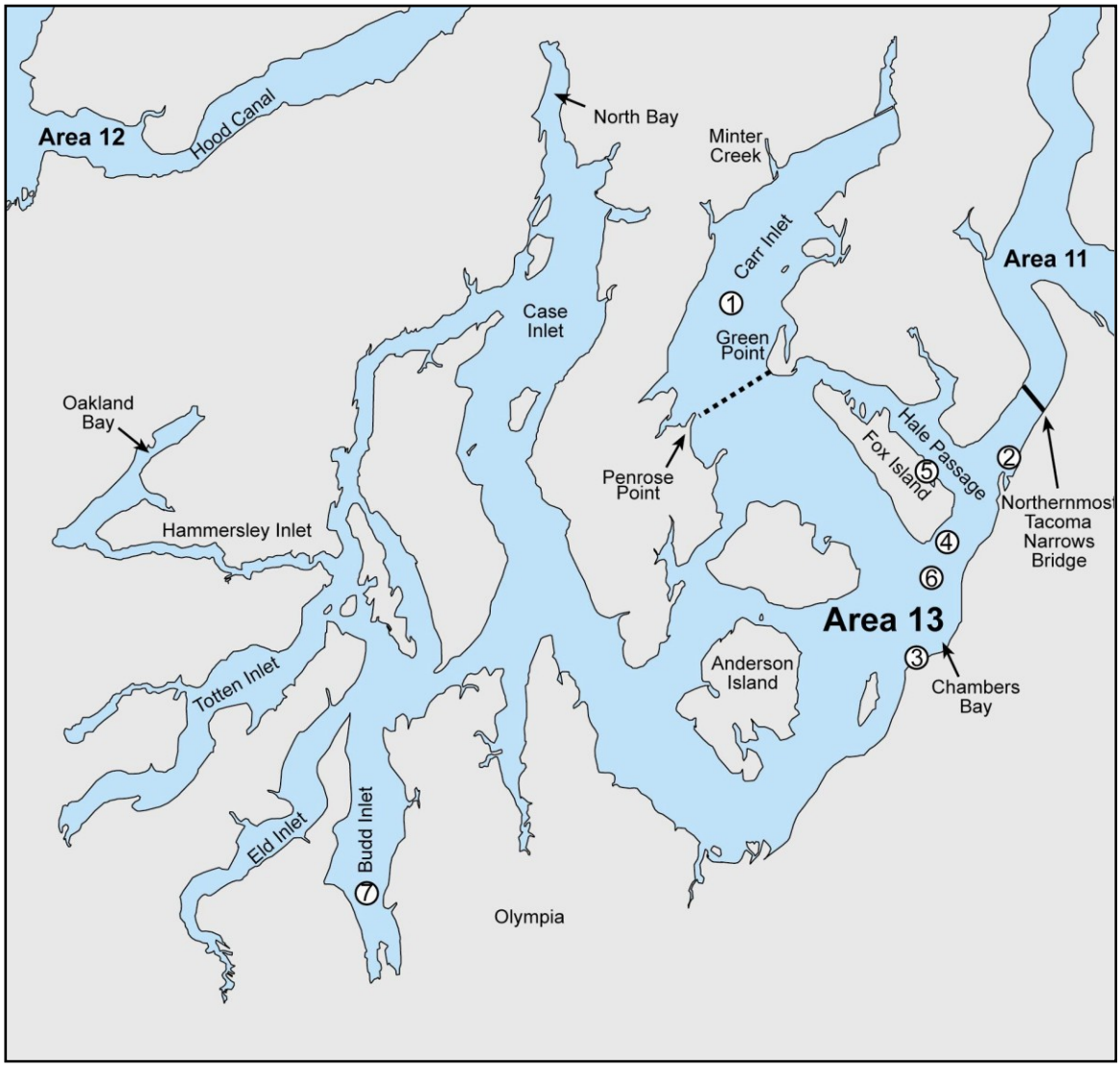

Figure 1-2. Map of Marine Catch Area 13 in Puget Sound, where the second season of the pilot selective Chinook fishery occurred from May 1-September 30, 2008. Note that the circled numbers in this figure correspond to special-area regulations for the 2008-09 fishing season (see 2008/2009 WDFW Sport Fishing Rules for details).

By combining dockside interview data with estimated size measures, we generated daily estimates (and variances) of total fishing effort and landed Chinook catch (by mark-status group) for our sample frame using Murthy's population-total estimator (Murthy 1957, Cochran 1977, WDFW 2008b). We then expanded these estimates to account for the out-of-frame effort proportion and then again to obtain stratum-wide totals (**Table 1**). To minimize the influence of recall bias on our assessment, we estimated Chinook releases as the difference between retained catch (i.e., from the Murthy estimator, based on *observed* landings) and total Chinook encounters (i.e., *releases = encounters – retained catch*) generated using the bias-corrected Conrad and McHugh (2008) approach. Briefly, encounters were estimated by dividing the creel estimate of legal-marked Chinook harvest by a test fishery-based estimate of the proportion of the fishable Chinook population that is of legal size and marked (i.e., our former "Method 2" approach; e.g., WDFW 2007b). Given that this approach yields negatively biased estimates if anglers release any of the legal-marked Chinook they encounter, Conrad and McHugh estimated a "correction" factor to account for this phenomenon and incorporated it into their estimator (See **Appendix A** for complete computational details). Although we do not review estimates of Chinook releases based solely on angler accounts in our assessment, we supply these estimates, as well estimates of retained catch and/or reported releases for other salmon species, in appendices to this report (**Appendix H**).

As a final note, due to logistical constraints we were unable to separately census charter catch and effort during the Area 11 fishery. In contrast to last year's monitoring plan and that employed in other areas, charter anglers were therefore treated identically to private fleet anglers in both sampling and estimation. If they returned to sampled sites they were accounted for in our initial sample-frame estimate; if not, they were accounted for when we expanded it by the fraction of angling effort originating at out-of-frame sites. Given the limited number of charter trips that occurred last year (0.2% of total effort; WDFW 2007a) and their continued limited presence this year (4 out of 1,785 boats during on-the-water surveys), the 2008 estimates are expected to be functionally similar (i.e., no loss in precision or accuracy) to those that would have been obtained had a separate breakout been possible.

Test Fishery Methods

In order to obtain accurate estimates of the size (legal or sublegal) and mark-status (marked or unmarked) composition of the pool of Chinook salmon encountered by anglers participating in the fishery, we conducted a recreational test fishery during the entirety of the mark-selective Chinook season (**Table 1**). Our test boat crew consisted of two WDFW technicians, each fishing with a single rod for five days a week (Monday-Friday). Test fishers focused their efforts at locations that optimized their overall encounter rate and mirrored choices made by the at-large private fleet. Also, test fishers fished for Chinook using the same methods as the recreational fleet, as prescribed by supervisory staff based on dockside interview results for the preceding week. For each fish brought to boat, test fishers logged details on its identity (species), size (fork length and total length), and, if appropriate, mark status (marked or unmarked). For Chinook salmon encounters only, test fishers additionally collected scale and DNA samples (~1-cm^2 piece of dorsal tissue).

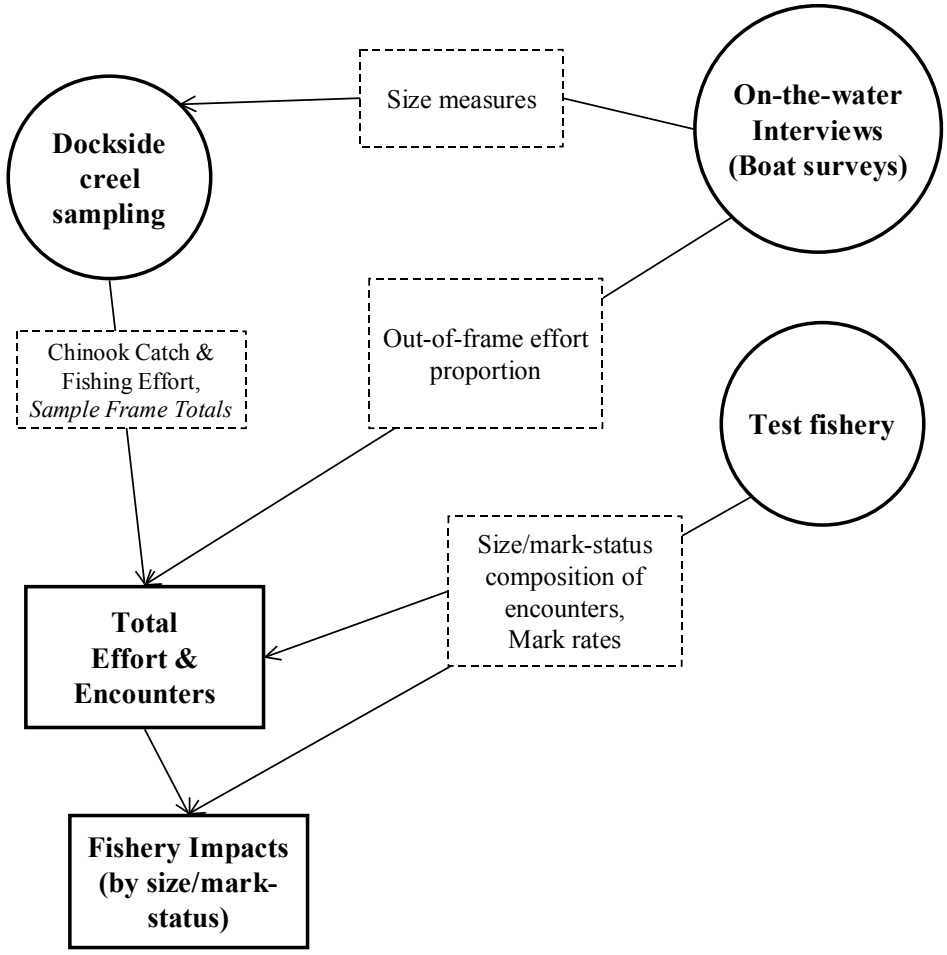

Figure 2. Conceptual diagram of the monitoring plan implemented in Area 11 during the June 1-September 30, 2008 mark-selective Chinook season. Circles represent discrete sampling activities, dashed boxes represent parameters that are estimated using data from a given activity, and solid boxes depict key quantities estimated from the comprehensive plan. 'Encounters' includes both harvested and released Chinook salmon.

Estimating Fishery Impacts

Total Encounters and Mortalities

We characterized the overall impacts of the fishery in terms of grand-total estimates of encounters and mortalities and by using estimates specific to each of the four size/mark-status groups (i.e., legal-marked [LM], sublegal-marked [SM], legal-unmarked [LU], and sublegal-unmarked [SU]; **Table 1**). As indicated above and in contrast to the previous post-season summer Areas 11 and 13 report, we used only one approach to estimate total Chinook encounters and, consequently, mortalities. This single method was selected as a result of a thorough state–tribal review of bias potential in estimators of encounters in MSFs (see Conrad and McHugh 2008 for details). In brief, encounters were estimated by dividing creel

estimates of legal-marked Chinook harvest by the test fishery-based proportion of the targeted Chinook population that was of legal size and marked, inclusive of a bias correction accounting for the modest level legal-marked Chinook release that occurs in this fishery. We then decomposed total encounters into size/mark-status group-specific estimates using test-fishery encounters composition data.

We estimated total Chinook mortality resulting from the fishery by applying assumed mortality rates to the total harvest and release estimates for the four size/mark-status groups (LM, LU, SM, and SU). For retained Chinook, the mortality estimate was equivalent to the total harvest estimate for the applicable size/mark-status group. We applied selective fishing mortality (*sfm*) rates of 15% and 20% to legal (marked and unmarked) and sublegal (marked and unmarked) release totals, respectively, to estimate release mortality. See **Appendix A** for a complete description of our impact estimation procedure, including formulae for total and variance estimators.

The final step of our overall impacts assessment involved comparing fishery outcomes to pre-season expectations. To do this, we compared season-total estimates of Chinook encounters and mortalities to pre-season modeled values (FRAM model run no. 2108) for each size and mark status category.

Table 1. Sampling/estimation details on target parameters associated with the overall Area 11 mark-selective fishery monitoring program (**Figure 1**).

Activity	Focal Parameter(s)	Secondary Parameter(s)	Sample Unit(s)	Finest Estimation Time Step	Comments
Dockside Creel Sampling	Fishing effort (boat & angler trips); kept and released fish[1]	Catch rates (CPUE); length, age, and CWT composition of harvest[2]	Angler trip; kept fish; reported fish release	Week[1]	Within weeks, estimates are also produced by strata (weekday/weekend).
Test Fishing	Size (legal/sublegal) and mark-status composition (marked, unmarked) of encountered Chinook	Chinook length, age, and DNA-based[3] stock composition; species composition of non-Chinook encounters	Fish encounter	Two-month block (Jun/Jul, Aug/Sept)	Though they were qualitatively examined, too few encounters occurred to rigorously assess mark rates on a finer time scale.
Overall Fishery Impacts Estimation	Total Chinook encounters and mortalities, by size/mark-status group	Ratios of encounters and mortalities per kept Chinook	N/A	Two-month block (Jun/Jul, Aug/Sept)	Though estimated on a 2 mo. time step, impacts are considered at season-total level only.
Coded-wire tag (CWT) Impacts Estimation	Marked/unmarked double-index tag (DIT) encounters and mortalities	N/A	N/A	Season (4 months)	The temporal resolution of DIT impacts is constrained by the total number of tags recovered.

[1] Under the "bias-corrected Method-2" approach, Chinook releases can be estimated only as finely as test fishery data allow.
[2] The length and CWT composition of landed catch was assessed on a season-wide basis for impact estimation.
[3] Though samples were collected, DNA-based estimates of stock composition are not yet available for this fishery.

CWT Impacts

To understand the potential effects of the Area 11 fishery on the CWT program, we estimated the total number of unmarked-tagged Chinook mortalities that may have occurred during the course of its four-month season. To do this, we acquired information for all marked CWT double index tag (DIT) groups present in landed catch from the Pacific States Marine Fisheries Commission's Regional Mark Information System (RMIS) and then applied the methods described by the Selective Fisheries Evaluation Committee–Analysis Work Group (SFEC-AWG 2002) to estimate the number of unmarked DIT fish encountered[7]. We subsequently estimated the number of these fish that may have died due to hook-and-release impacts using an *sfm* analogous that used in FRAM modeling. Given our interest in characterizing the impacts of mark-selective regulations on the CWT program and not recreational fishing in general, we used an *sfm* of 10% in all unmarked-DIT mortality calculations. Thus, we used 10% instead of 15% (applied above to legal-sized releases) since unseen drop-off mortality (the 5% differential) is a feature common to selective and non-selective recreational Chinook fisheries.

AREA 13 METHODS

Data collection methods used to monitor the Area 13 mark-selective Chinook fishery included dockside angler interviews (with catch sampling) and voluntary trip reports provided by private anglers. From these activities, we were able to estimate catch rates (i.e., CPUE), mark rates (based on VTRs), and landed-catch composition (age, length, and CWT). Additionally, we described relative catch and effort patterns over the five-month season based on the assumption that baseline-sampling observations of these parameters are good indicators of associated fishery-wide trends.

To acquire dockside data, we conducted "Baseline Sampling" at selected Area 13 access sites. Baseline sampling is opportunistic in nature, with overall sampling effort allocated across space and time in a manner that maximizes the number of angler interviews obtained per sample effort. The Area 13 baseline sample frame included 22 different access sites (listed in Area 13 Results) each of which was visited on an average of 15 days during the five-month season. Site visits lasted 5.2 hours on average and ranged from short (e.g., "no effort" samples) to full-day (11+ hour) sampling events. When present, samplers interviewed all anglers exiting the Area 13 fishery at the selected access site. The interview and catch-sampling procedures employed in Area 13 were identical to those used in Area 11, less the collection of fishing methods information. Thus, Area 13 samplers acquired information about: 1) angling effort (boat and angler trips, trip length), 2) encounters composition (retained and/or released) by species and mark status (marked vs. unmarked, Chinook and coho salmon only), and 3) landed Chinook size (fork and total length) and age (scales were collected and ultimately read) composition. Samplers also inspected landed Chinook and coho salmon for CWTs using wand detectors and acquired snouts when tags were present;

[7] For all unmarked-DIT encounters and mortalities calculations, we relied on the unmarked-to-marked abundance ratio (λ) estimated for DIT groups at the time of juvenile release.

resulting tag data were used to estimate the CWT-based composition (unexpanded) of landed catch.

In contrast to the survey design (i.e., the "Murthy" design) employed in Area 11, Area 13 sampling results could not be used to produce fishery-total estimates of effort, encounters (retained catch + releases), and unmarked-DIT Chinook impacts. It should be noted, however, that Area 13 baseline sampling observations will ultimately (one to two years from the close of the fishery) be combined with CRC data to estimate catch and effort at the fishery-total level, by month. Thus, while these descriptors of MSF impacts are not presented in the present document, they will be available at a future time.

AREA 11: RESULTS & DISCUSSION

Summary of Sampling Efforts

Sampled Access Sites

Between June 1 and September 30, 2008, we sampled the Area 11 recreational fleet via dockside creel surveys at two different sites per day on a grand total of 85 days (i.e., 170 site-days; **Table 2**). We interviewed anglers at six different access sites, most frequently at Point Defiance Public Ramp (49% of site-days) and Boathouse (22% of all site-days). While site-days spent at Gig Harbor and Redondo ramps comprised the majority remaining sampling effort (24% of total combined), we also periodically visited two low-effort sites (Armeni Public Ramp and Narrows Marina). Over the season, we successfully expended sampling effort at sites in proportion to their estimated overall "size" (i.e., as measured by fishing effort [angler trips], **Table 2**, **Appendix D**).

In total, our Area 11 angler-interview efforts allowed us to directly sample 17,131 completed angler trips and 8,428 completed boat trips. These efforts, coupled with supplemental Baseline sampling, also yielded samples from over 2,000 Chinook salmon harvested from Area 11 between June 1st and September 30th (**Appendix C**).

Table 2. List of sites sampled, with the number of sampling events (site-days), during the Area 11 summer 2008 mark-selective Chinook fishery.

Area 11 Sampled Sites	Sample days per month				Total sample days	% of total	Season-total site size[1]
	June	July	Aug.	Sept.			
Armeni Public Ramp	0	1	1	0	2	**1.2%**	**4.4%**
Gig Harbor Ramp	2	7	5	3	17	**10.0%**	**8.9%**
Narrows Marina (Boathouse, Ramp, Rental)	2	2	0	1	5	**2.9%**	**6.3%**
Point Defiance Boathouse	14	8	7	9	38	**22.4%**	**14.8%**
Point Defiance Public Ramp	21	23	20	20	84	**49.4%**	**46.6%**
Redondo Ramp	3	7	7	7	24	**14.1%**	**19.0%**
TOTAL	**42**	**48**	**40**	**40**	**170**		

[1] Estimated from on-the-water surveys; value is relative to sites included in the sample frame only (See **Appendix D** for raw season-wide values).

On-the-Water Survey Summary

During the 122-day period that Area 11 was open under mark-selective regulations, we conducted 3,477 on-the-water interviews (i.e., total anglers intercepted [n = 1,785 boats]) over a total of six weekday and seven weekend boat surveys (**Appendix D**). These surveys yielded quantitative details about the set of sites anglers used to access Area 11 and thus allowed us to estimate the proportion of effort originating at each of our sample-frame sites (i.e., size measures; **Appendix D**, **E**) during both weekday and weekend strata. As suggested above,

Point Defiance Public Ramp and Point Defiance Boat House were the two sites that anglers most frequently reported using to access Area 11, followed closely by Redondo and Gig Harbor ramps. Pooled over all surveys, 40% of all anglers interviewed during boat surveys indicated that their trip would end at either a private or never-sampled launch site (**Appendix D**). Additionally, boat surveys revealed that the relative "size" of sampled access sites and the proportion of total effort captured in our sample frame remained relatively constant during the fishery (**Appendix E**).

Table 3. Monthly summary of boat surveys conducted during the Area 11 summer 2008 mark-selective Chinook fishery.

Boat survey schedule: Area 11		
Month	**Weekday**	**Weekend**
June	13th, 20th	22nd, 28th
July	11th, 18th	6th, 12th
August	14th	10th, 23rd
September	11th	6th
Total Number	**6**	**7**

Fishery Characteristics

Estimates of Fishing Effort and Chinook Catch

On a season-total level, anglers (charter and private anglers combined) completed an estimated total of nearly 66,000 angler trips between June 1 and September 30, 2008 (**Table 4**). In terms of within-season trends, fishery participation was modest throughout June, increased progressively from July to early August, dropped off sharply in late August, and resumed June levels during September (**Figure 3**). Given this pattern, the majority (>75%) of Area 11 effort occurred during the months of July and August, with peak participation occurring during statistical week 33 (the second week of August). Relative to Area 11's prior summer mark-selective Chinook season (June-Sept., 2007), during which fishing effort approached 80,000 angler trips (WDFW 2007b), summer 2008 angler participation was down considerably.

In contrast to patterns in angler interest, 2008 Area 11 Chinook salmon catch rates (CPUE, landed Chinook per angler trip) were similar to those documented for 2007 (2007 CPUE = 0.13 [range: 0.02-0.20]; WDFW 2007b). Between June 1-September 30, 2008, CPUE averaged 0.10 landed Chinook per angler trip at the season-total level and ranged from 0.01 (early September) to 0.20 (mid August) across weeks. Relative, within-season patterns demonstrate that CPUE was initially moderate (June 1 to mid-July), highest between mid-July and late August, extremely low during September, and somewhat variable on a week-to-week basis (**Figure 4**).

Given observed patterns in effort and catch rates, we estimated that anglers harvested a grand total of 7,400 Chinook salmon during the Area 11 summer fishery (**Table 4**). Virtually all (>99%) harvested Chinook salmon were marked. On average, anglers harvested 388 (range: 5-1,586) marked Chinook per week, with the greatest number of removals occurring during week 32 (mid-August). Nearly half of all landed Chinook were caught during August (47 % of season total) and very few (3% of season total) landings occurred during September; see **Figure 5** for a graphical display of temporal harvest patterns. Finally, in addition to Chinook salmon, anglers harvested 1,701 (1,333 marked, 368 unmarked) coho salmon (*O. kisutch*) and five chum salmon (*O. keta*) during the summer 2008 MSF Chinook season (**Appendix H**).

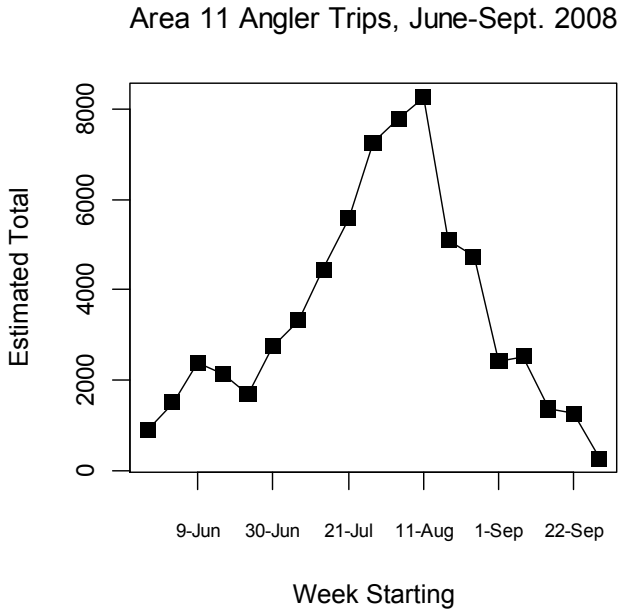

Figure 3. Temporal patterns in weekly total fishing effort during the Area 11, summer 2008 mark-selective Chinook fishery.

In addition to harvesting 7,400 Chinook salmon, we estimated that anglers participating in the Areas 11 MSF caught and released an additional 3,056 marked and 2,322 unmarked Chinook salmon (**Table 4**, **Figure 5**)[8]. Thus, on a season-total level anglers released an estimated 0.4 marked and 0.3 unmarked Chinook per marked, harvested fish. Combining these releases with harvest estimates, we estimated that anglers encountered a grand total of 12,779 Chinook in Area 11 during its four-month mark-selective season (**Table 4**). For more on fishery impacts from a total encounters perspective, see the section entitled *Overall Fishery Impacts*.

[8] Total Chinook releases were estimated using the bias-corrected "Method 2" encounters estimation approach (Conrad and McHugh 2008). For Murthy estimates of Chinook releases based solely on angler-reported releases (i.e., "Method 1" estimates), as well as estimates of harvest and releases for other salmon species, see **Appendix H**.

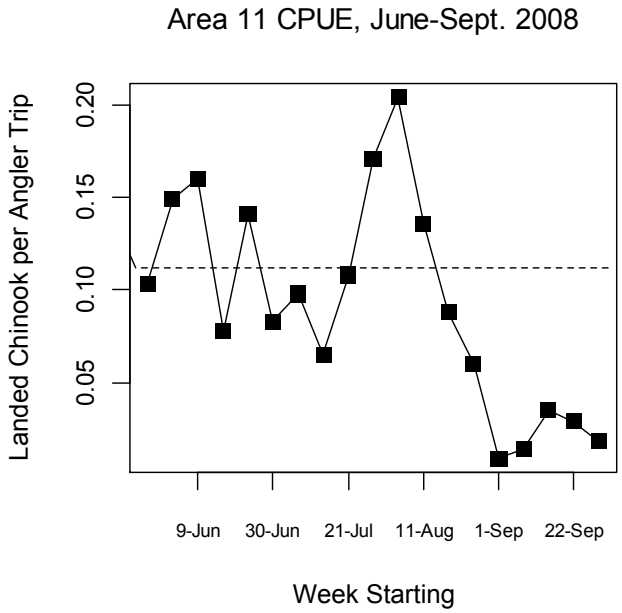

Figure 4. Temporal patterns in CPUE (landed Chinook per angler trip, weekly estimates) during the Area 11 summer 2008 mark-selective Chinook fishery. The horizontal dashed line corresponds to the season-wide CPUE.

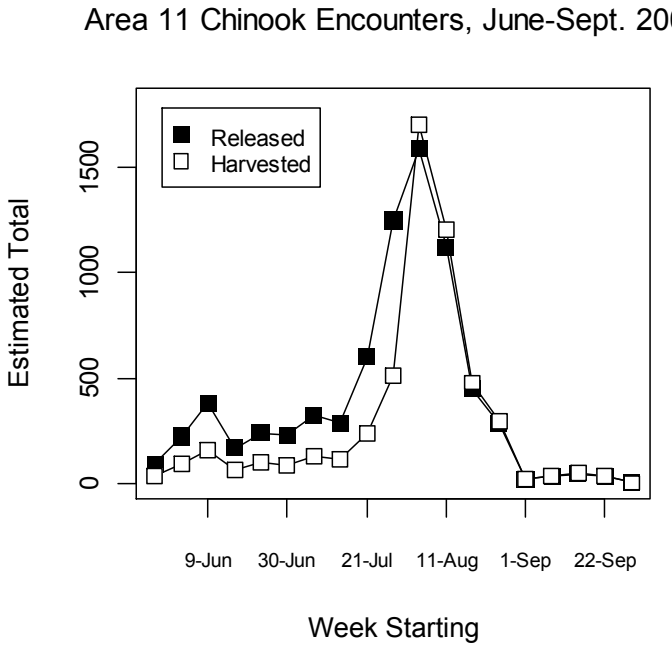

Figure 5. Temporal patterns in weekly total Chinook harvest and releases during the Area 11, summer 2008, mark-selective Chinook fishery.

Table 4. Estimates of total fishing effort and the total number of salmon kept and released during the Area 11, summer 2008 mark-selective Chinook fishery. Values may not add exactly due to rounding error.

Month	Stat. Week	Start Date	End Date	Effort[1]		Retained Chinook[1]		Released Chinook[2]		Encounters Total[2]
				Boats	Anglers	AD	UM	AD	UM	
June	22	1-Jun	1-Jun	470	902	93	0	20	17	130
	23	2-Jun	8-Jun	836	1,503	224	0	48	40	313
	24	9-Jun	15-Jun	1,291	2,372	380	0	81	68	530
	25	16-Jun	22-Jun	1,183	2,147	168	4	36	26	234
	26	23-Jun	29-Jun	879	1,698	240	0	51	43	334
July	27	30-Jun	6-Jul	1,468	2,752	228	5	49	36	318
	28	7-Jul	13-Jul	1,813	3,317	324	0	69	58	451
	29	14-Jul	20-Jul	2,248	4,447	288	0	61	52	401
	30	21-Jul	27-Jul	2,859	5,587	601	7	128	101	837
	31	28-Jul	3-Aug	3,828	7,260	1,245	0	266	223	1,733
August	32	4-Aug	10-Aug	4,116	7,787	1,586	2	994	702	3,284
	33	11-Aug	17-Aug	4,010	8,259	1,122	0	703	498	2,322
	34	18-Aug	24-Aug	2,536	5,104	448	0	281	199	927
	35	25-Aug	1-Sep	2,416	4,739	284	5	178	121	587
September	36	2-Sep	7-Sep	1,260	2,425	21	0	13	9	43
	37	8-Sep	14-Sep	1,292	2,524	36	0	23	16	75
	38	15-Sep	21-Sep	765	1,368	48	0	30	21	100
	39	22-Sep	28-Sep	642	1,260	36	0	23	16	75
	40	29-Sep	30-Sep	180	276	5	0	3	2	10
Season Total:				34,090	65,728	7,377	23	3,056	2,247	12,703
Standard Error:				1,745	2,532	878	7	1,492	656	2,244
CV (%):				5%	4%	12%	31%	49%	29%	18%
95% CI:				30,670-37,510	60,766-70,690	5,657-9,098	9-37	132-5,981	961-3,533	8,305-17,102

[1] Estimated boats, anglers, and retained salmon catch were estimated via the Murthy estimator method.

[2] Released Chinook were estimated as the difference between total Chinook encounters generated using a bias-corrected "Method 2" estimator. See **Appendix A** and Conrad and McHugh (2008) for additional details.

[3] The 5 UM Chinook included during week 27 were actually of undetermined mark status; they are assumed to be unmarked for impact-estimation purposes.

Characteristics of Harvested Chinook

Length and Age.—Over the course of the Area 11 mark-selective fishery, 2,076 retained Chinook were sampled at dockside (**Table 5**). All of these fish were measured and examined for the presence of a CWT. Marked Chinook harvested from Area 11 averaged 73.1 cm TL (range: 26.5-97.2, SD = 7.7; **Figure 6**) and were predominantly (98.6%) of legally harvestable size (≥ 22 in [56 cm]).

Table 5. Summary of length samples collected during dockside angler interviews from retained Chinook salmon, Area 11, June 1-Sept. 30, 2008.

	Number Sampled		
Mark Type	**Legal-size**	**Sublegal-size**	**Total**
Marked	2,035	28	2,063
Unmarked	8	2	10
Undetermined	3	0	3
Total	2,046	30	2,076

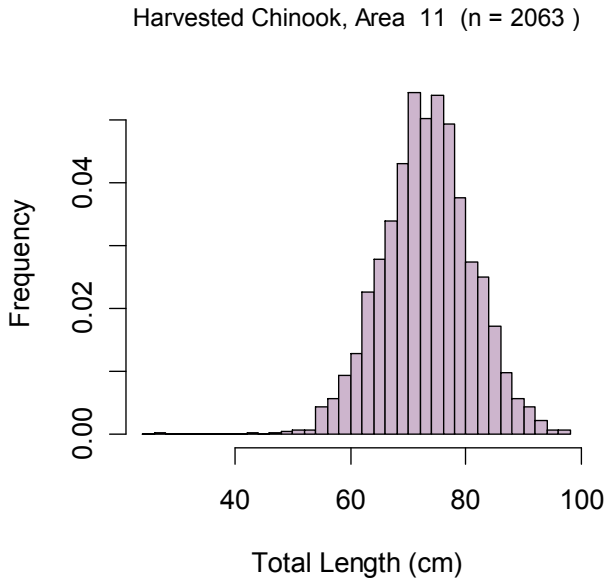

Figure 6. Length-frequency distributions of retained marked Chinook sampled at dockside during the Area 11, June 1-Sept. 30, 2008 mark-selective Chinook fishery.

Though scales were collected from all of the 2,063 marked Chinook sampled at dockside, only 1,956 (95%) of these could be successfully aged. From this, we found that the majority of the retained Chinook were age-3 (brood year 2005) individuals (86%); age-4 fish constituted almost all of the remaining 14% of samples, though a few age-1, -2, and -5 fish were also sampled. Further, 96% of all retained Chinook were subyearling outmigrants.

CWT Samples.—In total, 155 coded-wire tags were recovered from the Area 11 fishery (**Appendix G**). Fifty-eight percent of these recoveries came from a combination of South Puget Sound rearing facilities (**Table 6**). The majority of the remaining Area 11 CWT

recoveries (59/65) were from a relatively even mix of Hood Canal and Central/North Puget Sound release sites; the five remaining tags were from Canadian facilities. As for individual South Puget Sound hatcheries, recoveries associated with Chambers Creek releases (Garrison and Lakewood hatcheries) were most abundant (28% of fishery total), followed by Voight Creek (13% of total) and Nisqually (10% of total) hatcheries. For other regions, the only facility with represented at noteworthy level was Hoodsport Hatchery (12% of total). Finally, 43 of the 155 CWTs (28%) were associated with DIT releases.

Table 6. Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 11 June 1-Sept. 30, 2008 mark-selective Chinook fishery. The field "No. DITs" corresponds to the number of tags that belonged to double-index tag groups. Note, one orphan tag (Tag code: 633471) was also recovered.

Release Region[1]	Release Site	Rearing Location	CWTs	No. DITs
British Columbia-Fraser River	Chilliwack River	Chilliwack River Hatchery	3 (1.9%)	3
	Harrison River	Chehalis River Hatchery	1 (0.6%)	
British Columbia-Vancouver Island	Chemainus River	Chemainus River Hatchery	1 (0.6%)	
	Puntledge River	Puntledge River Hatchery	1 (0.6%)	
Hood Canal	Finch Creek	Hoodsport Hatchery	18 (11.6%)	
	Skokomish River	Ricks Pond	1 (0.6%)	
	John Creek	RFEG 6 Hood Canal	1 (0.6%)	
	Purdy Creek	George Adams Hatchery	6 (3.9%)	6
Puget Sound-Central	Big Soos Creek	Unreported (Soos Cr.)	6 (3.9%)	6
	Green River	Icy Creek Hatchery	4 (2.6%)	
	Grovers Creek	Grovers Creek Hatchery	6 (3.9%)	6
	Grovers Creek Hatchery	Grovers Creek Hatchery	3 (1.9%)	3
Puget Sound-North	Friday Creek	Samish Hatchery	2 (1.3%)	2
	N.F. Nooksack River	Kendall Creek Hatchery	1 (0.6%)	1
	Tulalip Creek	Bernie Gobin Hatchery	2 (1.3%)	
	Wallace River	Wallace River Hatchery	3 (1.9%)	
	Whitehorse Springs	Whitehorse Pond	6 (3.9%)	
Puget Sound-South	Chambers Creek	Chambers Cr. & Garrison Hatchery	7 (4.5%)	
		Garrison Hatchery	19 (12.3%)	
		Lakewood Hatchery	18 (11.6%)	
	Clear Creek	Nisqually Hatchery	16 (10.3%)	16
	Cowskull Acclimation Pond	Cowskull Acclimation Pond	1 (0.6%)	
	Deschutes River	Tumwater Falls Hatchery	1 (0.6%)	
	Deschutes River + Capitol Lake	Tum. Falls H., Percival Cove	2 (1.3%)	
	Kalama Creek	Kalama Creek Hatchery	3 (1.9%)	
	Minter Creek	Minter Hatchery	2 (1.3%)	
	Voight Creek	Voights Creek Hatchery	20 (12.9%)	
	White River	White River Hatchery	1 (0.6%)	
		Grand Total	155	43

[1]Unofficial release regions. Puget Sound regions were designated based on the WDFW marine catch area containing the river/stream network where juvenile releases originated (i.e., Areas 11 and 13 = South; Areas 9 and 10 = Central; and Areas 7, 8-1, and 8-2 = North).

Test Fishing Results

Fishing Time and Gear Types

Test fishers were scheduled to fish in Area 11 on every weekday (excluding holidays) between June 1 and September 30, 2008. In total, they spent 608.6 hours and 82 out of 85 possible days on the water pursuing Chinook salmon in the fishery (**Table 8**). Based on dockside interview results for anglers reporting successful Chinook salmon encounters (n = 3,082 responses to our fishing methods question), gear schedules were prescribed to help ensure that samplers fished using the same methods in approximately the same proportions as the private fleet. During their 82 days of fishing, test fishers trolled using downriggers 72% of the time, mooched (i.e., used the "weight-and-bait" method) 25% of the time, and jigged for the remainder (values are weekly means; **Table 7**). Their fleet counterparts pursued Chinook using a similar fishing-methods composition, with downrigger trolling, mooching, and jigging making up 72, 22, and 4% of the responses to our fishing methods interview question. Additionally, though test fishers did not use this method, 2% of respondents reported encountering Chinook by trolling with divers.

Table 7. Fishing methods employed by private recreational anglers (from dockside interviews, based on number of boat trips sampled, n = 3,082) and test fishers (based on hours fished, n = 544.3 h [lines in water only]) during the Area 11 summer 2008 mark-selective Chinook fishery.

Month	Stat. Week	DR		WB		Diver		Jig	
		Tst Boat	Fleet	Tst Boat	Fleet	Tst Boat	Fleet	Tst Boat	Fleet
June	23	84.8%	54.7%	15.2%	34.9%	0.0%	1.2%	0.0%	9.3%
	24	51.7%	26.5%	46.0%	67.7%	0.0%	1.5%	2.3%	4.4%
	25	56.0%	46.4%	44.0%	44.6%	0.0%	0.0%	0.0%	8.9%
	26	58.2%	61.3%	41.8%	33.3%	0.0%	0.0%	0.0%	5.3%
July	27	47.1%	44.9%	49.0%	42.0%	0.0%	1.5%	3.8%	11.6%
	28	85.3%	57.8%	5.9%	28.4%	0.0%	2.9%	8.8%	10.8%
	29	91.6%	64.1%	8.4%	27.7%	0.0%	4.1%	0.0%	6.2%
	30	90.2%	84.1%	9.8%	9.5%	0.0%	2.7%	0.0%	3.7%
	31	64.1%	84.7%	35.9%	12.5%	0.0%	1.9%	0.0%	0.9%
Aug.	32	95.2%	86.1%	4.8%	8.4%	0.0%	3.7%	0.0%	1.8%
	33	91.1%	88.9%	8.9%	7.9%	0.0%	1.5%	0.0%	1.7%
	34	24.3%	84.2%	50.3%	11.2%	0.0%	1.9%	25.3%	2.7%
	35	90.0%	87.6%	7.7%	8.5%	0.0%	1.6%	2.3%	2.3%
Sept.	36	81.5%	81.2%	5.7%	18.0%	0.0%	0.0%	12.8%	0.9%
	37	70.2%	86.0%	29.8%	10.6%	0.0%	1.1%	0.0%	2.2%
	38	76.5%	86.9%	20.4%	9.5%	0.0%	3.6%	3.1%	0.0%
	39	86.1%	84.7%	13.9%	9.2%	0.0%	5.1%	0.0%	1.0%
	40	48.5%	81.3%	51.5%	12.5%	0.0%	0.0%	0.0%	6.3%
Weekly Average		**71.8%**	**71.8%**	**24.9%**	**22.0%**	**0.0%**	**1.9%**	**3.2%**	**4.4%**

Encounters, Mark Rates, and Size/Mark-status Composition

As a result of their four months of fishing, test fishers encountered 112 total Chinook salmon in Area 11. Eighty of these fish were legal-sized and marked (LM), 16 were legal-sized and unmarked (LU), 14 were sublegal-sized and marked (SM), and the 2 remaining individuals were sublegal-sized and unmarked (SU) (**Table 8**). Thus, with 83% of all Chinook encountered being marked (84% for legal-sized fish only), the Area 11 mark rate was remarkably high. Additionally, the majority of test fishery encounters were of legal size (86%, marked and unmarked, combined). Over the season, test fisher "CPUE" (LM Chinook *encountered* per angler trip, 0.49) was nearly five times higher than that of the average private fleet angler, even though both groups displayed a similar temporal catch-rate trend over the course of the season (i.e., highest in July and August, lowest in June and September).

In terms of within-season patterns, the mark rate of legal-sized Chinook remained high (≥75% during all months) and varied little between June 1st and September 30th. The lowest test-fishery-based estimate of the overall mark rate was observed during August (75%), whereas values approached 90% during both June and September (**Table 8**, **Figure 7**). Thus, there was little evidence of a seasonal trend in mark rates throughout the Area 11 fishery. In contrast, the relative abundance of legal-sized fish (**Figure 7**) and the average size of fish sampled in the test fishery appeared to decrease continuously from July onwards, approaching 50% in September. Combining length and mark-rate trends, the legally harvestable proportion of encountered Chinook (i.e., marked and ≥22 in [56 cm]) averaged ~70% (range: 50-89%) and varied across months in a manner similar to the trend documented for the legal-sized (marked and unmarked, combined) encounters fraction (**Figure 7**; see also **Figure 9** for changes in mean length, brood year 2005 fish only).

To gauge the similarity between test fishery and fleet catch, we compared season-wide encounters composition estimated for the former group (**Table 8**) with that provided by anglers participating in our Voluntary Trip Report (VTR) program (**Table 9**). Sixty-one VTRs were returned by 19 different anglers participating in the Area 11 fishery, providing the size/mark-status details for 161 Chinook encounters. Based on these results, we found that the size/mark-status composition of encounters differed significantly between VTR and test fishery datasets ($\chi^2 = 58.1$, df = 3, $P < 0.001$); as overall (legal and sublegal, combined) mark rates were similar (83% in test fishery vs. 78% on VTRs; $\chi^2 = 1.0$, df = 1, $P = 0.313$), this result was due mainly to test-fishery encounters being composed of a higher proportion of legal-sized fish (marked and unmarked, combined) than was reported by VTR-program participants (85% vs. 40%, $\chi^2 = 55.6$, df = 1, $P < 0.001$). Given that the Area 11 VTR dataset was heavily influenced by a single respondent (e.g., 40% of all sublegal encounters reported on VTRs were due to one person), these results underscore the importance of obtaining a broad and representative sample of anglers when using this sampling tool for estimating encounters composition.

Finally, given the small sample sizes obtained by test fishers during June ($n = 18$) and September ($n = 10$) and the similarities observed for encounters composition in adjacent months (i.e., June vs. July and August vs. September, $P > 0.10$ for all χ^2 homogeneity tests),

we pooled test fishery data into two two-month strata (June-July and Aug.-Sept.) for subsequent impact estimation (**Table 8**).

Table 8. Chinook encounters by size/mark-status group for the summer 2008 Area 11 test fishery. Values in parentheses reflect the variance about proportional season-total contributions of a particular size/mark-status group to total Chinook encounters. Note, whereas the time specified in the Table 6 caption corresponds to time with lines in the water, 'Hours' reported here reflect all on-the-water time (i.e., inclusive of time spent running).

Month	Stat Week	Fishing Effort		Legal		Sublegal		Total
		Days	Hours	AD	UM	AD	UM	
June	**23**	5	38.7	5	1	0	1	7
	24	5	39.6	6	0	0	0	6
	25	5	41.6	2	0	0	0	2
	26	5	39.8	3	0	0	0	3
July	**27**	4	32.5	6	1	0	0	7
	28	5	39.9	7	2	2	0	11
	29	5	39.1	9	1	1	0	11
	30	5	40.8	10	2	0	0	12
	31	5	41.3	9	1	1	0	11
August	**32**	5	33.5	6	4	0	0	10
	33	5	35.0	9	3	2	0	14
	34	4	28.0	2	1	1	0	4
	35	5	34.0	1	0	3	0	4
September	**36**	4	26.3	0	0	2	1	3
	37	5	35.4	3	0	0	0	3
	38	4	27.6	0	0	0	0	0
	39	5	29.5	0	0	2	0	2
	40	1	6.0	2	0	0	0	2
Season Total		**82**	**608.6**	**80**	**16**	**14**	**2**	**112**
Size/mark-status composition:				0.714 (0.002)	0.143 (0.001)	0.125 (0.001)	0.018 (0.000)	
Legal size mark rate:				0.83 (0.001)				
Overall mark rate:				0.84 (0.001)				

[1] June and July test-fishery encounters were combined into a single stratum for subsequent impact analyses.
[2] August and July test-fishery encounters were combined into a single stratum for subsequent impact analyses.

Chinook Size and Age

During the period that Area 11 was open under mark-selective Chinook harvest regulations, marked and unmarked Chinook salmon sampled by test fishers were large on average and exhibited a skewed, unimodal size distributions (**Figure 8**). Overall, Chinook (marked and unmarked, combined) averaged 69.8 cm (SD = 14.7 cm) and ranged from 21.1-93.0 cm in total length (TL), with marked and unmarked fish being on average similar in size ($t = 0.8$, df = 21, $P = 0.42$). It is worth noting, however, that the mean total length of encountered Chinook was greater during the first compared to the second half of the season (**Figure 9**).

Of the 112 Chinook encountered and sampled by test fishers during the four-month fishery, most (108 total: 93 AD and 15 UM) had scales that were successfully read. As the length-frequency data suggest (discussed above), marked and unmarked Chinook salmon encountered by test fishers had similar age structures, with age-3 (brood year 2005) individuals making up the majority (67-78%) for both datasets (**Appendix F**). Additionally, very few (2%) test fishery scale samples were yearling outmigrants.

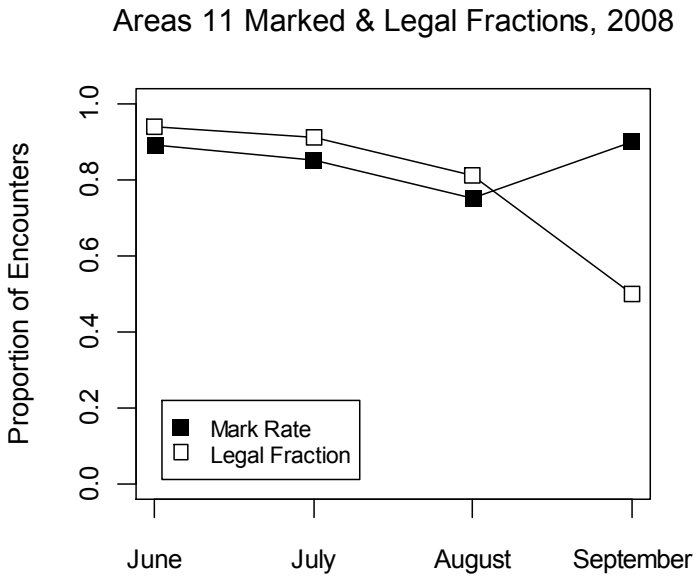

Figure 7. Trends in monthly Chinook mark rates (all size classes) and legal size fractions (marked and unmarked combined) encountered by test fishers during the Area 11 summer 2008 mark-selective Chinook fishery.

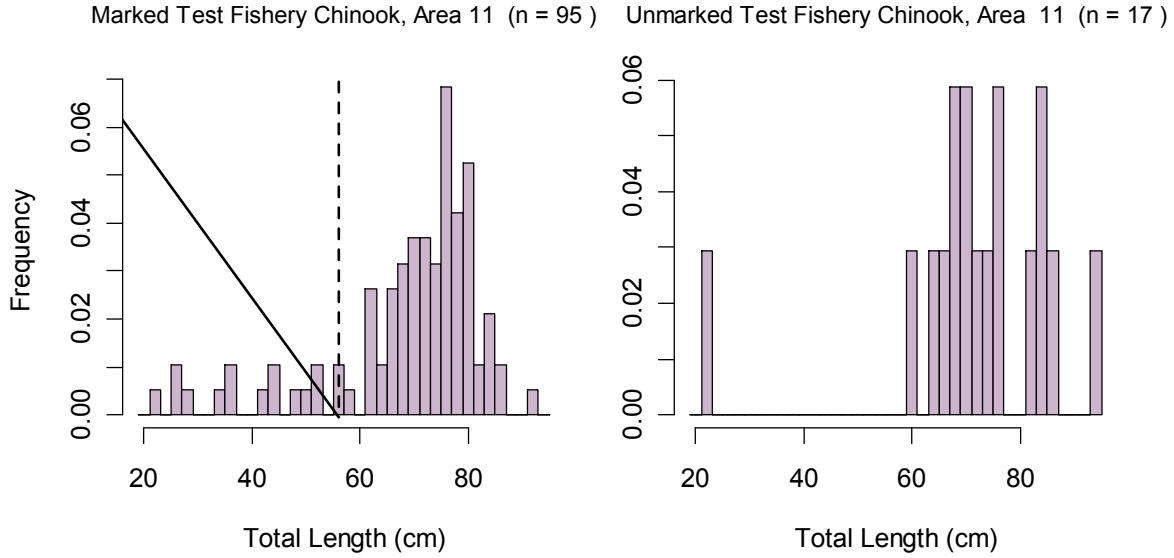

Figure 8. Length-frequency distributions of marked (*left panel*) and unmarked (*right panel*) Chinook encountered by test fishers during the Area 11 summer 2008 mark-selective Chinook fishery. The dashed vertical line in the length-frequency histograms for marked Chinook corresponds to the legal size limit (22 in or 56 cm).

Table 9. Total Chinook encountered (retained and released) by private anglers logging their trips on voluntary trip reports (VTRs), with estimates of legal and overall mark rates, Area 11, June 1-Sept. 30, 2008. Note "NA" denotes that the mark rate was not estimable for a particular time period (e.g., no fish were encountered).

Month	Stat Wk	VTRs (*n*)	Angler Trips	Chinook Encounters						Legal Mark Rate	Overall Mark Rate
				LM Kept	LM Rel'd	LU	SM	SU	TOTAL		
June	22	1	3	0	0	1	0	0	1	0.0%	0.0%
	23	1	1	2	0	0	0	0	2	100.0%	100.0%
	24	1	2	2	0	0	0	0	2	100.0%	100.0%
	25	1	1	0	0	0	1	0	1	NA	100.0%
	26	2	4	3	0	2	2	0	7	60.0%	71.4%
July	27	2	4	2	0	1	1	0	4	66.7%	75.0%
	28	3	6	1	0	0	2	1	4	100.0%	75.0%
	29	3	5	1	0	0	3	1	5	100.0%	80.0%
	30	6	13	4	0	1	13	0	18	80.0%	94.4%
	31	14	34	13	1	6	23	3	46	70.0%	80.4%
August	32	2	3	2	0	0	3	0	5	100.0%	100.0%
	33	11	20	15	0	0	8	3	26	100.0%	88.5%
	34	7	12	4	0	0	12	6	22	100.0%	72.7%
	35	4	8	2	0	0	2	5	9	100.0%	44.4%
September	36	1	2	1	0	0	0	0	1	100.0%	100.0%
	37	1	2	0	0	0	3	4	7	NA	42.9%
	38	0	0	0	0	0	0	0	0	NA	NA
	39	0	0	0	0	0	0	0	0	NA	NA
	40	1	2	0	0	0	0	1	1	NA	0.0%
Season Total		**61**	**122**	**52**	**1**	**11**	**73**	**24**	**161**	**82.8%**	**78.3%**

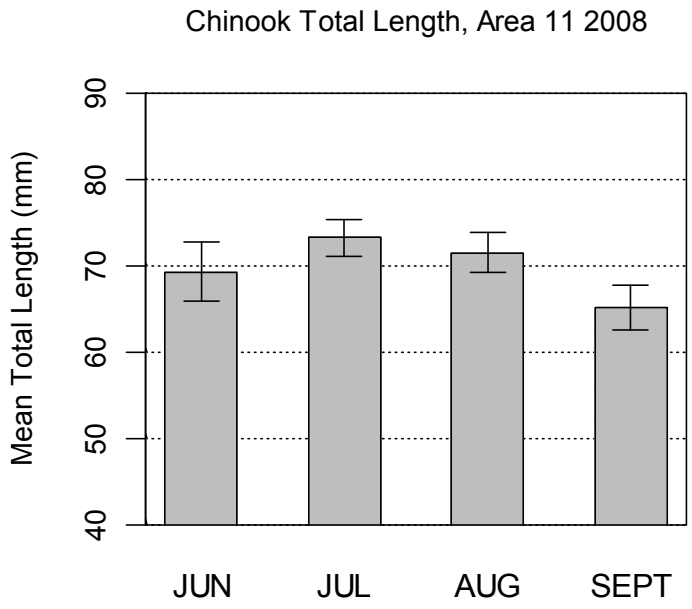

Figure 9. Monthly mean total length (+/- 95% CIs) of Chinook (marked and unmarked combined) sampled by test fishers during the Area 11 summer 2008 mark-selective Chinook fishery; given that brood year (BY) 2004 and 2006 fish were not sampled during every month, only BY 2005 lengths are displayed.

Other Fish Species Encountered

Though they fished exclusively for Chinook, test fishers encountered 227 individuals belonging to at least nine other fish species (i.e., encounters were also logged for two genus- or family-level categories) during their Area 11, summer 2008 sampling efforts (**Table 10**). Across all species encountered, spiny dogfish (n = 119), coho salmon (n = 41), and Pacific sandab (n = 35), ranked greatest to least, dominated non-Chinook test fishery encounters.

Table 10. Test fishery catches of species other than Chinook salmon during the Area 11 June 1-Sept. 30, 2008 mark-selective Chinook fishery.

Common Name (*Scientific Name*)	Area 11 Total
coho salmon (*Oncorhynchus kisutch*)	41
unidentified flatfish (Family: Bothidae, Pleuronectidae)	8
Pacific sandab (*Citharichthys sordidus*)	35
unidentified greenlings (Family: Hexagrammidae)	1
lingcod (*Ophiodon elongatus*)	4
kelp greenling (*Hexagrammos decagrammus*)	1
unidentified rockfish (*Sebastes* sp.)	2
Brown rockfish (*Sebastes auriculatus*)	10
copper rockfish (*Sebastes caurinus*)	3
spiny dogfish (*Squalus acanthias*)	119
brown Irish lord (*Hemelepidotus spinesus*)	1
red Irish lord (*Hemelepidotus hemelepidotus*)	2
Grand total (n = 9+ species)	**227**

Overall Fishery Impacts

Total Encounters and Mortalities

We derived size/mark-status group-specific estimates of Chinook encounters from a combination of dockside sampling results (i.e., size/mark-status group-specific harvest estimates derived from data in **Tables 4** and **5**) and test fishery size/mark-status composition data (**Table 8**; see **Appendix A** for computational details). In total, we estimated that anglers fishing in Area 11 encountered a total of 8,365 LM, 2,017 LU, 2,069 SM, and 252 SU Chinook (12,703 total) between June 1 and Sept. 30, 2008 (**Tables 11** and **12**). Given estimates of harvest and the assumed selective fishing mortality (*sfm*) mortality rates of 0.15 for legal-sized and 0.20 for sublegal-sized Chinook, these encounters translated into 8,306 total mortalities (**Tables 11** and **13**). Eighty-eight percent of this estimate of total mortality was due to the direct harvest of legal-marked Chinook. Unmarked Chinook mortality totaled 372 fish (318 legal, 54 sublegal), which corresponds to less than one unmarked mortality per 20 legal-marked Chinook kept. In addition, given the 112 (80 LM, 16 LU, 14 SM, 2 SU)

Chinook caught and released by test fishers, an estimated 18 (15 marked, 3 unmarked) Chinook may have died due to our sampling activities.

FRAM versus Creel Comparison

Observed Area 11 impacts (i.e., field estimates) were comparable (i.e., within ~20% of predictions) to those predicted by pre-season Fishery Regulation Assessment Model (FRAM, model run 2108) runs for legal-sized but not sublegal-sized Chinook. For example, FRAM predicted that a total of 10,431 legal-sized Chinook (7,446 marked and 2,985 unmarked) would be encountered by anglers participating in the Area 11 fishery, whereas field surveys indicate that 10,382 legal-sized Chinook encounters (8,365 marked, 2,017 unmarked) actually occurred (**Figure 10**, **Table 12**). Most notably, FRAM predictions of total and legal-marked landings differed by less than 5% (**Table 12**). In contrast, differences between model predictions and field estimates of fishery impacts (encounters and mortalities) were quite different for all categories of sublegal-sized Chinook salmon, with FRAM values being substantially (500+%) greater than field estimates in all cases (**Figure 10**, **Tables 12** and **13**). As an extreme example, we estimated sublegal-unmarked Chinook encounters at 252 based on angler interviews whereas the FRAM prediction of sublegal-unmarked Chinook encounters was ~1,800% higher (i.e., 4,995). In sum, the overall impact (legal and sublegal encounters or mortalities combined) of the Area 11 summer 2008 MSF was far less than was anticipated.

Estimated CWT-DIT Impacts

Of the 155 coded-wire tags recovered during the Area 11 mark-selective Chinook fishery from June 1 through September 30 2008, 43 belonged to double-index tag (DIT) release groups (**Table 14**). Based on the release details associated with these tags and their unmarked sister groups, we obtained an estimate of the unmarked-to-marked ratio (λ) at juvenile release for each applicable hatchery of origin and brood year, and we used this value to estimate total unmarked DIT encounters for the entirety of the Area 11 fishery. In total, we estimated that 165 unmarked-DIT Chinook were caught and released during the fishery. Given an *sfm* rate of 0.10 for the estimated unmarked DIT encounters, and the addition of 3.7 estimated unmarked DIT Chinook that anglers retained (assumed 100% mortality), we estimate that as many as 20 of these unmarked-DIT Chinook may have died as a result of the Area 11 mark-selective fishery.

Table 11. Summary of season-wide fishery impact estimates for the June 1-Sept. 30, 2008, Area 11 mark-selective Chinook fishery. Values may not add up perfectly due to rounding error.

	Total Encounters (E):	**12,703**								
	V(E):	**4,870,004**								
Size/mark group	**Encounters**	**No. Retained**	**No. Rel'd**	**Rel. Mort. Rate**	**Rel. Mort.**	**Total Mortality**	**Var**	**SE**	**95% CI**	**CV (%)**
Legal marked	8,365	7,277	1,087	0.15	163	7,440	788,962	888	5699 - 9181	12
Legal unmarked	2,017	18	1,999	0.15	300	318	8,890	94	133 - 503	30
Sublegal marked	2,069	100	1,969	0.20	394	494	19,726	140	219 - 769	28
Sublegal unmarked	252	5	248	0.20	50	54	1,484	39	0-151	71
All groups combined	**12,703**	**7,400**	**5,304**		**906**	**8,306**	**819,061**	**905**	**6532 - 10080**	**11**

Table 12. Comparison of modeled (i.e., using FRAM, model run 2108) and estimated total Chinook encounters for the Area 11, June 1-Sept. 30, 2008 mark-selective Chinook fishery.

Data Source	**Group**	**Total Encounters**	**Legal**	**Sublegal**	**Landed Only**
FRAM Encounters	Unmark.	7,980	2,985	4,995	179
	Mark.	20,986	7,446	13,540	6,999
	Total	28,966	10,431	18,535	7,178
	% Mark.	73	71	73	98
Estimated (Creel) Encounters	Unmark.	2,270	2,017	252	23
	Mark.	10,434	8,365	2,069	7,377
	Total	12,703	10,382	2,321	7,400
	% Mark.	82	81	89	100

Table 13. Comparison of modeled (i.e., using FRAM, model run 2108) and estimated total Chinook mortalities for the Area 11, June 1-Sept. 30, 2008, mark-selective Chinook fishery.

	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
Mortality Category	**Unmark.**	**Mark.**	**Total**	**Unmark.**	**Mark.**	**Total**
Total (Landed + Released)	1,608	10,125	11,733	372	7,934	8,306
Released Legal	430	418	848	300	163	463
Released Sublegal	999	2,708	3,707	50	394	443
Landed Only	179	6,999	7,178	23	7,377	7,400

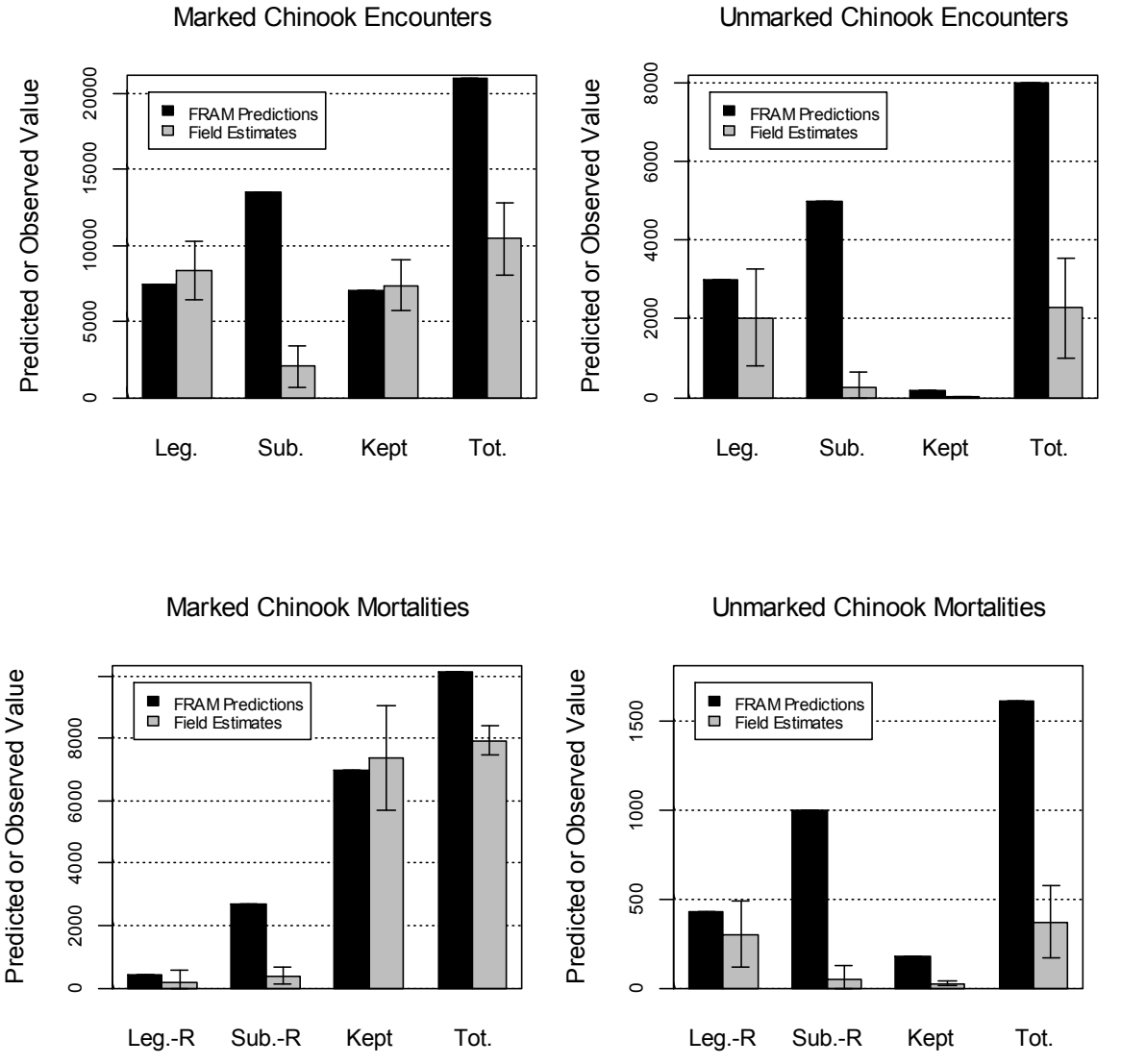

Figure 10. Comparison of modeled (i.e., using FRAM, model run 2108) and estimated total marked (*left column*) and unmarked (*right column*) Chinook encounters (*upper row*) and mortalities (*lower row*) the Area 11, June 1-Sept. 30, 2008, mark-selective Chinook fishery. Error bars represent approximate 95% confidence intervals for field estimates.

Table 14. Summary of double-index tagged (DIT) Chinook kept by anglers, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 11 June 1-Sept. 30, 2008 mark-selective Chinook fishery.

Hatchery	Brood Year	DITs Obs'd	AD DIT Harvest		UM DIT Enc.	UM DIT Mortality	
			Est.	var(Est.)		Est.	var(Est.)
George Adams Hatchery	2005	6	19.9	47.49	19.90	1.99	0.48
Grovers Creek Hatchery	2004	3	11.4	31.95	12.88	1.29	0.41
	2005	6	21.8	58.33	28.48	2.85	0.99
H-Chilliwack R. Hatchery	2005	3	9.6	21.61	9.72	0.97	0.22
Kendall Creek Hatchery	2005	1	2.8	4.86	2.77	0.28	0.05
Nisqually Hatchery	2004	5	19.2	54.62	19.43	1.94	0.56
	2005	11	37.6	103.51	42.26	7.94 [a/]	11.42
Samish River Hatchery	2005	2	6.6	15.45	5.98	0.60	0.13
Soos Creek Hatchery	2005	6	22.8	63.91	23.37	2.34	0.67
TOTAL		**43**	**151.6**	**401.73**	**164.79**	**20.20**	**14.92**

[a/] Of the 7.9 estimated unmarked double-index tagged (DIT) Chinook mortalities associated with Nisqually Hatchery brood year 2005, 3.7 were estimated as unmarked DIT Chinook that anglers retained in the Area 11 fishery. We estimated the 3.7 retained unmarked DIT fish based on the recovery of one unmarked DIT Chinook (tag code 210681) during dockside sampling, which expanded to 3.7 based on the applicable sample rate in the Area 11 fishery. We assumed a 100% mortality rate for the retained unmarked DIT fish. We then added the estimated 3.7 retained unmarked DIT Chinook mortalities to the 4.2 unmarked DIT Chinook that we estimate may have died as a result of hook-and-release impacts in the Area 11 selective Chinook fishery.

AREA 13: RESULTS & DISCUSSION

Summary of Sampling Efforts

Between May 1st and September 30th, 2008, samplers staffed twenty-two different Area 13 access sites for Baseline Sampling (**Table 15**). The majority of this effort (60% of all site days), similar to 2007 sampling, was spent at Narrows Marina (55 days, 17% of total), Zittel's Marina (51 days, 15.7% of total), Luhr Beach Ramp (47 days 14.5% of total), and Solo Point (Tatsolo Pt – Ft. Lewis; 41 days 12.7% of total).

Table 15. List of sites sampled, with the number of sampling events (site-days), during the Area 13 May 1-Sept. 30, 2008 mark-selective Chinook fishery.

Area 13 Dockside Sample Sites	Sample days per month					Sample Days	% of total
	May	June	July	Aug.	Sept.		
Allyn Public Ramp	0	5	4	2	0	11	**3.4%**
Boston Harbor Ramp/Marina	0	1	9	16	13	39	**12.0%**
Concrete Dock	0	0	2	0	1	3	**0.9%**
Fox Island Public Ramp	0	0	1	0	3	4	**1.2%**
Grapeview Public Ramp	0	0	0	2	0	2	**0.6%**
Hartstene Is. Ramp	0	0	4	5	14	23	**7.1%**
Home Public Ramp	0	0	0	1	1	2	**0.6%**
Luhr Beach Dock	0	0	1	1	1	3	**0.9%**
Luhr Beach Ramp	3	8	16	9	11	47	**14.5%**
Narrows Marina (Boathouse, Ramp, Rental)	10	8	9	8	20	55	**17.0%**
Narrows Properties Park	0	1	4	0	1	6	**1.9%**
Point Defiance Boathouse	1	0	0	0	0	1	**0.3%**
Point Defiance Public Ramp	2	1	0	0	0	3	**0.9%**
Priest Point Park	0	0	0	0	2	2	**0.6%**
Solo Point (Tatsolo Pt-Ft Lewis) Ramp	2	2	15	14	8	41	**12.7%**
Solo Point Shore	0	0	1	1	0	2	**0.6%**
Steilacoom Public Ramp	1	0	5	0	0	6	**1.9%**
Vaughn Public Ramp	1	8	3	0	0	12	**3.7%**
Wauna Ramp	0	0	0	2	3	5	**1.5%**
Wauna Shore	0	0	0	2	0	2	**0.6%**
Wollochet Bay Public Ramp	0	1	2	0	1	4	**1.2%**
Zittel's Marina	9	5	16	7	14	51	**15.7%**
TOTAL	**29**	**40**	**92**	**70**	**93**	**324**	

Fishery Characteristics

Observations of Fishing Effort and Chinook Catch

From May 1 to September 30, 2008, samplers interviewed 3,097 anglers participating in the Area 13 mark-selective Chinook fishery. Based on a summation of sample observations made across sites during the fishery (i.e., taken as an index of fishery-total effort patterns), angling effort was initially low and then increased to a peak, which occurred during the latter part of July and into early August (**Table 16**, **Figure 11**). Effort observations then resumed low levels during September. On average, 50 anglers were sampled each week in May and June; during July and August, an average of 209 anglers were sampled each week. On a season-total basis, we sampled 135 anglers per week at staffed Area 13 access sites. This pattern contrasts sharply with what was observed during the 2007 Area 13 MSF, when two distinct effort peaks were observed (June and August; WDFW 2007b). Overall, however, the total number of angler trips was similar for the two seasons.

At 0.06 Chinook landed per angler trip, Chinook salmon catch rates were remarkably low during the majority of the summer 2008 Area 13 MSF. CPUE was variable on a week-to-week basis and appeared to peak on two separate occasions, once at 0.14 in late May and then again at 0.15 in early August (**Figure 12**). September catch rates were virtually zero, with less than one in 100 anglers successfully landing Chinook (CPUE < 0.01). 2008 catch rates were considerably lower than those observed during the 2007 Area 13 summer mark-selective season (i.e., 0.06 in 2008 vs. 0.14 in 2007; WDFW 2007b).

Across all interviews, samplers observed Area 13 anglers land a total of 180 Chinook (179 marked and 1 unmarked), with virtually all (>99%) of these fish being marked. The nearly 3,100 interviewed anglers also reported releasing a total of 392 Chinook (109 marked, 54 unmarked, and 229 with unknown mark status; **Table 16**). On a weekly basis, samplers observed as few as zero to as many as 48 retained Chinook, and as few as zero to as many as 70 released Chinook over the course of the five-month fishery. Nearly half (47%) of all encounters sampled (i.e., observed harvest) or enumerated (i.e., reported releases) during the season occurred between statistical weeks 32 and 34 (**Figure 13**).

In total, interviewed anglers encountered 586 known (i.e., identified as such during interviews) Chinook salmon during the Area 13 summer selective fishery. Finally, in addition to Chinook salmon, anglers harvested 84 (79 marked and 5 unmarked) and released 203 (68 marked, 18 unmarked, and 117 unknown mark status) coho salmon (*O. kisutch*). Anglers also released 93 cutthroat trout (*O. clarkii*) during the five-month season (**Table 16**).

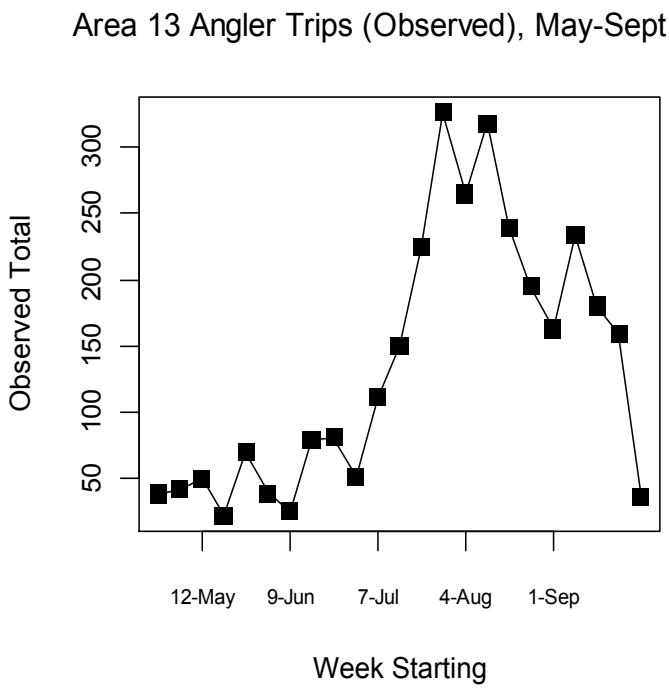

Figure 11. Temporal patterns in fishing effort during the Area 13, May 1-Sept. 30, 2008 mark-selective Chinook fishery. Note: displayed values are sample observations (i.e., summed across sampled sites) and not fishery-total estimates.

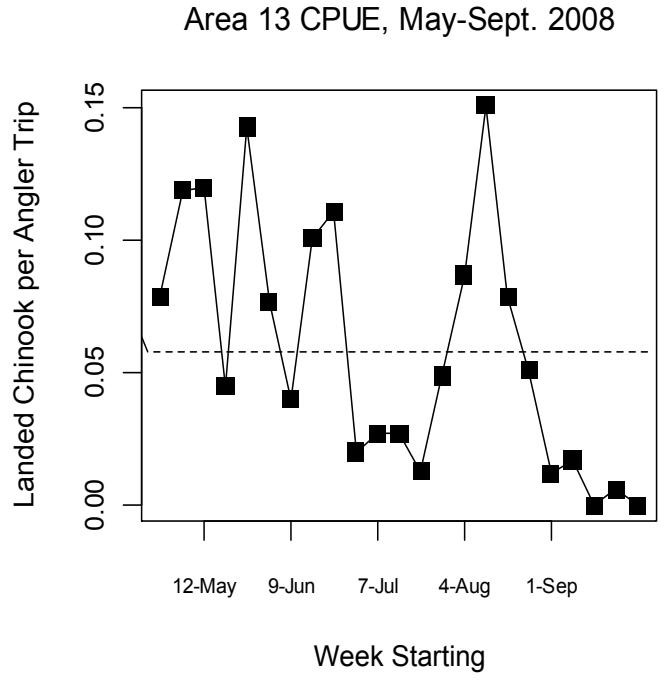

Figure 12. Temporal patterns in CPUE (landed Chinook per angler trip, weekly estimates) during the Area 13 May 1-Sept. 30, 2008 mark-selective Chinook fishery. The horizontal dashed line corresponds to the season-wide CPUE.

Table 16. Observations of fishing effort, salmon harvest, and reported salmon releases, by week, for the Area 13, May 1-Sept. 30, 2008 mark-selective Chinook fishery. Note: displayed values are sample observations (i.e., summed across sampled sites) and not fishery-total estimates.

		Effort		Retained Chin.		Other Sp. Kept.[1]		Rel'd Chin.			Other Sp. Released[1]				
Month	Stat Week	Boats	Anglers	AD	UM	AD Coho	UM Coho	AD	UM	UNK	AD Coho	UM Coho	UNK Coho	Cutt.	UnID'd Salmonid
May	18	20	38	3	0	0	0	1	0	0	0	0	0	0	0
	19	20	42	5	0	0	0	2	0	1	0	0	0	0	0
	20	24	50	6	0	0	0	0	0	2	0	0	0	0	0
	21	11	22	1	0	0	0	0	1	0	0	0	0	0	0
	22	35	70	10	0	0	0	1	4	0	0	0	0	2	0
June	23	18	39	3	0	0	0	0	2	1	0	0	0	0	0
	24	13	25	1	0	0	0	0	0	1	0	0	0	0	0
	25	36	79	8	0	0	0	1	2	0	0	0	0	0	0
	26	42	81	9	0	0	0	0	2	2	0	0	0	1	0
July	27	24	51	1	0	0	0	0	0	3	0	0	0	0	0
	28	53	111	2	1	3	1	0	0	3	1	2	2	6	2
	29	68	150	4	0	2	1	0	0	11	0	0	10	3	0
	30	118	224	3	0	1	0	8	3	14	2	1	12	4	15
	31	184	326	16	0	2	0	8	10	11	5	0	13	14	3
Aug.	32	135	265	23	0	2	0	7	0	37	15	0	7	7	2
	33	162	318	48	0	2	1	12	7	44	4	0	24	0	2
	34	121	239	19	0	1	0	43	8	19	6	0	9	23	1
	35	97	195	10	0	0	0	6	11	23	0	3	6	18	15
Sept.	36	87	163	2	0	2	0	0	1	15	8	0	4	1	18
	37	118	234	4	0	3	1	7	1	29	1	2	9	2	12
	38	93	180	0	0	45	0	10	1	8	26	10	17	10	14
	39	82	159	1	0	11	1	3	1	5	0	0	3	0	8
	40	18	36	0	0	5	0	0	0	0	0	0	1	2	9
Grand Total:		1,579	3,097	179	1	79	5	109	54	229	68	18	117	93	101

[1] In addition, 4 cutthroat trout were retained during statistical week 24 and 1 steelhead was released during statistical week 30.

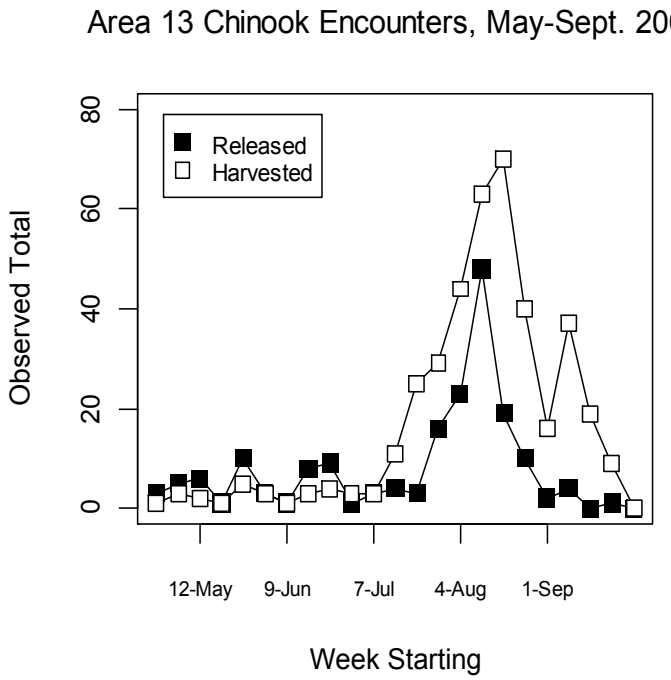

Figure 13. Temporal patterns in weekly observations of harvested Chinook salmon harvest and reported Chinook salmon releases during the Area 13, summer 2008, mark-selective Chinook fishery. Note: displayed values are sample observations (i.e., summed across sampled sites) and not fishery-total estimates.

Characteristics of Harvested Chinook

<u>*Length and Age*</u>.— During the Area 13 Summer selective fishery a total of 180 Chinook were sampled at dockside, with 170 having usable length information (**Table 17**). All of these fish were measured and examined for the presence of a CWT. Marked Chinook harvested from Area 13 averaged 74.4 cm TL (range: 53.8-99.1, SD = 7.8; **Figure 14**). Further, legally harvestable (<u>≥</u> 22 in [56 cm] *and* marked) Chinook comprised over 99% of the 170 fish measured at dockside.

Of the 180 Chinook sampled at dockside, 164 (91%) were successfully aged (**Appendix F**). Based on these samples, we found that retained Chinook were predominantly three-years old (137/164, 85%), belonging to the 2005 brood. Age-4 fish constituted almost all (24/25%)of the sample remainder, with one age-5 fish also being observed (1%). For all Chinook that were aged, 94% were subyearling outmigrants.

Table 17. Summary of length samples collected during dockside angler interviews from retained Chinook salmon, Areas 13, May 1-Sept. 30, 2008.

	Number Sampled		
Mark Type	**Legal-size**	**Sublegal-size**	**Total**
Marked	169	1	170
Unmarked	0	0	0
Undetermined	0	0	0
Total	169	1	170

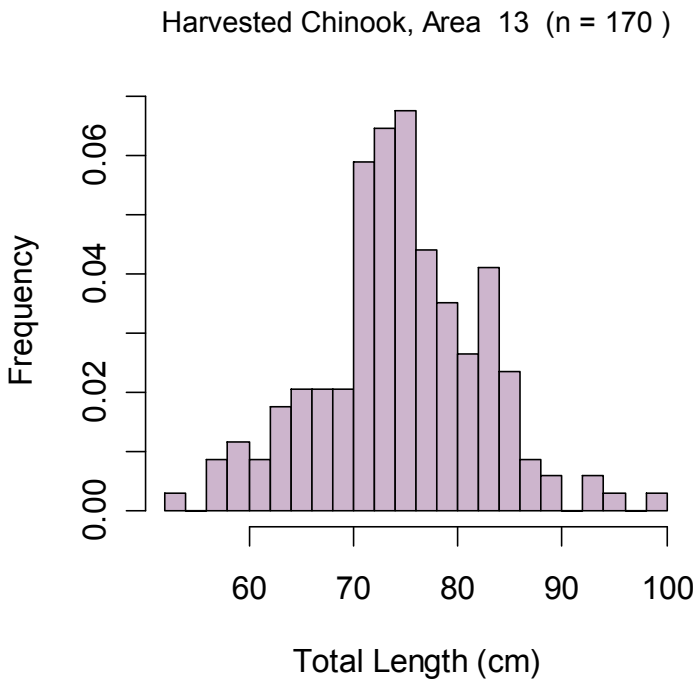

Figure 14. Length-frequency distributions of retained marked Chinook sampled at dockside during the Area 13, May 1-Sept. 30, 2008, mark-selective Chinook fishery.

CWT Samples.— In total, eight coded-wire tags were recovered from the Area 13 summer recreational mark-selective fishery. Five of the eight recoveries were from the South Puget Sound region whereas the remaining 3 were from North Puget Sound facilities (**Table 18**). As for individual hatcheries, tag recoveries were spread amongst 7 different facilities of origin, with 2 originating from the Whitehorse Springs Hatchery in North Puget Sound. Of the eight CWT recoveries recovered in from Area 13, only one was associated with a double-index tag group.

Table 18. Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 13 May 1-Sept. 30, 2008 mark-selective Chinook fishery. The field "No. DITs" corresponds to the number of tags that belonged to double-index tag groups.

Release Region	Release Site	Rearing Location	CWTs Recovered	No. DITs
Puget Sound-North	Cascade River	Marblemount Hatchery	1 (12.5%)	
	Whitehorse Springs	Whitehorse Pond	2 (25.0%)	
Puget Sound-South	Chambers Creek	Garrison Hatchery	1 (12.5%)	
	Clear Creek	Nisqually Hatchery	1 (12.5%)	1
	Deschutes River	Tumwater Falls Hatchery	1 (12.5%)	
	Kalama Creek	Kalama Creek Hatchery	1 (12.5%)	
	Minter Creek	Minter Hatchery	1 (12.5%)	
		Grand Total	8	1

Voluntary Trip Reports (VTRs)

In total, 20 VTRs were returned by private anglers fishing in Area 13 between May 1 and September 30, 2008. These VTRs provided data on a total of 45 angler trips and 42 separate Chinook encounters. Based these data, we estimated the overall Area 13 mark rate at 89% (legal and sublegal combined), a value which differs sharply from that derived from dockside observations of observed catch and reported releases (67% mark rate, based on data summarized in **Table 19**). It should be noted, however, that Area 13 VTR returns were heavily weighted to towards the early months of the fishery; 15 (75%) of the 20 returned VTRs, and 34 (75%) of the 42 VTR-based encounters, were for trips occurring during May and June. Further, it is also worth noting that the Area 13 VTR dataset was modest and heavily influenced by one respondent (i.e., among $n = 6$ anglers submitting data on 20 separate trips, 71% of all Chinook encounters were due to a single respondent). Despite these shortcomings, available VTR data (and angler interview results) suggest that mark rates were relatively high during months where "sampling" coverage occurred.

Table 19. Total Chinook encountered (retained and released) by private anglers logging their trips on voluntary trip reports (VTRs), with estimates of legal and overall mark rates, Area 13, summer 2008. Note "NA" denotes that the mark rate was not estimable for a particular time period (e.g., no fish were encountered).

Month	Stat Wk	VTRs (*n*)	Angler Trips	Chinook Encounters						Legal Mark Rate	Overall Mark Rate
				LM Kept	LM Rel'd	LU	SM	SU	TOTAL		
May	18	0	0	0	0	0	0	0	0	NA	NA
	19	0	0	0	0	0	0	0	0	NA	NA
	20	3	8	6	0	1	0	0	7	85.7%	85.7%
	21	3	7	6	0	1	0	1	8	85.7%	75.0%
	22	5	11	10	0	1	1	1	13	90.9%	84.6%
June	23	2	4	3	0	0	1	0	4	100.0%	100.0%
	24	2	4	3	0	0	0	0	3	100.0%	100.0%
	25	0	0	0	0	0	0	0	0	NA	NA
	26	0	0	0	0	0	0	0	0	NA	NA
July	27	1	3	1	0	0	0	0	1	100.0%	100.0%
	28	1	2	1	0	0	0	0	1	100.0%	100.0%
	29	0	0	0	0	0	0	0	0	NA	NA
	30	0	0	0	0	0	0	0	0	NA	NA
	31	1	2	1	0	0	0	0	1	100.0%	100.0%
Aug.	32	0	0	0	0	0	0	0	0	NA	NA
	33	0	0	0	0	0	0	0	0	NA	NA
	34	0	0	0	0	0	0	0	0	NA	NA
	35	1	2	0	0	1	1	0	2	0.0%	50.0%
Sept.	36	0	0	0	0	0	0	0	0	NA	NA
	37	0	0	0	0	0	0	0	0	NA	NA
	38	0	0	0	0	0	0	0	0	NA	NA
	39	0	0	0	0	0	0	0	0	NA	NA
	40	1	2	0	0	0	2	0	2	NA	100.0%
Season Total		**20**	**45**	**31**	**0**	**4**	**5**	**2**	**42**	**88.6%**	**85.7%**

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This review of the summer 2008 Areas 11 and 13 mark-selective Chinook fisheries is a result of the dedicated efforts of several individuals. Dan O'Brien (South Sound Sampling Supervisor) and his sampling crew collected creel, test-fishery, and on-the-water survey data throughout the season in both Areas 11 and 13. Jim Ames, Tim Flint, Bryan Blazer, and John Rohr conducted test fishing, as well as assisted with on-the-water boat surveys in Area 11. Mike Elam, Ellie Heikkila, Tom Matthews, Justin Terry, Scott Walker, and Gerald Weidandt also provided extensive Area 11 boat-survey support.

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APPENDICES

Appendix A. Mark-selective fishery impact estimation details.

Below are definitions and equations for all quantities used in estimating mark-selective fishery impacts from the combination of creel survey information, test fishery results, and (where applicable) charter and/or derby accounts. The estimation sequence builds from monthly[9] estimators of encounters-by-class (i.e., the four size [legal, sublegal] × mark-status [marked, unmarked] groups) to season-wide impact estimates. Where appropriate, the encounters (kept and released) for charter, derby, and/or other fishery components assessed via a complete census (i.e., totals without variance) are simply added to relevant total private-fleet estimates.

A. Total and Class-specific Encounters Estimation

The first step towards quantifying mark-selective fishery impacts by size/mark-status class is to estimate total Chinook encounters ($\hat{E}_i$, includes retained + released Chinook; See *Monthly Encounters* below) for each month of the fishery. Secondarily, encounters are apportioned to the appropriate size/mark-status group using encounters-composition data collected in the test fishery (See *Test-fishery Encounter Composition* on following page).

Monthly Encounters

$\hat{E}_i$ = Total Chinook encounters for month *i*, which is estimated by combining creel estimates of legal-marked Chinook harvest ($\hat{K}_{LM\,i}$, defined on subsequent page) with a test fishery-based estimate of the proportion of the fishable Chinook population that is of legal size and marked ($\hat{p}_{LM\,i}$,defined on subsequent page). Given the potential for negative bias in $\hat{E}_i$ if anglers release any of the legal-marked Chinook that they encounter, the $\hat{E}_i$ estimator also includes a "correction" to account for this phenomenon (i.e., 1-$p_{\text{LM-R}}$, where $p_{\text{LM-R}}$ is the estimated legal-marked Chinook release rate)[10]. $\hat{E}_i$ and its variance are estimated as:

$$(1) \qquad \hat{E}_i = \frac{K_{LM}}{\left[\hat{p}_{LM}(1 - p_{LM-R})\right]}$$

$$(2) \qquad \operatorname{var}(\hat{E}_i) = \frac{1}{[(1 - p_{LM-R})^2]} * \left[\frac{\hat{K}_{LM\,i}{}^2}{\hat{p}_{LM\,i}{}^2} * \left(\frac{\operatorname{var}(\hat{K}_{LM\,i})}{\hat{K}_{LM\,i}{}^2} + \frac{\operatorname{var}(\hat{p}_{LM\,i})}{\hat{p}_{LM\,i}{}^2} \right) \right]$$

[9] **Note:** For fisheries characterized by short-duration seasons (i.e., ~ 1 month), the "monthly" estimators described in this appendix are synonymous season-total estimators.

[10] Equations 1 and 2 were modified based on a recent state–tribal evaluation of sources of bias in estimates of total Chinook encounters in mark-selective fisheries. Based on a review of relevant data, the current operational $p_{\text{LM-R}}$ (combined intentional and unintentional LM Chinook release rate) applied in the bias-corrected $\hat{E}_i$ estimator is 0.13. See Conrad and McHugh (2008) for further detail.

Test-fishery Encounter Composition

$\hat{p}_{LMi}$ = the test-fishery estimate of the proportion of Chinook encounters that are legal-sized (*L*) and marked (*M*) during month *i*

$\hat{p}_{LUi}$ = the estimated proportion of encounters that are legal-sized (*L*) and unmarked (*U*)

$\hat{p}_{SMi}$ = the estimated proportion of encounters that are sublegal-sized (*S*) and unmarked (*M*)

$\hat{p}_{LUi}$ = the estimated proportion of encounters that are sublegal-sized (*S*) and unmarked (*U*)

For each *XY* combination (where *X* = *L* or *S* and *Y* = *M* or *U*), $\hat{p}_{XYi}$ and its variance is estimated as:

(3) $\hat{p}_{XYi} = n_{XYi} / n_i$, and

(4) $\text{var}(\hat{p}_{XYi}) = [\hat{p}_{XYi}(1 - \hat{p}_{XYi})]/(n_i - 1)$,

where n_i = the total number of fish encountered by test boats during month *i*.

Encounters by Size/Mark-status Class

$\hat{E}_{LMi}$ = estimated legal (*L*), marked (*M*) encounters during month *i*

$\hat{E}_{LUi}$ = estimated legal (*L*), unmarked (*U*) encounters during month *i*

$\hat{E}_{SMi}$ = estimated sublegal (*S*), marked (*M*) encounters during month *i*

$\hat{E}_{SUi}$ = estimated sublegal (*S*), marked (*U*) encounters during month *i*

For each *XY* combination (where *X* = *L* or *S* and *Y* = *M* or *U*) excluding *LM*, $\hat{E}_{XYi}$ and an estimate of its variance are obtained from:

(5) $\hat{E}_{XYi} = \hat{E}_i * \hat{p}_{XYi}$

(6) $\text{var}(\hat{E}_{XYi}) = \text{var}(\hat{E}_i) * \hat{p}_{XYi}{}^2 + \hat{E}_i{}^2 * \text{var}(\hat{p}_{XYi}) - \text{var}(\hat{E}_i) * \text{var}(\hat{p}_{XYi})$

Since the $\hat{E}_{LMi}$ estimate derived according to Eqn. 5 above is equivalent to that obtained by expanding $\hat{K}_{LMi}$ by the constant 1 - $p_{\text{LM-R}}$, its variance is estimated as:

(7) $\text{var}(\hat{E}_{LMi}) = \text{var}(\hat{K}_{LMi})/(1 - \hat{p}_{LM=R})^2$

B. Estimating Retained and Released Numbers by Size/Mark-status Class

Before total mortality can be estimated for each class (LM, SM, LU, SU), class-specific encounters must be separated into retention and release categories. First, given that harvest is estimated only to mark-status class for creel survey purposes (i.e., Murthy estimates or otherwise), estimates of marked

and unmarked Chinook retention must be assigned to size classes (See *Apportioned Estimates of Retention to Size Classes* on subsequent page); this is done using mark-status-specific size composition data from dockside sampling (See *Dockside Observations for Apportioning Retained Catch to Class* on subsequent page). Subsequently, size/mark-status group-specific releases are estimated as the difference between class-specific encounters and retention (See *Estimating Release Numbers by Class* on subsequent page).

Dockside Observations for Apportioning Retained Catch to Class

$\hat{d}_{LMK}$ = the estimated proportion of retained (kept, *K*), marked (*M*) Chinook salmon that were legal (*L*); based on *season-wide*[11] dockside observations of marked Chinook (as is $\hat{d}_{SMK}$)

$\hat{d}_{SMK}$ = the estimated proportion of retained (kept, *K*), marked (*M*) Chinook that were sublegal (*S*)

The proportion of retained, marked fish in size class *X* (*X* = *L* or *S*) and its variance are estimated as:

$$(8) \qquad \hat{d}_{XMK} = n_{XMK} / n_{MK}$$

$$(9) \qquad \mathrm{var}(\hat{d}_{XMK}) = [\hat{d}_{XMK} * (1 - \hat{d}_{XMK})] / (n_{MK} - 1),$$

where n_{MK} and n_{XMK} are *season-wide* total dockside counts of marked fish and the subset of marked fish in size-class *X*, respectively.

$\hat{d}_{LUK}$ = the estimated proportion of retained (kept, *K*), unmarked (*U*) Chinook salmon that are legal (*L*); estimated from *season-wide* dockside observations of unmarked Chinook (as is $\hat{d}_{SUK}$)

$\hat{d}_{SUK}$ = the estimated proportion of retained (kept, *K*), unmarked (*U*) Chinook that are sublegal (*S*)

The proportions of retained, unmarked fish belonging to legal and sublegal size classes and their respective variances are estimated as above (Eqns. 8 and 9) but using *season-wide* dockside observations on unmarked (*U*), not marked Chinook salmon.

Apportioned Estimates of Retention to Size Classes

$\hat{K}_{LM\,i}$ = the estimated number of legal (*L*), marked (*M*) Chinook kept in month *i*

$\hat{K}_{LU\,i}$ = the estimated number of legal (*L*), unmarked (*U*) Chinook kept in month *i*

The number of kept, marked encounters, marked fish in size class *X* (*L* or *S*) and its variance is estimated as:

$$(10) \qquad \hat{K}_{XM\,i} = \hat{d}_{XMK} * \hat{N}_{MK\,i}$$

$$(11) \qquad \mathrm{var}(\hat{K}_{XM\,i}) = \mathrm{var}(\hat{K}_{XM\,i}) * \hat{d}_{XMK}{}^2 + \hat{N}_{MK_i}{}^2 * \mathrm{var}(\hat{d}_{XMK}) - \mathrm{var}(\hat{N}_{MK\,i}) * \mathrm{var}(\hat{d}_{XMK})$$

[11] Due to small sample sizes for observed, harvested Chinook—particularly for sublegal and/or unmarked classes—dockside length data are pooled across the season to estimate $\hat{d}_{XYK}$.

where $\hat{d}_{XMK}$ and its variance are from 7 and 8 above and $\hat{N}_{MKi}$ is the survey estimate of retained marked fish for month *i* defined in Eqn. 1.

$\hat{K}_{SMi}$ = estimated number of sublegal (*S*), marked (*M*) Chinook kept in month *i*

$\hat{K}_{SUi}$ = estimated number of sublegal (*S*), unmarked (*U*) Chinook kept in month *i*

The number of retained, unmarked fish belonging to legal and sublegal size classes is estimated according to Eqns. 10 and 11 above but using unmarked fish proportions and monthly retention estimates.

Estimating Release Numbers by Class

$\hat{R}_{LMi}$ = the estimated number of legal (*L*), marked (*M*) Chinook released in month *i*

$\hat{R}_{LUi}$ = the estimated number of legal (*L*), unmarked (*U*) Chinook released in month *i*

$\hat{R}_{SMi}$ = the estimated number of sublegal (*S*), marked (*M*) Chinook released in month *i*

$\hat{R}_{SUi}$ = the estimated number of sublegal (*S*), unmarked (*U*) Chinook released in month *i*

For each size/mark-status class (i.e., *XY* combination [*X* = *L* or *S* and *Y* = *M* or *U*]), the number of fish encountered and released is estimated as the difference between total size/mark-status class encounters ($\hat{E}_{XYi}$) and retention ($\hat{K}_{XYi}$) during month *i*. The estimator and its variance are:

$$\hat{R}_{XYi} = \hat{E}_{XYi} - \hat{K}_{XYi} \quad (12)$$

$$\mathrm{var}(\hat{R}_{XYi}) = \mathrm{var}(\hat{E}_{XYi}) + \mathrm{var}(\hat{K}_{XYi}) \quad (13)$$

C. Estimating Total (and Class-specific) Monthly and Season-wide Mortality

The application of assumed mortality rates (See *Assumed Mortality Rates for Retained and Released Chinook* below) to class-specific estimates of total retention and releases constitutes the final step in quantifying mark-selective fishery impacts.

Assumed Mortality Rates for Retained and Released Chinook

m_K = retention mortality rate, 100% for all retained Chinook (reincarnation is rare among fishes)
sfm_L = release mortality rate for legal (*L*) Chinook, assumed to be a constant 15%
sfm_S = release mortality rate for sublegal (*S*) Chinook, assumed to be a constant 20%

Retention-mortality Estimates

$\hat{M}_{LMKi}$ = estimated mortality due to legal (*L*), marked (*M*) Chinook harvest in month *i* (= $\hat{K}_{LMi}$).

$\hat{M}_{LUKi}$ = estimated mortality due to harvest of legal (*L*), unmarked (*U*) Chinook in month *i* (= $\hat{K}_{LUi}$).

$\hat{M}_{SMKi}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SMi}$).
$\hat{M}_{SUKi}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SUi}$).

Release-mortality Estimates

$\hat{M}_{LMRi}$ = estimated post-release mortality for legal (*L*), marked (*M*) Chinook in month *i*
$\hat{M}_{LURi}$ = estimated post-release mortality for legal (*L*), unmarked (*U*) Chinook in month *i*
$\hat{M}_{SMRi}$ = estimated post-release mortality for sublegal (*S*), marked (*M*) Chinook in month *i*
$\hat{M}_{SURi}$ = estimated post-release mortality for sublegal (*S*), unmarked (*U*) Chinook in month *i*

All class-specific (*XY* [*X* = *L* or *S*, *Y* = *M* or *U*]) release mortality estimates are obtained from:

(14) $\hat{M}_{XYRi} = \hat{R}_{XYi} * sfm_Y$

(15) $\text{var}(\hat{M}_{XYRi}) = \text{var}(\hat{R}_{XYi}) * sfm_Y^2$

Season-wide Total and Class-specific Mortality Estimation

$\hat{M}_{total}$ = total season-wide Chinook salmon mortality; this parameter and its variance [$\text{var}(\hat{M}_{total})$] are computed as the sum of all monthly retention and release mortality estimates [i.e., $\hat{M}_{total} = \sum_{i=1}^{\max i} (\hat{M}_{XYKi} + \hat{M}_{XYRi})$] and variances [$\text{var}(\hat{M}_{total}) = \sum_{i=1}^{\max i} [\text{var}(\hat{M}_{XYKi}) + \text{var}(\hat{M}_{XYRi})]$], respectively, for all four size/mark-status groups (*X* = *L* or *S*, *Y* = *M* or *U*). Season total estimates for subgroups of interest (e.g., unmarked, sublegal Chinook, $\hat{M}_{SU-total}$) are obtained by summing monthly estimates (and variances) across the season for just that group.

D. Characterizing Precision of Estimates

The precision of estimates generated from creel surveys and the preceding fishery impact estimation scheme is characterized using estimates of a parameter's standard error (*SE*), coefficient of variation (*CV* or relative standard error), and approximate 95% confidence interval. For any parameter estimate $\hat{\theta}$ (e.g., $\hat{M}_{total}$, $\hat{K}_{LMi}$, $\hat{E}_i$, etc.), these metrics are estimated using:

(16) $SE(\hat{\theta}) = \sqrt{\text{var}(\hat{\theta})}$

(17) $CV(\hat{\theta}) = [SE(\hat{\theta}) / \hat{\theta}] * 100$

(18) $CI = \hat{\theta} \pm 1.96 * SE(\hat{\theta})$

Figure A1. (*On following page*) Graphical representation of the approach used to estimate monthly encounters and mortalities by size/mark-status category in mark-selective Chinook fisheries. Boxes depict abundance estimates (encounters, mortalities) whereas the mathematical operations depicted on intermediate connector lines are estimator formulae yielding quantities found in subsequent boxes (moving from left to right). Parameter definitions, complete formulae, and variances are defined in the preceding pages. For short-duration fisheries (~ 1 month or less), monthly and season-total values are equivalent; for all others, season-total impacts are equivalent to the sum of monthly impact estimates (and variances).

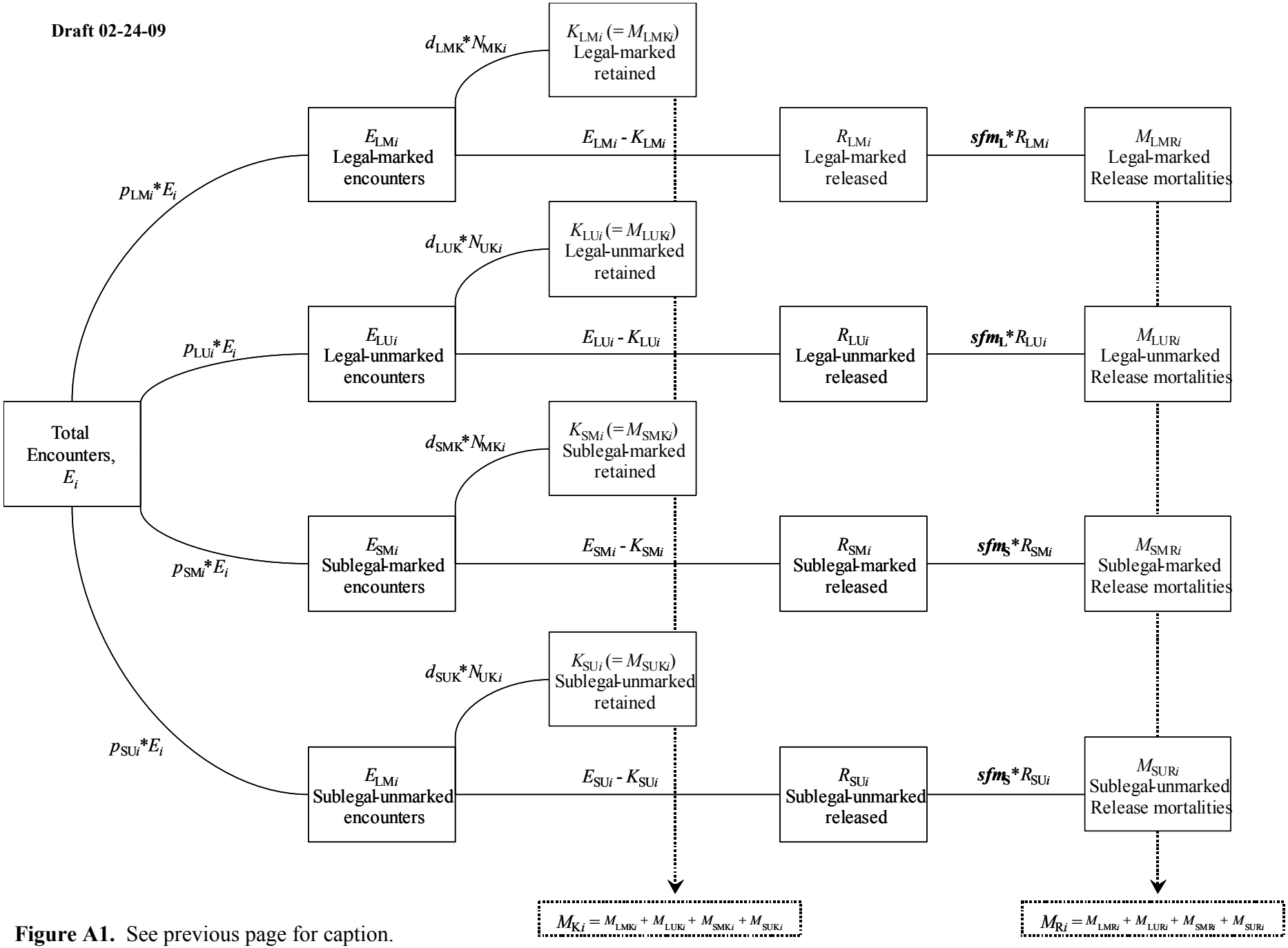

Figure A1. See previous page for caption.

Appendix B. Statistical week calendar for 2008. Note that grayed weeks correspond to those during which either or both of Areas 11 or 13 were open under mark-selective harvest regulations.

Stat Month	Week #	Start Date	End Date	Stat Month	Week #	Start Date	End Date
1	1	01-Jan	06-Jan	7	27	30-Jun	06-Jul
	2	07-Jan	13-Jan		28	07-Jul	13-Jul
	3	14-Jan	20-Jan		29	14-Jul	20-Jul
	4	21-Jan	27-Jan		30	21-Jul	27-Jul
	5	28-Jan	03-Feb		31	28-Jul	03-Aug
2	6	04-Feb	10-Feb	8	32	04-Aug	10-Aug
	7	11-Feb	17-Feb		33	11-Aug	17-Aug
	8	18-Feb	24-Feb		34	18-Aug	24-Aug
	9	25-Feb	02-Mar		35	25-Aug	31-Aug
3	10	03-Mar	09-Mar	9	36	01-Sep	07-Sep
	11	10-Mar	16-Mar		37	08-Sep	14-Sep
	12	17-Mar	23-Mar		38	15-Sep	21-Sep
	13	24-Mar	30-Mar		39	22-Sep	28-Sep
4	14	31-Mar	06-Apr	10	40	29-Sep	05-Oct
	15	07-Apr	13-Apr		41	06-Oct	12-Oct
	16	14-Apr	20-Apr		42	13-Oct	19-Oct
	17	21-Apr	27-Apr		43	20-Oct	26-Oct
	18	28-Apr	04-May		44	27-Oct	02-Nov
5	19	05-May	11-May	11	45	03-Nov	09-Nov
	20	12-May	18-May		46	10-Nov	16-Nov
	21	19-May	25-May		47	17-Nov	23-Nov
	22	26-May	01-Jun		48	24-Nov	30-Nov
6	23	02-Jun	08-Jun	12	49	01-Dec	07-Dec
	24	09-Jun	15-Jun		50	08-Dec	14-Dec
	25	16-Jun	22-Jun		51	15-Dec	21-Dec
	26	23-Jun	29-Jun		52	22-Dec	28-Dec
					53	29-Dec	31-Dec

Appendix C. Sample rates for the Area 11 (June 1-Sept. 30, 2008) mark-selective Chinook fishery. Note: sample counts and totals are for adipose-clipped (i.e., marked) Chinook only.

Month	Stat. Weeks	Date Range	No. AD Chinook Sampled	Estimated Chinook Retained	Sample Rate
June	22-26	1-29 June	386	1,106	34.9%
July	27-31	30 June-3 Aug.	699	2,686	26.0%
August	32-35	4-31 Aug.	925	3,439	26.9%
September	36-40	1-30 Sept.	53	146	36.2%
		Season Total	**2,063**	**7,377**	**28.0%**

Appendix D. Total number of anglers intercepted in Area 11 during on-the-water surveys between June 1 and Sept. 30, 2008. Grayed sites were included in the dockside sample frame.

Site Name	Weekday Anglers	Weekday Total (unadjusted) Size Measure	Weekend Anglers	Weekend Total (unadjusted) Size Measure
1st Ave. S.	2	0.0019	0	0.0000
Alki Ramp	2	0.0019	3	0.0013
Armeni Ramp	39	0.0361	51	0.0213
Beach Launch	1	0.0009	1	0.0004
Blake Island	2	0.0019	2	0.0008
Breakwater Marina/Launch	8	0.0074	36	0.0150
Browns Point	8	0.0074	22	0.0092
Brownsville Ramp	6	0.0056	14	0.0058
Chambers Bay Launch	4	0.0037	7	0.0029
Chinook Landing	6	0.0056	3	0.0013
Crows Nest	0	0.0000	1	0.0004
Day Island	2	0.0019	14	0.0058
Des Moines Sling	34	0.0315	100	0.0417
Des Mones Marina	93	0.0862	156	0.0651
Des Moines Dry Storage	2	0.0019	2	0.0008
Des Moines Yacht Club	0	0.0000	12	0.0050
Dockton Park	13	0.0120	41	0.0171
Eagle Harbor	0	0.0000	3	0.0013
Edmonds All	0	0.0000	4	0.0017
Elliott Bay Marina	0	0.0000	14	0.0058
Evergreen Park Ramp	3	0.0028	2	0.0008
Foss Marina	13	0.0120	32	0.0133
Fox Island Launch/Marina	2	0.0019	10	0.0042
Ft Ward St Park	1	0.0009	2	0.0008
Gig Harbor Ramp	80	0.0741	104	0.0434
GigHarbor Marina	33	0.0306	16	0.0067
Harper Ramp	0	0.0000	5	0.0021
Hylebos Marina	8	0.0074	6	0.0025
Longbranch Marina	2	0.0019	0	0.0000
Luhr Beach	3	0.0028	0	0.0000
Manchester Ramp	52	0.0482	126	0.0525
Narrows Ramp	28	0.0259	107	0.0446
Olie and Charlies	10	0.0093	45	0.0188
Olalla Public Ramp	4	0.0037	9	0.0038
Private Buoy/moorage	32	0.0297	108	0.0450
Pt Defiance Boathouse	112	0.1038	192	0.0801
Pt Defiance Ramp	297	0.2753	662	0.2761
Pt Fosdick	2	0.0019	1	0.0004
Pt Orchard Ramp Public	0	0.0000	10	0.0042
Pt Orchard Marina	4	0.0037	14	0.0058
Quatermaster harbor	5	0.0046	1	0.0004
Redondo Ramp	88	0.0816	302	0.1259
Shilshole Ramp	0	0.0000	10	0.0042
Solo Point	0	0.0000	4	0.0017
Swantown Marina	0	0.0000	6	0.0025
Tacoma Outboard Assn Ramp	34	0.0315	61	0.0254
Tacoma yacht club	9	0.0083	16	0.0067
Tyee Marina	25	0.0232	43	0.0179
Vashon YC	2	0.0019	0	0.0000
Wallochet Bay	0	0.0000	16	0.0067
Zittel's	8	0.0074	2	0.0008
Total Anglers	**1,079**	**1.0000**	**2,398**	**1.0000**

Appendix E. Size measures of sites sampled during the Area 11 June 1-Sept. 30, 2008 creel survey, by statistical week. WD and WE correspond to weekday and weekend strata, respectively. Grayed cells represent periods when a given site was excluded from the frame.

Stat Week	Day Type	Prop'n Effort In Sample Frame	Area 11 Sampled Sites and Size Measures					
			Armeni Public Ramp	Gig Harbor Ramp	Narrows Marina (Boathouse, Ramp, Rental)	Point Defiance Boathouse	Point Defiance Public Ramp	Redondo Ramp
22	WE	0.588	0.054	0.085	0.069	0.170	0.489	0.132
23	WD	0.588	0.054	0.085	0.069	0.170	0.489	0.132
	WE	0.588	0.054	0.085	0.069	0.170	0.489	0.132
24	WD	0.588	0.054	0.085	0.069	0.170	0.489	0.132
	WE	0.588	0.054	0.085	0.069	0.170	0.489	0.132
25	WD	0.588	0.054	0.085	0.069	0.170	0.489	0.132
	WE	0.588	0.054	0.085	0.069	0.170	0.489	0.132
26	WD	0.711	0.000	0.110	0.066	0.319	0.440	0.066
	WE	0.711	0.000	0.110	0.066	0.319	0.440	0.066
27	WD	0.665	0.031	0.101	0.057	0.239	0.484	0.088
	WE	0.691	0.043	0.118	0.000	0.151	0.543	0.145
28	WD	0.665	0.031	0.101	0.057	0.239	0.484	0.088
	WE	0.671	0.083	0.073	0.125	0.109	0.391	0.219
29	WD	0.677	0.031	0.101	0.057	0.239	0.484	0.088
	WE	0.569	0.022	0.075	0.086	0.188	0.478	0.151
30	WD	0.576	0.116	0.147	0.000	0.211	0.368	0.158
	WE	0.596	0.051	0.061	0.078	0.153	0.449	0.207
31	WD	0.545		0.173	0.053	0.060	0.571	0.143
	WE	0.596	0.051	0.061	0.078	0.153	0.449	0.207
32	WD	0.545		0.173	0.053	0.060	0.571	0.143
	WE	0.596	0.051	0.061	0.078	0.153	0.449	0.207
33	WD	0.614	0.086	0.113	0.054	0.158	0.425	0.163
	WE	0.530		0.075	0.075	0.082	0.593	0.175
34	WD	0.610	0.086	0.113	0.054	0.158	0.425	0.163
	WE	0.534		0.075	0.075	0.082	0.593	0.175
35	WD	0.610	0.086	0.113	0.054	0.158	0.425	0.163
	WE	0.534		0.075	0.075	0.082	0.593	0.175
36	WD	0.610	0.086	0.113	0.054	0.158	0.425	0.163
	WE	0.479			0.088	0.237	0.404	0.272
37	WD	0.610	0.086	0.113	0.054	0.158	0.425	0.163
	WE	0.479			0.088	0.237	0.404	0.272
38	WD	0.556	0.083	0.112		0.190	0.450	0.165
	WE	0.508		0.091		0.091	0.390	0.429
39	WD	0.556	0.083	0.112		0.190	0.450	0.165
	WE	0.508		0.091		0.091	0.390	0.429
40	WD	0.556	0.083	0.112		0.190	0.450	0.165

Appendix F. Age composition of retained (dockside samples) and encountered (test fishery samples) Chinook salmon, Areas 11 and 13, summer 2008. AD = marked or adipose-fin clipped Chinook, UM = unmarked (unclipped) Chinook.

Area	Source	Mark-status group	Month	Age Composition 1.1	2.1	2.2	3.1	3.2	4.1	4.2	5.1	Total
11	Dockside harvest	AD	June	0	0	0	341	0	15	14	0	370
			July	0	1	0	548	4	83	19	2	657
			Aug.	1	8	0	736	11	109	15	1	881
			Sept.	1	1	1	34	8	1	2	0	48
			Season	*2*	*10*	*1*	*1,659*	*23*	*208*	*50*	*3*	*1,956*
			(%)	(0%)	(1%)	(0%)	(85%)	(1%)	(11%)	(3%)	(0%)	
	Test Fishery encounters	AD	June	0	0	0	16	0	0	0	0	16
			July	1	2	0	38	1	3	0	0	45
			Aug.	2	3	0	14	0	4	0	0	23
			Sept.	3	0	1	5	0	0	0	0	9
			Season	*6*	*5*	*1*	*73*	*1*	*7*	*0*	*0*	*93*
			(%)	(6%)	(5%)	(1%)	(78%)	(1%)	(8%)	(0%)	(0%)	
	Test Fishery encounters	UM	June	0	0	0	0	0	1	0	0	1
			July	0	0	0	4	0	1	0	0	5
			Aug.	0	0	0	6	0	2	0	0	8
			Sept.	1	0	0	0	0	0	0	0	1
			Season	*1*	*0*	*0*	*10*	*0*	*4*	*0*	*0*	*15*
			(%)	(7%)	(0%)	(0%)	(67%)	(0%)	(27%)	(0%)	(0%)	
13	Dockside harvest	AD	May	0	0	0	24	0	0	0	0	24
			June	0	0	0	16	1	0	4	0	21
			July	0	1	0	22	0	1	1	0	25
			Aug.	0	1	0	70	1	15	2	1	90
			Sept.	0	0	0	2	1	1	0	0	4
			Season	*0*	*2*	*0*	*134*	*3*	*17*	*7*	*1*	*164*
			(%)	(0%)	(1%)	(0%)	(82%)	(2%)	(10%)	(4%)	(1%)	

[1]Gilbert-Rich age notation, "Total Age". "Age at outmigration", inclusive of time spent in incubation.

Appendix G. CWTs recovered from Chinook salmon during the Areas 11 and 13 summer 2008 mark-selective Chinook fisheries.

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingHatchery	Release Agency	DIT Code(s)	FL (cm)	Sex	RecovMark	ReleaseMark	Label
11	1-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		79		AD Fin Clp	AD Fin Clp	51601
11	1-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		82		AD Fin Clp	AD Fin Clp	51801
11	1-Jun	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		68	F	AD Fin Clp	AD Fin Clp	51602
11	1-Jun	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		80		AD Fin Clp	AD Fin Clp	51371
11	3-Jun	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	67	M	AD Fin Clp	AD Fin Clp	51802
11	11-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		81		AD Fin Clp	AD Fin Clp	51660
11	11-Jun	633369	05	FRIDAY CR 03.0017	SAMISH HATCH.	WDFW	DIT: 633368	56		AD Fin Clp	AD Fin Clp	26232
11	11-Jun	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		68	F	AD Fin Clp	AD Fin Clp	51803
11	13-Jun	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		60		AD Fin Clp	AD Fin Clp	51663
11	13-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		78		AD Fin Clp	AD Fin Clp	51804
11	13-Jun	210671	05	KALAMA CR 11.0017	KALAMA CR HATCH.	NISQ		62		AD Fin Clp	AD Fin Clp	51603
11	15-Jun	632876	04	WALLACE R 07.0940	WALLACE R HATCH.	WDFW		71		AD Fin Clp	AD Fin Clp	51951
11	16-Jun	185238	05	R-CHILLIWACK R	H-CHILLIWACK R	CDFO	DIT: 185030, 185031, 185032	75		AD Fin Clp	AD Fin Clp	51805
11	17-Jun	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	69		AD Fin Clp	AD Fin Clp	26233
11	22-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		75	F	AD Fin Clp	AD Fin Clp	51806
11	23-Jun	633089	04	DESCHUTES R 13.0028	TUMWATER FALLS HATCH	WDFW		80	F	AD Fin Clp	AD Fin Clp	51807
11	26-Jun	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	76	M	AD Fin Clp	AD Fin Clp	42264
11	28-Jun	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		53		AD Fin Clp	AD Fin Clp	51808
11	29-Jun	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		81	F	AD Fin Clp	AD Fin Clp	42265
11	29-Jun	632877	04	GREEN R 09.0001	ICY CR HATCH.	WDFW		80	F	AD Fin Clp	AD Fin Clp	42266
11	29-Jun	185240	05	R-CHILLIWACK R	H-CHILLIWACK R	CDFO	DIT: 185030, 185031, 185032	77		AD Fin Clp	AD Fin Clp	51954
11	1-Jul	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		62		AD Fin Clp	AD Fin Clp	51952
11	1-Jul	632877	04	GREEN R 09.0001	ICY CR HATCH.	WDFW		72		Undetmd AD	AD Fin Clp	26236
11	1-Jul	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		55		AD Fin Clp	AD Fin Clp	26237
11	5-Jul	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	63		AD Fin Clp	AD Fin Clp	51666
11	5-Jul	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		55		AD Fin Clp	AD Fin Clp	26238
11	6-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		60		AD Fin Clp	AD Fin Clp	51955
11	6-Jul	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		54		AD Fin Clp	AD Fin Clp	51605
11	6-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		74		AD Fin Clp	AD Fin Clp	51953
11	6-Jul	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	54		AD Fin Clp	AD Fin Clp	51606
11	9-Jul	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	79		AD Fin Clp	AD Fin Clp	51956

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingHatchery	Release Agency	DIT Code(s)	FL (cm)	Sex	RecovMark	ReleaseMark	Label
11	11-Jul	632877	04	GREEN R 09.0001	ICY CR HATCH.	WDFW		87	M	AD Fin Clp	AD Fin Clp	42267
11	11-Jul	632879	04	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		88	F	AD Fin Clp	AD Fin Clp	42268
11	11-Jul	632876	04	WALLACE R 07.0940	WALLACE R HATCH.	WDFW		78		AD Fin Clp	AD Fin Clp	50480
11	12-Jul	633382	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		68		AD Fin Clp	AD Fin Clp	51608
11	13-Jul	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		65		AD Fin Clp	AD Fin Clp	51810
11	13-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		84		AD Fin Clp	AD Fin Clp	41611
11	16-Jul	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	53		AD Fin Clp	AD Fin Clp	26240
11	17-Jul	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		62		AD Fin Clp	AD Fin Clp	26241
11	17-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		82		AD Fin Clp	AD Fin Clp	26239
11	18-Jul	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	74		AD Fin Clp	AD Fin Clp	41616
11	19-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		72		AD Fin Clp	AD Fin Clp	41615
11	19-Jul	632965	04	MINTER CR 15.0048	MINTER HATCH.	WDFW		86		Undetmd AD	AD Fin Clp	26243
11	20-Jul	632894	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		77	M	AD Fin Clp	AD Fin Clp	42270
11	22-Jul	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	76		AD Fin Clp	AD Fin Clp	51958
11	22-Jul	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		76		AD Fin Clp	AD Fin Clp	26244
11	22-Jul	210601	04	COWSKULL ACCLIM POND	COWSKULL ACCLIM POND	PUYA		73		AD Fin Clp	AD Fin Clp	26245
11	22-Jul	210592	04	GROVERS CR HATCH.	GROVERS CR HATCH.	SUQ	DIT: 632790	95		AD Fin Clp	AD Fin Clp	51957
11	23-Jul	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	88		AD Fin Clp	AD Fin Clp	51959
11	24-Jul	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	78	F	AD Fin Clp	AD Fin Clp	42271
11	25-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		74		AD Fin Clp	AD Fin Clp	51610
11	25-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		68		AD Fin Clp	AD Fin Clp	51747
11	25-Jul	632871	04	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		77		AD Fin Clp	AD Fin Clp	51609
11	25-Jul	632874	04	SKOKOMISH R 16.0001	RICKS PD (LLTK)	WDFW		72		AD Fin Clp	AD Fin Clp	26246
11	25-Jul	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		73		AD Fin Clp	AD Fin Clp	51611
11	25-Jul	210592	04	GROVERS CR HATCH.	GROVERS CR HATCH.	SUQ	DIT: 632790	76		AD Fin Clp	AD Fin Clp	41613
11	25-Jul	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		65		AD Fin Clp	AD Fin Clp	51960
11	25-Jul	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		51		AD Fin Clp	AD Fin Clp	41963
11	25-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	72	M	AD Fin Clp	AD Fin Clp	51812
11	26-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	59		AD Fin Clp	AD Fin Clp	54566
11	26-Jul	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		69		AD Fin Clp	AD Fin Clp	51813
11	26-Jul	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		78		AD Fin Clp	AD Fin Clp	51961
11	26-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		85		AD Fin Clp	AD Fin Clp	26248
11	26-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		73		AD Fin Clp	AD Fin Clp	26247
11	26-Jul	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		67		AD Fin Clp	AD Fin Clp	42272

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingHatchery	Release Agency	DIT Code(s)	FL (cm)	Sex	RecovMark	ReleaseMark	Label
11	27-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	74		AD Fin Clp	AD Fin Clp	54034
11	27-Jul	185240	05	R-CHILLIWACK R	H-CHILLIWACK R	CDFO	DIT: 185030, 185031, 185032	81		AD Fin Clp	AD Fin Clp	51612
11	28-Jul	210571	05	TULALIP CR 07.0001	BERNIE GOBIN HATCH	TULA		55	F	AD Fin Clp	AD+OTOLITH	51814
11	29-Jul	210598	04	KALAMA CR 11.0017	KALAMA CR HATCH.	NISQ		81		AD Fin Clp	AD Fin Clp	41617
11	31-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		81	F	AD Fin Clp	AD Fin Clp	42273
11	31-Jul	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		69	F	AD Fin Clp	AD Fin Clp	42274
11	1-Aug	633472	05	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		62	F	AD Fin Clp	AD Fin Clp	51815
11	1-Aug	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	75		AD Fin Clp	AD Fin Clp	51665
11	2-Aug	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	74	M	AD Fin Clp	AD Fin Clp	42277
11	2-Aug	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	73	F	AD Fin Clp	AD Fin Clp	42276
11	2-Aug	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	84	F	AD Fin Clp	AD Fin Clp	42275
11	3-Aug	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	71		AD Fin Clp	AD Fin Clp	51964
11	3-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		66		AD Fin Clp	AD Fin Clp	54036
11	3-Aug	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	79		AD Fin Clp	AD Fin Clp	52000
11	4-Aug	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		68		AD Fin Clp	AD Fin Clp	42279
11	7-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		71	F	AD Fin Clp	AD Fin Clp	51816
11	7-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		71		AD Fin Clp	AD Fin Clp	41620
11	7-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		78	F	AD Fin Clp	AD Fin Clp	51817
11	7-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		82		AD Fin Clp	AD Fin Clp	26253
11	7-Aug	632870	04	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		72	F	AD Fin Clp	AD Fin Clp	42280
11	7-Aug	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		78	F	AD Fin Clp	AD Fin Clp	56901
11	7-Aug	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		80		AD Fin Clp	AD Fin Clp	26251
11	8-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	57	F	AD Fin Clp	AD Fin Clp	56902
11	8-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	71	F	AD Fin Clp	AD Fin Clp	42281
11	8-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		72		AD Fin Clp	AD Fin Clp	51614
11	9-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		72	F	AD Fin Clp	AD Fin Clp	51818
11	9-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		86		AD Fin Clp	AD Fin Clp	26254
11	9-Aug	632871	04	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		74		AD Fin Clp	AD Fin Clp	51615
11	10-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	65		AD Fin Clp	AD Fin Clp	51668
11	10-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		68		AD Fin Clp	AD Fin Clp	51617
11	10-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		84		AD Fin Clp	AD Fin Clp	54584
11	10-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		78	M	AD Fin Clp	AD Fin Clp	51820
11	10-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		79		AD Fin Clp	AD Fin Clp	51966
11	10-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		83	F	AD Fin Clp	AD Fin Clp	51819

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingHatchery	Release Agency	DIT Code(s)	FL (cm)	Sex	RecovMark	ReleaseMark	Label
11	10-Aug	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	76		AD Fin Clp	AD Fin Clp	54585
11	10-Aug	210690	05	WHITE R 10.0031	WHITE RIVER HATCH.	MUCK		60	F	AD Fin Clp	Unmarked	51821
11	10-Aug	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		69		AD Fin Clp	AD Fin Clp	51616
11	11-Aug	210681	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 633286	70	M	AD Fin Clp	Unmarked	42283
11	13-Aug	633471						56		AD Fin Clp		51620
11	13-Aug	633468	05	WALLACE R 07.0940	WALLACE R HATCH.	WDFW		53		AD Fin Clp	AD Fin Clp	51618
11	13-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	68		AD Fin Clp	AD Fin Clp	51619
11	13-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		67	M	AD Fin Clp	AD Fin Clp	56903
11	14-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		66	M	AD Fin Clp	AD Fin Clp	56905
11	14-Aug	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	58	M	AD Fin Clp	AD Fin Clp	56904
11	14-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	67		AD Fin Clp	AD Fin Clp	51823
11	14-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	68		AD Fin Clp	AD Fin Clp	41619
11	14-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		68		AD Fin Clp	AD Fin Clp	51963
11	14-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		74		AD Fin Clp	AD Fin Clp	26255
11	14-Aug	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		85		AD Fin Clp	AD Fin Clp	50062
11	15-Aug	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		73		AD Fin Clp	AD Fin Clp	51622
11	15-Aug	633382	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		67		AD Fin Clp	AD Fin Clp	26256
11	15-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		72	M	AD Fin Clp	AD Fin Clp	42285
11	15-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		74	F	AD Fin Clp	AD Fin Clp	42284
11	15-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		57		AD Fin Clp	AD Fin Clp	41965
11	15-Aug	632965	04	MINTER CR 15.0048	MINTER HATCH.	WDFW		78		AD Fin Clp	AD Fin Clp	51621
11	15-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		79		AD Fin Clp	AD Fin Clp	51670
11	16-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		68		AD Fin Clp	AD Fin Clp	51671
11	16-Aug	210671	05	KALAMA CR 11.0017	KALAMA CR HATCH.	NISQ		79		AD Fin Clp	AD Fin Clp	26257
11	16-Aug	185725	05	R-PUNTLEDGE R	H-PUNTLEDGE R	CDFO		88		AD Fin Clp	AD Fin Clp	54592
11	16-Aug	185210	05	R-CHEMAINUS R	H-CHEMAINUS R	CDFO		85	M	AD Fin Clp	AD Fin Clp	42286
11	17-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210681	70		AD Fin Clp	AD Fin Clp	26494
11	17-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		71		AD Fin Clp	AD Fin Clp	51969
11	17-Aug	632964	04	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		88		AD Fin Clp	AD Fin Clp	51975
11	17-Aug	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		77		AD Fin Clp	AD Fin Clp	42287
11	21-Aug	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		83	F	AD Fin Clp	AD Fin Clp	51745
11	22-Aug	633472	05	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		72		AD Fin Clp	AD Fin Clp	26258
11	22-Aug	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		58		AD Fin Clp	AD Fin Clp	54898
11	22-Aug	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		56		AD Fin Clp	AD Fin Clp	51669

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingHatchery	Release Agency	DIT Code(s)	FL (cm)	Sex	RecovMark	ReleaseMark	Label
11	22-Aug	210592	04	GROVERS CR HATCH.	GROVERS CR HATCH.	SUQ	DIT: 632790	83		AD Fin Clp	AD Fin Clp	51623
11	23-Aug	633285	05	GROVERS CR 15.0299	GROVERS CR HATCH.	SUQ	DIT: 210682	79	F	AD Fin Clp	AD Fin Clp	51749
11	23-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		75	F	AD Fin Clp	AD Fin Clp	12885
11	24-Aug	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	72		AD Fin Clp	AD Fin Clp	26259
11	24-Aug	025650	05	R-HARRISON R	H-CHEHALIS R	CDFO		72	M	AD Fin Clp	AD Fin Clp	56906
11	28-Aug	633289	05	DESCHUTES R +CAPITOL	PERCIVAL COVE+TUMWATER FA	WDFW		68		AD Fin Clp	AD Fin Clp	56907
11	29-Aug	633369	05	FRIDAY CR 03.0017	SAMISH HATCH.	WDFW	DIT: 633368	66		AD Fin Clp	AD Fin Clp	51970
11	30-Aug	633472	05	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		58		AD Fin Clp	AD Fin Clp	51672
11	30-Aug	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		59		AD Fin Clp	AD Fin Clp	26260
11	30-Aug	633375	05	VOIGHT CR 10.0414	VOIGHTS CR HATCH.	WDFW		70		AD Fin Clp	AD Fin Clp	51625
11	31-Aug	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	73		AD Fin Clp	AD Fin Clp	26498
11	31-Aug	633174	05	JOHN CR 16.0253	RFEG 6 HOOD CANAL	WDFW		64	M	AD Fin Clp	AD+OTOLITH	56909
11	4-Sep	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		59		AD Fin Clp	AD Fin Clp	54897
11	10-Sep	633472	05	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		53		AD Fin Clp	AD Fin Clp	51627
11	12-Sep	633469	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		59		AD Fin Clp	AD Fin Clp	51971
11	13-Sep	632978	04	CHAMBERS CR 12.0007	LAKEWOOD HATCH.	WDFW		69		AD Fin Clp	AD Fin Clp	51628
11	19-Sep	633382	05	FINCH CR 16.0222	HOODSPORT HATCH.	WDFW		63		AD Fin Clp	AD Fin Clp	41966
11	20-Sep	633366	05	PURDY CR 16.0005	GEORGE ADAMS HATCHRY	WDFW	DIT: 633365	71		AD Fin Clp	AD Fin Clp	41967
11	20-Sep	633172	05	NOOKSACK R -NF 01.0120	KENDALL CR HATCH.	WDFW	DIT: 633171	68		AD Fin Clp	AD+OTOLITH	51629
11	20-Sep	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		66		AD Fin Clp	AD Fin Clp	26499
11	27-Sep	633467	05	GREEN R 09.0001	ICY CR HATCH.	WDFW		63		AD Fin Clp	AD Fin Clp	41968
11	27-Sep	633289	05	DESCHUTES R +CAPITOL	PERCIVAL COVE+TUMWATER FA	WDFW		64		AD Fin Clp	AD Fin Clp	51630
11	27-Sep	210571	05	TULALIP CR 07.0001	BERNIE GOBIN HATCH	TULA		73		AD Fin Clp	AD+OTOLITH	41969
13	30-May	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		56		AD Fin Clp	AD Fin Clp	26231
13	2-Jun	633089	04	DESCHUTES R 13.0028	TUMWATER FALLS HATCH	WDFW		80		AD Fin Clp	AD Fin Clp	51656
13	22-Jun	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		60		AD Fin Clp	AD Fin Clp	42218
13	24-Jun	633364	05	CASCADE R 03.1411	MARBLEMOUNT HATCH.	WDFW		56		AD Fin Clp	AD Fin Clp	42219
13	3-Aug	210671	05	KALAMA CR 11.0017	KALAMA CR HATCH.	NISQ		65		AD Fin Clp	AD Fin Clp	51613
13	7-Aug	632783	04	CLEAR CR 11.0013C	NISQUALLY HATCH.	NISQ	DIT: 210589	88		AD Fin Clp	AD Fin Clp	12884
13	24-Aug	632965	04	MINTER CR 15.0048	MINTER HATCH.	WDFW		97		AD Fin Clp	AD Fin Clp	12886
13	29-Aug	632979	05	CHAMBERS CR 12.0007	GARRISON HATCH.	WDFW		63	F	AD Fin Clp	AD Fin Clp	56908

Appendix H. Fishery-total estimates of retained and released salmon (Chinook and other species) catch for the Area 11 summer 2008 Chinook MSF. Displayed Chinook harvest values are equivalent to those in **Table 4**; whereas the release estimates displayed in **Table 4** are based on the Conrad and McHugh (2008) method, these are based solely on angler-reported data. Values may not add exactly due to rounding error.

				Retained Chinook		Other Sp. Retained			Released Chinook			Other Sp. Released			
Month	Stat. Wk.	Start Date	End Date	AD	UM	AD Coho	UM Coho	Chum	AD	UM	Unk	AD Coho	UM Coho	Unk Coho	UnID'd
June	22	01-Jun	01-Jun	93	0	0	0	0	6	47	10	0	0	0	0
	23	02-Jun	08-Jun	224	0	0	0	0	0	96	12	0	0	0	0
	24	09-Jun	15-Jun	380	0	0	0	0	16	167	28	4	0	0	0
	25	16-Jun	22-Jun	168	4	4	2	0	53	61	7	0	0	0	4
	26	23-Jun	29-Jun	240	0	9	0	0	31	54	27	4	0	2	2
July	27	30-Jun	06-Jul	228	5	20	13	0	16	95	50	0	5	3	10
	28	07-Jul	13-Jul	324	0	121	47	0	138	144	74	4	4	12	10
	29	14-Jul	20-Jul	288	0	139	19	0	66	140	422	15	13	94	196
	30	21-Jul	27-Jul	601	7	50	35	3	128	223	311	14	50	140	757
	31	28-Jul	03-Aug	1,245	0	109	15	0	204	379	659	222	7	231	667
Aug.	32	04-Aug	10-Aug	1,586	2	101	24	0	127	364	784	25	35	277	1,885
	33	11-Aug	17-Aug	1,122	0	104	48	0	184	403	795	38	36	58	4,513
	34	18-Aug	24-Aug	448	0	119	56	0	192	251	738	23	4	93	4,233
	35	25-Aug	01-Sep	284	5	266	41	0	130	161	394	49	16	276	6,005
Sept.	36	02-Sep	07-Sep	21	0	171	15	0	133	133	834	33	51	312	1,671
	37	08-Sep	14-Sep	36	0	44	34	0	237	153	799	67	70	271	2,770
	38	15-Sep	21-Sep	48	0	53	11	2	17	68	691	3	12	358	818
	39	22-Sep	28-Sep	36	0	22	7	0	209	132	730	38	7	82	917
	40	29-Sep	30-Sep	5	0	0	0	0	89	51	81	5	0	0	396
Season Total:				7,377	23	1,333	368	5	1,974	3,121	7,445	543	309	2,208	24,854
Standard Error:				878	7	118	42	2	162	229	478	66	41	283	1,964
CV (%):				12%	31%	9%	12%	37%	8%	7%	6%	12%	13%	13%	8%
95% CI:				5,657-9,098	9-37	1,102-1,564	284-451	1-9	1,656-2,292	2,672-3,571	6,508-8,382	415-672	229-389	1,654-2,762	21,004-28,705

[1] The 5 UM Chinook during week 27 were actually of undetermined mark status; they are assumed to be unmarked for impact-estimation purposes.

Appendix I. Revised total and size/mark-status group-specific estimates of Chinook encounters for the summer 2007 Area 11 MSF (June 1-Sept. 30, 2007), with 2008 values. Revisions are based on the bias-corrected "Method 2" approach recommended by Conrad and McHugh (2008). LM = legal-sized, marked; LU = legal-sized, unmarked; SM = sublegal-sized, marked; SU = sublegal-sized, unmarked. Note that estimates include both private and charter anglers.

		Retained Chinook				Released Chinook				Total
Year	**Month**	**LM**	**LU**	**SM**	**SU**	**LM**	**LU**	**SM**	**SU**	**Encounters**
2007	June	753	5	26	1	112	676	1,342	182	3,096
	July	2,874	29	100	8	425	602	1,901	420	6,358
	August	6,190	40	216	12	921	1,568	3,708	1,604	14,259
	September	375	0	12	0	53	170	1,082	152	1,845
	Season total	**10,192**	**74**	**354**	**21**	**1,511**	**3,015**	**8,033**	**2,357**	**25,558**
2008	June[1]	1,091	3	15	1	163	173	73	21	1,540
	July[1]	2,650	9	36	2	396	418	177	51	3,740
	August[1]	3,393	6	47	1	507	1,351	1,649	168	7,121
	September[1]	144	0	2	0	22	58	70	7	303
	Season total	**7,277**	**18**	**100**	**5**	**1,087**	**1,999**	**1,969**	**248**	**12,703**

[1]Test fishery sample sizes were too small to produce monthly total encounter estimates for 2008; the monthly values displayed are based on two two-month test fishery strata (i.e., Jun-Jul; Aug-Sept.; see main report body for details).