Marine Areas 5 and 6
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 5 and 6 for the sixth time during the summer of 2008 (July 1-August 9). 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) conducted comprehensive fishery monitoring activities during the Areas 5 and 6 mark-selective Chinook fisheries. The study designs used in the two areas during 2008, however, differed markedly from those previously employed (2003-2007). First, a scaled-back version (i.e., with fewer sites and days sampled) of the former dockside sample design (i.e., Intensive or "Murthy" [probability-based] sampling) was used to provide coarse in-season estimates of catch and effort for Area 5; to ensure that long-term fishery sampling targets were not compromised, this effort was accompanied by a high level of opportunistic Baseline Sampling. The Area 6 design consisted of Baseline angler/catch sampling only and therefore did not have an on-the-water (i.e., boat surveys, test fishing) sampling component[1]. Finally, a pilot study was conducted in both areas to evaluate the feasibility of using angler-supplied voluntary trip reports (VTRs) as a means for collecting reliable information about the size/mark-status composition of Chinook encountered in MSFs.

Area 5 sampling activities included dockside creel sampling (Intensive and Baseline), test fishing, and on-the-water effort surveys. Among other parameters, Area 5 efforts emphasized data collection needs for the estimation of: *i*) the mark rate of the targeted Chinook population (test fishing and VTRs), *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[2], and *v*) the total mortality of marked and unmarked double index tag (DIT) CWT stocks. The Area 6 design provided data for the estimation of: *i*) mark rates (based on VTRs), *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.

For the VTR feasibility study portion of our 2008 monitoring plan, we used an extensive on-site form distribution/collection effort in both areas and assessed program efficacy using two criteria. First, we evaluated whether this "enhanced" VTR program could yield a sizeable and

[1] The Area 6 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 will be combined with catch record card data to obtain these values at a later time.
[2] 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.

representative response from anglers fishing in the Areas 5 and 6 MSFs. Secondarily, we considered whether the Chinook encounters data acquired from VTRs were comparable to those collected by test fishers (Area 5 only).

Area 5 Summary

For in-season catch and effort estimation, creel samplers staffed one of three different access sites on 12 of the 40 days that Area 5 was open to Chinook retention under mark-selective regulations. Additionally, Baseline sampling occurred at three different access sites on a grand total of 73 site-days. In combination, samplers interviewed 4,809 anglers (933 Intensive; 3,876 Baseline) who fished in Area 5 and sampled 1,000 (157 Intensive; 843 Baseline) of the marked Chinook landed during the fishery. Other PSSU staff conducted 3 on-the-water effort surveys (2 weekday, 1 weekend), and spent 25 days (140 hours) on the water pursuing Chinook using test-fishing methods, in support of Area 5 monitoring efforts.

Based on the combination of sampling activities, we estimated that 13,004 trips were completed in Area 5 between July 1st and August 9th. Landing an estimated total of 2,819 marked Chinook during the fishery, these anglers experienced a season-wide CPUE of 0.22 Chinook retained per angler trip. Additionally, anglers released an estimated 2,678 Chinook (479 marked, 2,199 unmarked). Overall, total effort was substantially lower and catch rates were moderately higher than documented during past Chinook MSF seasons in Area 5 (i.e., 2003-07). As a result, the 2008 catch total was similar to the average value for the past five seasons (2003-07 mean catch = 2,757). However, due to the uncertainty associated with estimates produced by the reduced 2008 sampling design, these comparisons should be regarded as preliminary; draft 2008 creel estimates will be supplanted by final Catch Record Card (CRC) values when they become available.

During the forty-day Area 5 fishery, harvested Chinook averaged 72 cm (range: 52 to 99 cm) in total length and were larger than the legal minimum size limit ($\geq$22 in or 56 cm TL) in nearly all instances (dockside marked Chinook observations, >98% of legal size). Further, nearly four-fifths (78%) 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 86 CWTs from marked Chinook harvested in Area 5. The majority of these recoveries (72%) were from Puget Sound or Hood Canal production facilities (24, 17, and 17% from North, Central, and South Puget Sound, 11% from Hood Canal); Columbia River-origin CWTs groups comprised nearly all of the 28% CWT remainder.

Over the entire Area 5 season, test fishers encountered 50 Chinook salmon, 60% of which were marked (all sizes) and 92% of which were of legal size (both mark-status groups). With a "CPUE" (legal-marked Chinook *encounters* / angler trip) of 0.58, 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 76 cm (marked and unmarked mean; range: 46-96 cm). For the forty-day season, we estimated the size/mark-status composition at 58% legal-marked (LM), 34% legal-unmarked (LU), 2% sublegal-marked (SM), and 6% sublegal-unmarked (SU).

By combining dockside-sampling results (i.e., legal-marked Chinook harvest estimates) and test fishery encounters data, we generated preliminary estimates of size/mark-status group-specific encounters and mortalities for Area 5. In total, an estimated 5,496 Chinook were encountered (retained and released) during the Area 5 fishery, with 3,188 of these being legal-marked, 1,869 legal-unmarked, 110 sublegal-marked, and 330 sublegal-unmarked individuals. Among released encounters, an estimated 62 legal-marked, 280 legal-unmarked, 13 sublegal-marked, and 66 sublegal-unmarked Chinook (421 overall) were estimated to have died due to handling and release effects of the Area 5 fishery. Thus, in total, 2,894 marked (87% due to direct harvest) and 346 unmarked Chinook mortalities occurred as a result of the fishery. Overall, these preliminary estimates of impacts were similar to pre-season expectations (i.e., Fishery Regulation Assessment Model results [FRAM, model run 2108]) for legal-marked Chinook salmon; substantial differences, however, were documented for other size/mark-status groups. Specifically, sublegal and/or unmarked Chinook impact estimates were considerably less than expected based on pre-season FRAM runs. Finally, regarding impacts of the Area 5 fishery on the coded-wire tag (CWT) program, we estimated that 11 unmarked Chinook belonging to double-index tag (DIT) groups may have died due to this MSF.

Area 6 Summary

Between July 1st and August 9th, 2008, samplers conducted Baseline sampling at three different sites used to access the Area 6 MSF. As a result, samplers acquired catch (kept and released) and effort information about nearly 1,574 completed angler trips. Over all interviews, ramp samplers observed anglers harvest a total of 350 Chinook (345 marked, 5 unmarked) and recorded 258 angler-reported Chinook releases (0 marked, 5 unmarked, and 253 of unknown mark status). Given these observations, we estimated the season-wide Area 6 CPUE at 0.22 Chinook retained per angler trip, a value that was above average relative to values documented for this fishery during its previous five seasons (2003-7 mean = 0.16).

During the forty-day Area 6 fishery, harvested Chinook averaged 77 cm (range: 58 to 93 cm) in total length and were larger than the legal minimum size limit ($\geq$22 in or 56 cm TL) in all instances. Sixty-four percent of all harvested individuals were 3-year olds (i.e., brood year 2005); all but one of the remaining aged individuals were four years in age. In addition to collecting length data and scales, ramp samplers recovered 14 CWTs from marked Chinook harvested in Area 6, over half of which were from Central Puget Sound facilities. Outside of Puget Sound/Hood Canal tag groups, a single tag from each the Columbia River and Vancouver Island release regions was recovered.

Though we did not test fish in Area 6 in 2008, we estimated the size/mark-status composition of encountered Chinook using results from our VTR study (described below). In total, we received a total of 59 VTRs from participating anglers which provided data on 133 Chinook encounters. From the VTR response, we estimated that 61% of Area 6 Chinook encounters were marked and that very few (<2%) were sublegal in size.

VTR Feasibility Study Summary

In both Areas 5 and 6, participation in our enhanced VTR program was substantially higher than observed in previous seasons (2003-07) and/or other Puget Sound marine areas (i.e., Marine Catch Areas 7-13). The only fishery for which a similar response was received was Area 5 in 2003; a concerted on-the-ground VTR distribution/collection effort also occurred during this season. Beyond exceeding past benchmarks in 2008, VTRs (n = 156) provided information on three times as many Area 5 encounters as did the test fishery (n = 50). Though we did not test fish in Area 6 during 2008, the VTR encounters total (n = 133) was approximately double the mean test fishery sample size (n = 59) for past Chinook MSF seasons in this area. Further, multiple metrics suggest that our enhanced VTR effort was successful at acquiring participation from a diverse and representative subset of Areas 5 and 6 anglers. In sum, VTR sampling activities were successful at achieving sample-size goals for this pilot study.

For Area 5, we conducted additional analyses comparing size/mark-status composition estimates between VTR and test fishery encounters datasets. In brief, there was strong qualitative correspondence between the two samples and no statistically detectable differences for both legal/sublegal fraction (VTR vs. test fishery: 88% vs. 92%) and mark-rate comparisons (VTR vs. test fishery: 53% vs. 60%). Considering these similarities in conjunction with sample size potential, we conclude that VTRs can provide a cost-effective and reliable alternative to test fishing when distributed/collected in a strategic manner.

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 (2003-07; 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). From 1 July to 9 August 2008, the Washington Department of Fish and Wildlife (WDFW) implemented mark-selective Chinook fisheries in Areas 5 and 6 for the sixth consecutive summer. In contrast to their previous five seasons, the Areas 5 and 6 MSFs were managed on season- rather than quota-based criteria, and monitored at a lower intensity. 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 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 5 and 6 mark-selective Chinook fisheries, WDFW's Puget Sound Sampling Unit was tasked with implementing a comprehensive monitoring program during the entirety of their forty-day 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 5 fishery, we tailored sampling efforts to provide coarse in-season estimates of: *i*) the mark rate of the targeted Chinook population (based on test fishing and voluntary trip reports [VTRs]), *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 5 and 6 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 5 and 6 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 6 fishery, we employed a reduced monitoring program, which included sampling for the estimation of: *i*) mark rates (based on VTRs), *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 and/or landed Chinook, and the overall intensity of our sampling efforts. In addition to regular monitoring, we also conducted a pilot study evaluating the feasibility of using VTRs to obtain reliable and cost-effective estimates (i.e., in lieu of test fishing) of the size/mark-status composition of the Chinook encountered during the Areas 5 and 6 MSFs.

In the following pages, we report the results generated through our Areas 5 and 6 monitoring activities. 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 5 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, test fishery, and VTR data—are reviewed and compared with pre-season expectations (i.e., based on Fishery Regulation Assessment Model [FRAM] predictions). Next, we review our Area 6 results, which include only the first two items listed for the Area 5 results presentation sequence. Finally, we summarize our detailed analysis of "enhanced VTR" sampling results in a separate stand-alone section.

Marine Catch Area and Fishery Descriptions

At nearly 1,000 square miles (>2,500 km^2), Marine Areas 5 and 6 encompass the majority of U.S. waters in the Strait of Juan de Fuca (**Figure 1**). Area 5 stretches eastward from the mouth of the Sekiu River (eastern end of Area 4) in the west to the Lyre River in the east, and northward from the Olympic Peninsula to the U.S.-Canada border. Extending from Area 5 in the west to Whidbey Island in the east, and southward from the US-Canada/Area 7 boundaries to Admiralty Inlet, Marine Area 6 encompasses the east-central end of the Strait of Juan de Fuca, including Discovery and Sequim bays. During the summer of 2008 (and as in previous years), however, only the western portion Area 6 (westward of Ediz Hook) was open to Chinook harvest under MSF regulations in order to meet both fishery management and assessment objectives (WDFW 2008a); the entirety of Area 5 was open during the Chinook MSF. While both areas attract local, tourist, and charter-based angling activity during

[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 with catch record card (CRC) data to produce *fishery total* catch and effort estimates for Area 6.

summer months, Area 5 is generally regarded as being more of a "destination" fishery than Area 6. In addition to Chinook salmon, Areas 5 and 6 anglers pursue and encounter coho salmon (*O. kisutch*; also under mark-selective regulations during the 2008 season) and, during odd years, pink salmon (*O. gorbuscha*). During the summer of 2008, Areas 5 and 6 were open under mark-selective Chinook harvest regulations for a grand total of forty days (July 1 to August 9).

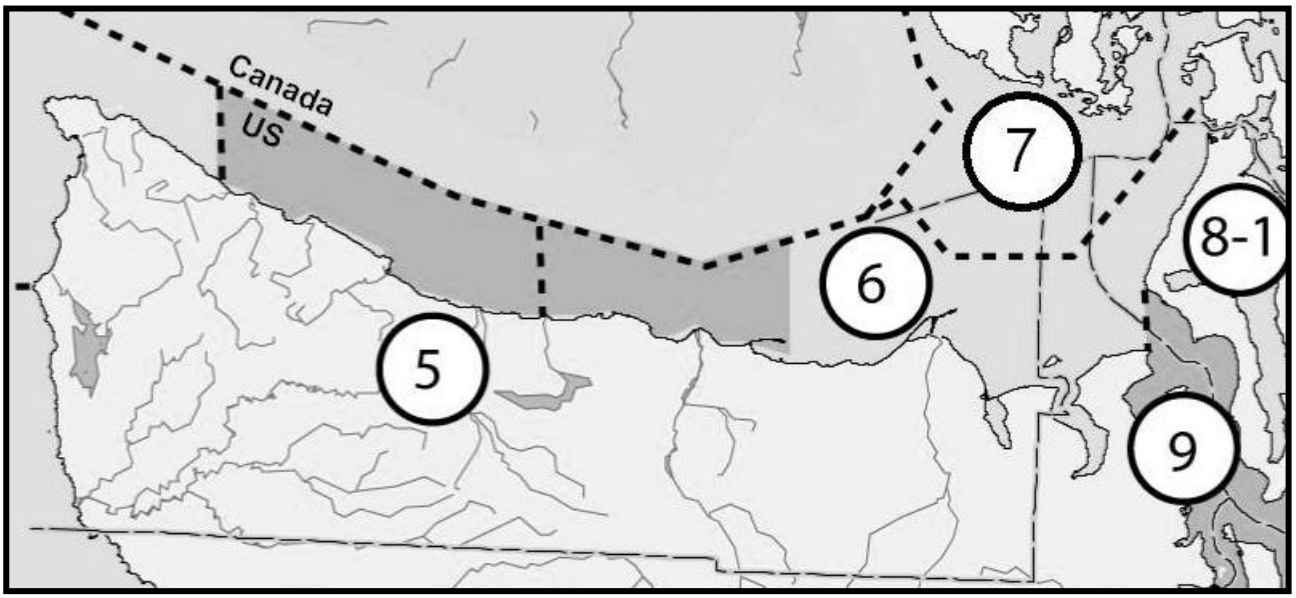

Figure 1. Map of Marine Catch Areas 5 and 6 in the Strait of Juan de Fuca, where the sixth season of the selective Chinook fishery occurred from July 1-August 9, 2008. Areas or sub-Areas (i.e., west of Ediz Hook in Area 6) open under mark-selective Chinook harvest regulations during the summer of 2008 are shaded in dark gray (see 2008/2009 WDFW Sport Fishing Rules for additional details). *Map courtesy of David Bramwell, WDFW.*

AREA 5 METHODS

Monitoring Program Overview

Our sampling program for the Area 5 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 private anglers (**Figure 2**). Relative to the survey design used during Area 5's 2003-07 summer MSF seasons (see WDFW 2008a for a complete description), however, our 2008 approach provided in-season catch estimates based on a reduced dockside-sampling component (i.e., fewer sites and days were sampled; see below for details). While we briefly review the field and analytical methods associated with our Area 5 monitoring efforts here, WDFW (2007b and 2008a) provide comprehensive descriptions of all aspects of our MSF sampling program.

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 one sample day from each of two temporal strata (weekday [Monday-Friday], with $N = 5$ possible sample days; and weekend [Saturday-Sunday], with $N = 2$ possible sample days) during each week of the fishery. On each selected sample day, we selected one access point (i.e., public ramps, boathouses, etc.) from our Area 5 sample frame 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", during which anglers are asked about where their trips will end that day) conducted in previous summers and routinely during the course of the 2008 fishery. Our sample frame included the three boat launch facilities most frequently used to access Area 5 (Olson's Resort—East Docks, Olson's Resort—Ramp and Central Docks, and Van Riper's Resort-South Docks). In prior MSF seasons, we sampled intensively at two sites per day, five (2 weekday, 3 weekend) days per week.

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.

We generated daily estimates of total fishing effort and landed Chinook catch (by mark-status group) by expanding dockside counts to account for the non-sampled effort proportion (i.e., estimated from boat survey data). We then expanded these estimates to obtain stratum-wide (i.e., weekday, weekend), weekly, and ultimately season-wide totals (**Table 1**). In contrast to prior Area 5 MSF assessments, our 2008 survey design did not allow for the estimation of site-to-site and day-to-day variance components. Accordingly, relevant variances associated with fishery-wide parameter estimates could not be produced. To minimize the influence of recall bias on our assessment, we estimated Chinook releases as the difference between retained catch (i.e., from the creel estimate, 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

[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 5 fishery.

"Method 2" approach; e.g., WDFW 2007b). Given that our former "Method 2" 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**).

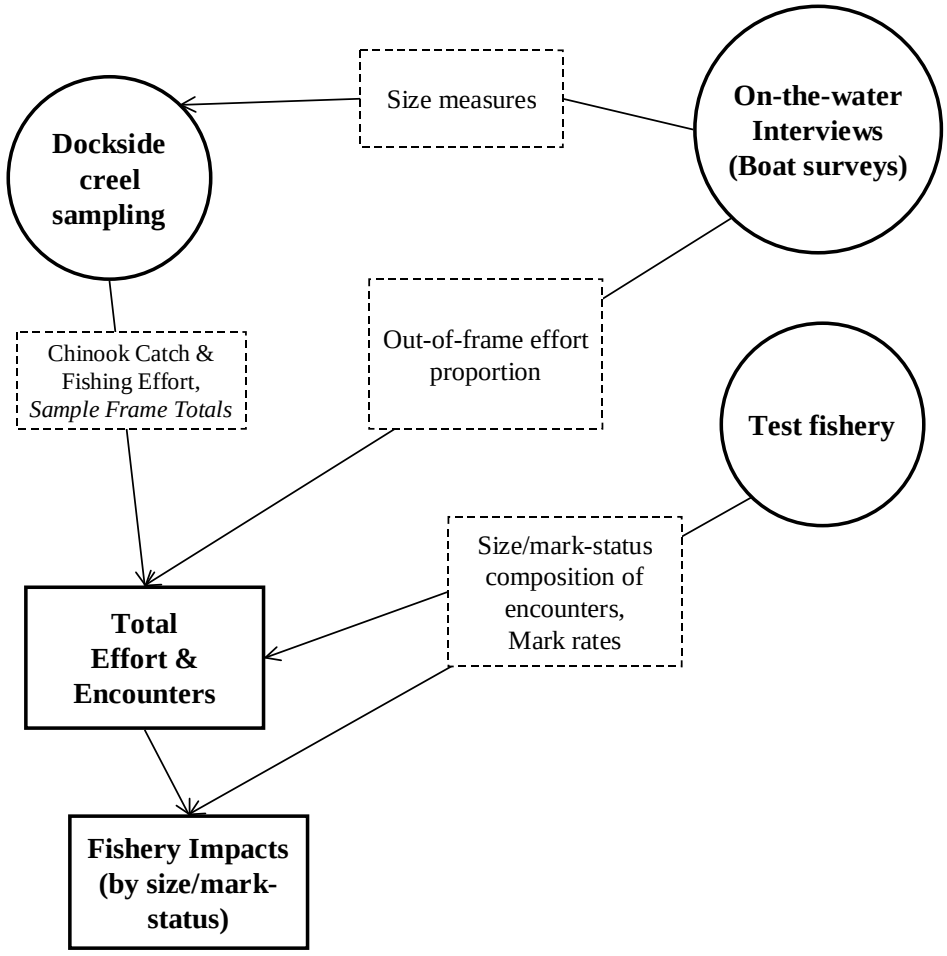

Figure 2. Conceptual diagram of the monitoring plan implemented in Area 5 during the July 1-August 9, 2008 mark-selective Chinook season. Circles represent discrete sampling activities, dashed boxes represent parameters that are estimated using data from a given activity, and solid boxes depict key quantities estimated from the comprehensive plan. 'Encounters' includes both harvested and released Chinook salmon.

The 2008 creel survey was designed to provide coarse in-season estimates of total fishing effort and the number of Chinook harvested and released. Given the reduced sampling effort and associated variance-estimation issues, these estimates are of lower quality than those presented in prior post-season Areas 5 and 6 MSF reports (e.g., WDFW 2008a). While 2003-07 creel results are assumed to be the "best" estimates of catch and effort available (i.e.,

superior to Catch Record Card [CRC] values), we believe the reverse is true for the 2008 season –i.e., CRC estimates will be of higher quality (higher accuracy and precision) compared to our coarse creel survey estimates generated during the 2008 season. Accordingly, final estimates of catch, effort, and total fishery impacts (encounter, mortalities; see below) will be produced when CRC estimates become available.

Finally, it should be noted that in addition to sampling Area 5 anglers according to the design described above ("Intensive sampling" hereafter), extensive Baseline sampling was also conducted so as to not compromise other sampling goals (e.g., 20% CWT harvest sample rate). In brief, Baseline sampling is the main source of biological (length, age, and CWT), catch-rate, and catch-composition data in Puget Sound/Strait of Juan de Fuca fisheries, independent of special studies associated with MSFs (See "AREA 6 METHODS" for a detailed description). While we used these data in catch-composition estimates (length, age, and CWT), Baseline interview results could not be used for fishery-total parameter estimation, due to design constraints. Given the volume of Baseline data collected during the Area 5 fishery (i.e., Baseline n > "Intensive" n), however, we briefly summarize these observations in the present report.

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).

Estimating Fishery Impacts

Total Encounters and Mortalities

We characterized the overall impacts of the Area 5 fishery in terms of season-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 5 and 6 reports, 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 draft 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.

Table 1. Sampling/estimation details on target parameters associated with the overall Area 5 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[2] of harvest	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	Season (40 days)	Examined qualitatively on a finer time scale (weekly) than used in impact estimation.
Overall Fishery Impacts Estimation	Total Chinook encounters and mortalities, by size/mark-status group	Ratios of encounters and mortalities per kept Chinook	N/A	Season (40 days)	The temporal resolution of impact estimates is constrained by that of the test-fishery encounters data.
Coded-wire tag (CWT) Impacts Estimation	Marked/unmarked double-index tag (DIT) encounters and mortalities	N/A	N/A	Season (40 days)	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.

We estimated total Chinook mortality resulting from the fishery by applying assumed mortality rates to the draft 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. Note that these creel-based estimates are preliminary and subject to replacement by CRC-based values.

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.

CWT Impacts

To understand the potential effects of the Area 5 fishery on the CWT program, we estimated the total number of unmarked-tagged Chinook mortalities that may have occurred during its 40-day 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 6 METHODS

Data collection methods used to monitor the Area 6 mark-selective Chinook fishery included dockside angler interviews (with catch sampling) and voluntary trip reports provided by private anglers (from our enhanced VTR effort, as in Area 5, described below). 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 summarized relative catch and effort patterns over the 40-day 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 6 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 6 access-site sample frame included 3 different locations (Freshwater Bay Public Ramp, Port Angeles Public Ramp—West, Port Angeles Public Ramp—Ediz Hook) each of which was visited an average of 21 times during the 40-day season. Site visits lasted 6.3 hours on average and ranged from short (e.g., "no effort" samples) to full-day sampling events. When present, samplers interviewed all (or nearly so) anglers exiting the Area 6 fishery at the selected access site. The interview and catch-sampling procedures employed in Area 6 were identical to those used in Area 5, less the collection of fishing methods information. Thus, Area 6 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

[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. Note also that the sample rate used to estimate DIT encounters was based on the draft 2008 catch estimate; this parameter may change slightly upon finalization of Catch Record Card-based harvest estimates.

read) composition. Samplers also inspected landed Chinook and coho salmon for CWTs using wand detectors and acquired snouts when tags were present; resulting tag data were used to estimate the CWT-based composition (unexpanded) of landed catch.

In contrast to the survey design employed in Area 5, Area 6 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 6 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. Thus, while these descriptors of MSF impacts are not presented in the present document, they will be available at a future time.

VOLUNTARY TRIP REPORT METHODS

In addition to monitoring the Areas 5 and 6 fisheries, we evaluated the feasibility of using a voluntary trip report (VTR) sampling program to obtain estimates of the size/mark-status composition of the pool of Chinook salmon encountered by anglers during MSFs. Our objectives were to determine: *i*) if a dedicated on-site VTR distribution/collection effort could produce a sizeable and representative response from anglers fishing in MSFs, and *ii*) whether the Chinook encounters data (e.g., size/mark-status composition estimates) acquired from VTRs would be similar to those collected by test fishers (Area 5 only). For the first objective, we deemed this "enhanced" VTR effort successful if VTRs provided, at minimum, a larger encounters sample than the test fishery. Our VTR effort was considered successful relative to our second objective if size/mark-status composition estimates derived from VTR and test fishery data were similar.

We took several measures to help ensure the success of our enhanced VTR program. First, we developed a simplified form (i.e., it requires less information than our old form) and assigned a dedicated sampler the duty of distributing forms to every possible angling party at the start of their trip during the 40-day MSF (i.e., to recruit participants on site). The Areas 5 and 6 VTR samplers focused their attention on high-use access sites only and began their shifts early (typically 0500 hours) in order to intercept as many anglers as possible. Additionally, samplers provided participants with a brochure describing the intent of VTRs and their significance to fishery monitoring, and answered VTR-related questions. To increase the response rate, participants were given three options for returning completed VTRs to WDFW: hand-delivering them to samplers, placing them in on-site drop boxes, or sending them via U.S. mail (pre-paid); if they were unsuccessful (i.e., no encounters occurred [harvested *or* released]) on their trip, participants were encouraged to keep their forms for future trips.

To formally assess the success of our enhanced VTR effort, we summarized the extent of VTR participation—measured in terms of both angler trips and salmon encounters represented—and qualitatively compared it to levels observed during past seasons and relative to the test fishery (Area 5 only). We also gauged how well our VTR sample reflected the activities of the total pool of anglers by contrasting VTR and interview-based estimates of

CPUE using a two-sample *t*-test[8] (both areas). Secondarily, we compared the size/mark-status composition of VTR Chinook encounters with those encountered by test fishers in Area 5 using separate Fisher exact tests on mark rates (legal- and sublegal-sized fish combined) and legal-size fractions (marked and unmarked fish combined). Though we also sought to do a single comparison of frequencies observed in the four size/mark-status groups (e.g., using a χ^2 test on a 2 [VTR, TF] x 4 [LM, LU, SM, SU]) contingency table, low (< 2) expected cell frequencies precluded doing so. We conducted all statistical tests and computed their power (where relevant) in the R statistical computing environment (R Core Team 2008).

AREA 5: RESULTS & DISCUSSION

Summary of Sampling Efforts

Sampled Access Sites

Between July 1 and August 9, 2008, we conducted Intensive sampling (i.e., for catch/effort estimation purposes) of the Area 5 recreational fleet via dockside creel surveys at one of three possible sites on a grand total of 12 of the 40 days that the fishery was open (**Table 2**). We interviewed anglers most frequently at the Olson's Resort–Central Ramp and Docks site (7/12 days or 58% of the time) and Olson's Resort–East Docks (4/12 days or 33% of time) site. We also intensively sampled at Van Riper's Resort–South Docks for one day (8% of total). Additionally, samplers conducted Baseline sampling at three different sites (Coho Resort, Olson's Resort, and Van Riper's Resort) on a grand total of 73 site-days during the season (**Table 2**). Considering Baseline and Intensive monitoring efforts together, sampling activities were spread across the three most heavily used sites in a manner proportional to their angling effort contribution. Forty-seven, 12, and 27% of anglers accessing the fishery (i.e., on-the-water survey results; **Appendix D**) from sites in our sample frame (Intensive + Baseline) ended their trips at Olson's, Coho, and Van Riper's resorts (inclusive of sub-sites), respectively; 51, 14, and 34% of all sampling effort (site-days) was expended at each of these respective locations (from **Table 2**). For Intensive sampling only, Olson's–East Docks and Olson's–Central Ramps and Docks were sampled at a higher rate, and Van Riper's–South Docks at a lower rate, than their estimated size measures suggest should have occurred (**Appendix E**).

In total, our Area 5 Intensive sampling efforts allowed us to directly sample 920 completed angler trips and 388 completed boat trips; Baseline efforts yielded an additional 1,708 boat trip and 3,876 angler trip observations. In combination, these efforts yielded samples from 1,003 Chinook salmon harvested (157 from Intensive, 846 from Baseline) from Area 5 between July 1st and August 9th (**Appendix C**).

[8] Because VTR results encompass only anglers successfully encountering (retained or released) Chinook, dockside interview results were subset by the same criteria before making this comparison. Additionally, it should be noted that this is a liberal test (i.e., more prone to a Type-I error than α would suggest) given that dockside and VTR samples are not truly independent (i.e., some VTR providers were also interviewed at dockside).

On-the-Water Survey Summary

During the 40-day period that Area 5 was open under mark-selective regulations, we conducted 823 on-the-water interviews (i.e., total anglers intercepted [*n* = 311 boats]) over a total of two weekday (9 and 18 July) and one weekend (12 July) boat surveys (**Appendix D**). These surveys yielded quantitative details about the set of sites anglers used to access Area 5 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, Olson's Resort (percent of *all* Area 5 anglers: 28% Ramp-and-Docks sub-site, 15% East Docks sub-site, 4% West Docks sub-site) was the site that anglers most frequently reported using to access Area 5, followed closely by Van Riper's Resort (18% South Docks sub-site, 9% North Docks sub-site). Pooled over all surveys, 39% of all anglers interviewed during boat surveys indicated that their trip would end at either a private or never-sampled launch site (relative to Intensive sites only [Olson's–East, Olson's–Ramp and Docks, Van Riper's–South]; **Appendix D**). With the exception of the Coho Resort, which many anglers thought was closed at the start of the season, the relative "size" of sampled access sites and the proportion of total effort captured in our sample frame remained relatively constant over the five surveys (**Appendix E**).

Table 2. List of sites sampled, with the number of sampling events (site-days), during the Area 5 July 1-August 9, 2008 mark-selective Chinook fishery.

Area 5 Sampled Sites	Intensive Sampling Site-Days[1]			Baseline Sampling Site-Days[1]		
	July	Aug.	Total	July	Aug.	Total
Olson's Resort--East Docks	2	2	4	0	0	0
Olson's Resort--Ramp & Docks	5	2	7	0	0	0
Olson's Resort--General[2]	0	0	0	26	7	33
Coho Resort	0	0	0	12	0	12
Van Riper's--General[2]	0	0	0	22	6	28
Van Riper's South	1	0	1	0	0	0
TOTAL	**8**	**4**	**12**	**60**	**13**	**73**

[1]The duration of an Intensive site-day encompasses the entire dawn-dusk period (~16 hours), whereas Baseline site-days averaged 6.3 hours in length (i.e., ranging from "no effort" site-checks to full eight-hour shifts).
[2]For Baseline sampling activities, the "General" category at Olson's and Van Riper's resorts encompasses all within-resort sub-sites defined for Intensive sampling purposes.

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 13,004 angler trips between July 1 and August 9, 2008 (**Table 3**). In terms of within-season trends, angler participation was generally higher during the first half of the season but varied considerably from week to week (**Figure 3**); anglers completed an average

of ~2,200 trips during each week that the Area 5 MSF was open. At 10,000 fewer angler trips than the five-year (2003-07) season-total average (23,339, range: 18,830-30,115), the preliminary[9] effort estimate for Area 5 during the 2008 season was considerably lower than what has been estimated for past years (WDFW et al. 2008a). Anecdotal accounts suggest that the summer of 2008's record-high fuel prices were the main cause of this pattern.

In contrast to effort patterns, Chinook salmon catch rates (CPUE, landed Chinook per angler trip) were the highest documented since mark-selective regulations were first instituted in Area 5 (2003-07 mean CPUE = 0.12 [range: 0.06–0.18]; WDFW 2008a). For the entire July 1-August 9, 2008 season, CPUE averaged 0.22 landed Chinook per angler trip, and ranged from 0.10 (week 29 [14-20 July]) to 0.39 (week 30 [21-27 July]) across weeks. Relative, within-season patterns demonstrate that CPUE was low during the first three weeks (mean CPUE = 0.12) and high during the last three weeks (mean CPUE = 0.34) of the fishery (**Figure 4**).

Given the combination of record low effort and record high catch rates, the draft Area 5 Chinook harvest estimate—2,819 Chinook for the 40-day season (**Table 3**)—was comparable to the recent five-year MSF average (2003-07 mean: 2,757 Chinook; WDFW 2008a). On average, anglers harvested 470 (range: 240-917) marked Chinook per week and 70 per day, with the greatest number of removals occurring during week 31 (28 July–3 Aug.; **Figure 5**). Finally, in addition to Chinook salmon, anglers harvested an estimated three marked coho salmon (*O. kisutch*) and 21 chum salmon (*O. keta*) during the summer 2008 MSF Chinook season (**Appendix H**).

In addition to harvesting 2,819 Chinook salmon, we preliminarily estimate that anglers participating in the Area 5 MSF caught and released an additional 479 marked and 2,199 unmarked Chinook salmon (**Table 3**, **Figure 5**)[10]. Thus, on a season-total level anglers released an estimated 5 marked and 16 unmarked Chinook for every 20 marked, harvested Chinook. Combining these releases with harvest estimates, we estimated that anglers encountered a grand total of 5,496 Chinook in Area 5 during its 40-day mark-selective season (**Table 3**). For more on fishery impacts from a total encounters perspective, see the section entitled *Overall Fishery Impacts*.

[9] The 2008 creel estimates presented in this report and associated inter-annual comparisons should be regarded as preliminary, due to uncertainty associated with estimates generated by the reduced 2008 sampling design; draft 2008 estimates of catch (and associated derivatives [releases, encounters, and mortalities]) and effort will be supplanted by final Catch Record Card (CRC) values once they become available.

[10] Total Chinook releases were estimated using the bias-corrected "Method 2" encounters estimation approach (Conrad and McHugh 2008). For 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**.

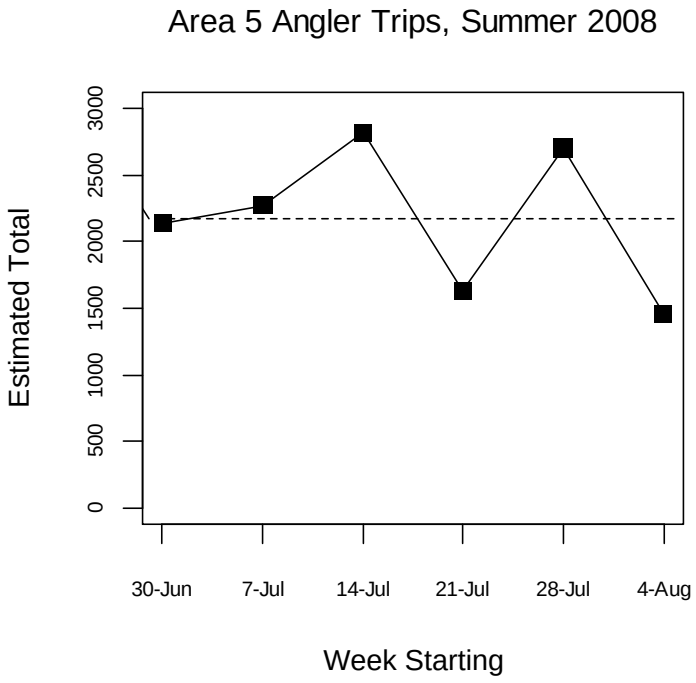

Figure 3. Temporal patterns in weekly total fishing effort during the Area 5, July 1-August 9, 2008 mark-selective Chinook fishery. The horizontal dashed line corresponds to the season-wide weekly average.

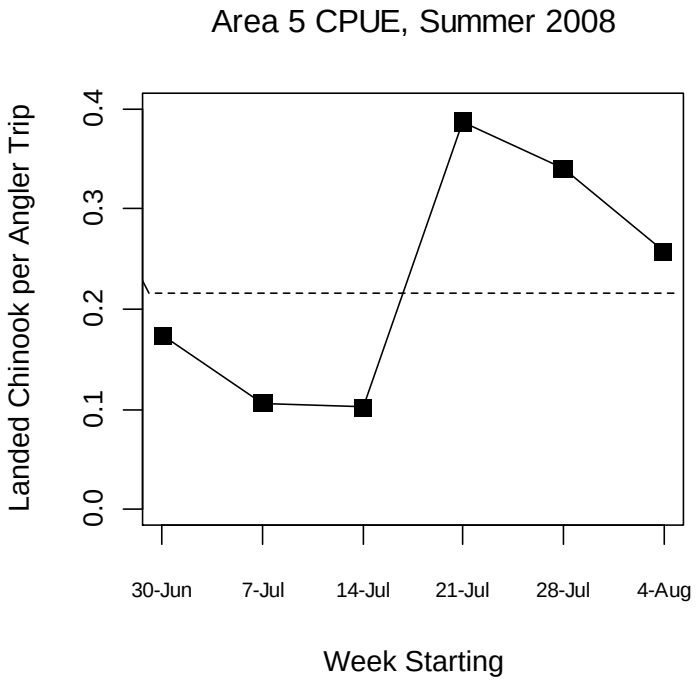

Figure 4. Temporal patterns in CPUE (landed Chinook per angler trip, weekly estimates) during the Area 5 July 1-August 9, 2008 mark-selective Chinook fishery. The horizontal dashed line corresponds to the season-wide CPUE.

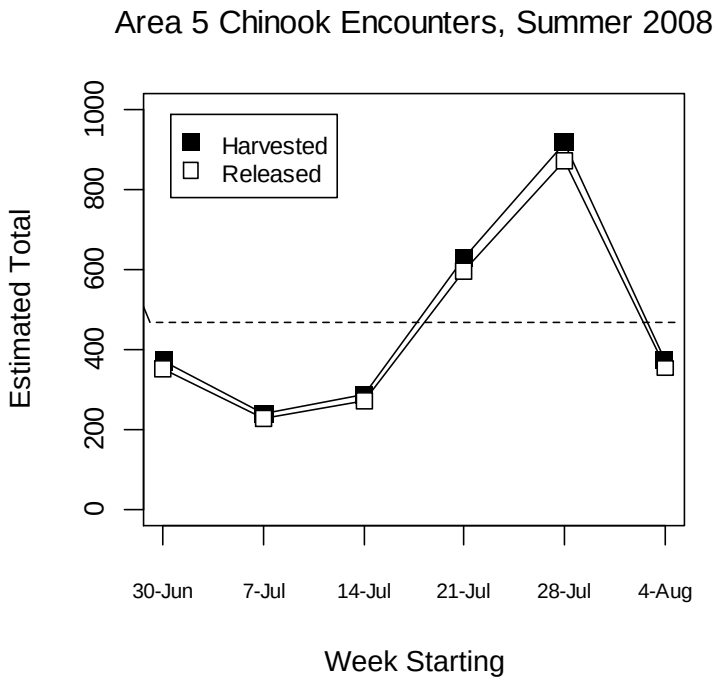

Figure 5. Temporal patterns in weekly total Chinook harvest and releases during the Area 5, July 1-August 9, 2008 mark-selective Chinook fishery.

Table 3. Preliminary post-season estimates of total fishing effort and the total number of salmon kept and released during the Area 5, 1 July–9 August, 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]		Chinook Encounters Total
				Boats	Anglers	AD	UM[3]	AD	UM	
July	27	30-Jun	06-Jul	893	2,139	372	0	63	290	726
	28	07-Jul	13-Jul	925	2,272	240	0	41	187	468
	29	14-Jul	20-Jul	1,271	2,815	288	0	49	224	561
	30	21-Jul	27-Jul	792	1,627	629	0	107	491	1,226
	31	28-Jul	03-Aug	1,207	2,698	917	0	156	715	1,788
August	32	04-Aug	10-Aug	622	1,454	373	0	63	291	727
Season Total:				5,710	13,004	2,819	0	479	2,199	5,496

[1] Estimated boats, anglers, and retained salmon catch were estimated from interview data.
[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] Although no unmarked Chinook were observed during Intensive sampling, six (3 measured) were documented during Baseline sampling; if marked/unmarked proportions are estimated from pooled Baseline and Intensive catch observations and used to partition total harvest (2,819), an estimated 17 UM Chinook were harvested during the fishery.

Characteristics of Harvested Chinook

Length and Age.— Over the course of the 40-day Area 5 MSF, 1,003 retained Chinook were sampled at dockside (**Table 4**). Scales were taken from all of these fish, and they were also measured (total and fork lengths [TL, FL]) and examined for the presence of a CWT. Among sampled individuals, marked Chinook lengths were bimodally distributed and averaged 72.4 cm (range: 52.2 -99.2, SD = 9.6; **Figure 6**). Nearly all (98.4%) of these fish were of legally harvestable size (≥ 22 in [56 cm]).

Table 4. Summary of length samples collected during dockside angler interviews from retained Chinook salmon, Area 5, July 1 – August 9, 2008.

	Number Sampled		
Mark Type	**Legal-size**	**Sublegal-size**	**Total**
Marked	984	16	1,000
Unmarked	3	0	3
Total	987	16	1,003

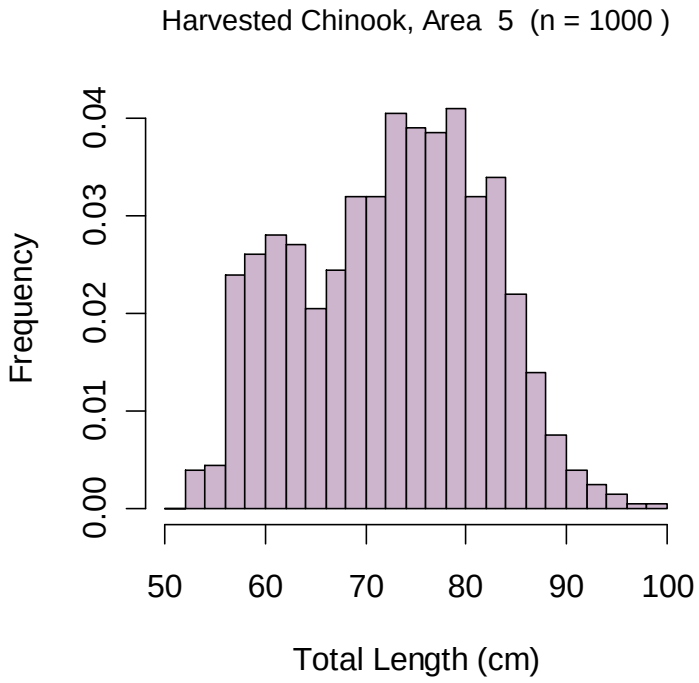

Figure 6. Length-frequency distributions of retained marked Chinook sampled at dockside during the Area 5, July 1-August 9, 2008 mark-selective Chinook fishery.

Of scales collected from the 1,003 Chinook sampled at dockside, 935 (93%) were successfully aged. From this, we found that the majority of the retained Chinook were age-3 (brood year 2005) individuals (78%); age-4 fish constituted another 15% of the remaining sample, though a few age-1, -2, and -5 fish were also sampled. Almost all (95%) of the retained Chinook were subyearling outmigrants.

CWT Samples.—In total, 86 coded-wire tags were recovered from the Area 5 fishery (**Appendix G**). Fifty-nine percent of these recoveries came from a combination of Puget Sound rearing facilities, with 24%, 17%, and 17% coming from each of the respective North, Central, and South Puget Sound regions (**Table 5**). Ranked from greatest to least, Columbia Basin (Lower and Mid-Columbia and Snake rivers, 21/35), Hood Canal (11/35), and Canadian (2/35) facilities were the source of the remaining 35 CWTs. Though no single release location and/or rearing facility made up more than 10% of the recovery total, recoveries associated with the Samish Hatchery in North Puget Sound (10% of total) and Spring Creek National Fish Hatchery in the Lower Columbia River (9% of total) were present at noteworthy levels. Finally, 37 of the 86 CWTs (43%) were associated with DIT releases.

Table 5. Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 5 July 1-Aug. 9, 2008 mark-selective Chinook fishery. The field "No. DITs" corresponds to the number of tags that belonged to double-index tag groups. Note, two orphan tags (Nos. 633578 and 612507) were also recovered.

Release Region[1]	Release Site	Rearing Location	CWTs Recovered	No. DITs
British Columbia-Fraser R.	Chilliwack River	Chilliwack River Hatchery	2 (2.3%)	2
British Columbia-Vanc. Isl.	Puntledge River	Puntledge River Hatchery	1 (1.2%)	
Hood Canal	Finch Creek	Hoodsport Hatchery	3 (3.5%)	
	John Creek	RFEG 6 Hood Canal	3 (3.5%)	
	Purdy Creek	George Adams Hatchery	3 (3.5%)	3
	Skokomish River	Ricks Pond	2 (2.3%)	
Puget Sound-North	Baker River	Unreported	1 (1.2%)	
	Friday Creek	Samish Hatchery	9 (10.5%)	9
	N.F. Nooksack River	Kendall Creek Hatchery	1 (1.2%)	1
	Tulalip Creek	Bernie Gobin Hatchery	2 (2.3%)	
	Wallace River	Wallace River Hatchery	3 (3.5%)	1
	Whitehorse Springs	Whitehorse Pond	5 (5.8%)	
Puget Sound-Central	Big Soos Creek	Unreported	4 (4.7%)	4
		Soos Creek Hatchery	1 (1.2%)	1
	Gorst Creek	Gorst Creek Rearing Pond	2 (2.3%)	
	Green River	Icy Creek Hatchery	1 (1.2%)	
	Grovers Creek	Grovers Creek Hatchery	4 (4.7%)	4
	Grovers Creek Hatchery	Grovers Creek Hatchery	1 (1.2%)	1
	Issaquah Creek	Issaquah Hatchery	2 (2.3%)	
Puget Sound-South	Chambers Creek	Chambers & Garrison creeks	2 (2.3%)	
		Garrison Hatchery	3 (3.5%)	
	Clear Creek	Nisqually Hatchery	3 (3.5%)	3
	Kalama Creek	Kalama Creek Hatchery	1 (1.2%)	
	Voight Creek	Voights Creek Hatchery	6 (7.0%)	
Columbia River	Clackamas River	Clackamas Hatchery	1 (1.2%)	
	Columbia River - General	Unreported	2 (2.3%)	
		Wells Hatchery	1 (1.2%)	
	Cowlitz River	Cowlitz Salmon Hatchery	1 (1.2%)	
	Elochoman River	Elochoman Hatchery	1 (1.2%)	
	Kalama River	Kalama Fals Hatchery	1 (1.2%)	
	Snake R. (Below Grande Ronde River)	Lyons Ferry Hatchery	4 (4.7%)	
	Spring Creek	Spring Creek National Fish Hatchery	8 (9.3%)	8
	Umatilla River	Umatilla Hatchery	1 (1.2%)	
	Wenatchee River	Dryden Pond	1 (1.2%)	
		Grand Total	86	37

[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 5 throughout the course of its July 1 and August 9, 2008 Chinook MSF season. In total, they spent 140 hours and 25 out of 40 possible days on the water pursuing Chinook salmon (**Table 7**). Based on dockside interview results for anglers reporting successful Chinook salmon encounters (n = 745 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 25 days of fishing, test fishers trolled using downriggers 93.6% of the time, mooched (i.e., used the "weight-and-bait" method) 3.4% of the time, trolled with divers 2.2% of the time, and jigged for the remainder (**Table 6**). Their fleet counterparts pursued Chinook using a similar fishing-methods composition, with downrigger trolling, mooching, diver trolling, and jigging making up 90.0, 7.3, 2.3, and 0.5% of the responses to our fishing methods interview question.

Table 6. Fishing methods employed by private recreational anglers (from dockside interviews, based on number of responses to fishing methods question, n = 745) and test fishers (based on hours fished, n = 140) during the Area 5 July 1-August 9, 2008 mark-selective Chinook fishery.

Month	Stat. Week	DR		WB		Diver		Jig	
		Test Boat	Fleet	Test Boat	Fleet	Test Boat	Fleet	Test Boat	Fleet
July	27	100.0%	83.4%	0.0%	9.9%	0.0%	4.4%	0.0%	2.2%
	28	95.2%	87.7%	0.0%	8.0%	0.0%	4.3%	4.8%	0.0%
	29	100.0%	90.4%	0.0%	7.0%	0.0%	1.8%	0.0%	0.9%
	30	90.0%	92.5%	6.7%	5.3%	3.3%	2.3%	0.0%	0.0%
	31	89.7%	92.9%	6.9%	6.4%	3.5%	0.7%	0.0%	0.0%
Aug.	32	86.7%	92.9%	6.7%	7.1%	6.7%	0.0%	0.0%	0.0%
Season Average		**93.6%**	**90.0%**	**3.4%**	**7.3%**	**2.2%**	**2.3%**	**0.8%**	**0.5%**

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

As a result of 25 days of fishing, test fishers encountered 50 total Chinook salmon in Area 5. Twenty-nine (58%) of these fish were legal-sized and marked (LM), 17 (34%) were legal-sized and unmarked (LU), one (2%) was sublegal-sized and marked (SM), and three (6%) were sublegal-sized and unmarked (**Table 7**). Thus, with 60% of all Chinook encountered being marked (63% for legal-sized fish only), the Area 5 mark rate was relatively high. This is especially true given that overall (i.e., legal and sublegal encounters combined) mark rates have averaged only 46% (range: 34-58%) over the past five MSF seasons (2003-07; WDFW 2008a). Additionally, the majority of test fishery encounters were of legal size (92%, marked and unmarked, combined). Combining length and mark-rate trends, the legally harvestable proportion of encountered Chinook (i.e., marked *and* $\geq$22 in [56 cm]) averaged 58% for the

season. Ultimately, test-fishery-based estimates of Chinook encounters composition were comparable to values estimated from the n = 73 usable VTRs returned during the Area 5 fishery (e.g., overall mark rate: 60% [test fishery] vs. 53% [VTRs]); see *VOLUNTARY TRIP REPORT RESULTS & DISCUSSION* for a more detailed evaluation of this result and associated data (e.g., **Table 18**).

Table 7. Chinook encounters by size/mark-status group for the July 1-August 9, 2008 Area 5 test fishery. Values in parentheses reflect the variance about proportional season-total contributions of a particular size/mark-status group to total Chinook encounters.

Month	Stat Week	Fishing Effort		Legal		Sublegal		Total
		Days	Hours	AD	UM	AD	UM	
July	**27**	3	18.0	3	3	0	0	6
	28	4	21.0	7	4	0	0	11
	29	5	27.0	4	1	0	0	5
	30	5	30.0	7	5	1	0	13
	31	5	30.0	4	2	0	3	9
August	**32**	3	14.0	4	2	0	0	6
Season Total		**25**	**140**	**29**	**17**	**1**	**3**	**50**
Size/mark-status composition:				0.580 (0.005)	0.340 (0.005)	0.020 (0.000)	0.060 (0.001)	
Legal size mark rate:				0.63 (0.005)				
Overall mark rate:				0.60 (0.005)				

During the Area 5 fishery, the marked and unmarked Chinook salmon sampled by test fishers were large on average (**Figure 7**). Overall, these fish (marked and unmarked, combined) averaged 76.3 cm (SD = 12.1 cm) and ranged from 45.5-96.8 cm in total length (TL); there was no difference in marked and unmarked Chinook total length (t = -0.8, df = 33, P = 0.41). Of the 50 Chinook encountered and sampled by test fishers, most (44 of total: 26 AD and 18 UM) had scales that were successfully aged. 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 dominating (59-96% of total) both samples (**Appendix F**). Additionally, very few (4%) of the test fishery encounters were yearling outmigrants.

Other Fish Species Encountered

Though they fished exclusively for Chinook salmon, test fishers caught 14 fish belonging to five other non-salmonid fish species during their Area 5, summer 2008 sampling efforts (**Table 8**). While lingcod made up more than a third of all non-Chinook encounters, the remaining encounters were uniformly split across the four other species.

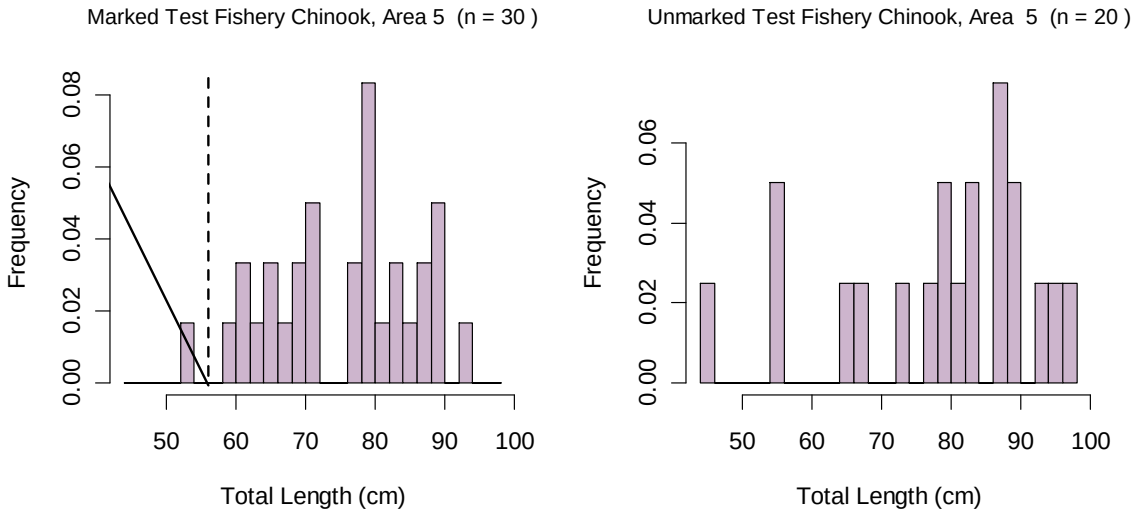

Figure 7. Length-frequency distributions of marked (*left panel*) and unmarked (*right panel*) Chinook encountered by test fishers during the Area 5 summer 2008 mark-selective Chinook fishery. The dashed vertical line in the length-frequency histograms for marked Chinook corresponds to the legal size limit (22 in or 56 cm).

Table 8. Test fishery catches of species other than Chinook salmon during the Area 5 July 1-Aug. 9, 2008 mark-selective Chinook fishery.

Common Name (*Scientific Name*)	**Area 5 Total**
Pacific halibut (*Hippoglossus stanolopis*)	2
lingcod (*Ophiodon elongatus*)	5
black rockfish (*Sebastes melanops*)	2
copper rockfish (*Sebastes caurinus*)	2
spiny dogfish shark (*Squalus acanthias*)	3
Grand total (n = 5 species)	**14**

Overall Fishery Impacts

Total Encounters and Mortalities

We derived draft size/mark-status group-specific estimates of Chinook encounters from a combination of preliminary dockside sampling results (i.e., size/mark-status group-specific harvest estimates derived from data in **Tables 3** and **4**) and test fishery size/mark-status composition data (**Table 7**; see **Appendix A** for computational details). In total, we estimated that anglers fishing in Area 5 encountered a total of 3,188 LM, 1,869 LU, 110 SM, and 330 SU Chinook (5,496 total) between July 1 and August 9, 2008 (**Tables 9** and **10**). 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 a preliminary estimate of 3,240 total mortalities (**Tables 9** and **11**). Eighty-seven percent of this estimate of total mortality was due to the direct harvest of legal-marked Chinook.

Unmarked Chinook mortality totaled 346 fish (280 legal, 66 sublegal), which corresponds to less than one unmarked mortality per eight legal-marked Chinook kept. In addition, given the 50 (29 LM, 7 LU, 1 SM, 3 SU) Chinook caught and released by test fishers, an estimated 8 (4 marked, 4 unmarked) Chinook may have died due to our sampling activities. Note that all estimates of fishery impacts affected by creel data are subject to revision upon the finalization and acceptance of 2008 CRC catch totals.

Table 9. Summary of preliminary fishery impact estimates for the July 1-August 9, 2008, Area 5 mark-selective Chinook fishery. Values may not add up perfectly due to rounding error.

Size/mark-status group	Encounters	No. Retained	No. Rel'd	Rel. Mort. Rate	Rel. Mort.	Total Mortality
Legal marked	3,188	2,773	414	0.15	62	2,836
Legal unmarked	1,869	0[a]	1,869	0.15	280	280
Sublegal marked	110	45	65	0.20	13	58
Sublegal unmarked	330	0[a]	330	0.20	66	66
All groups combined	**5,496**	**2,819**	**2,678**		**421**	**3,240**

[a] Though no unmarked Chinook were observed during Intensive sampling, six (3 of which were measured) were documented during Baseline sampling.

FRAM versus Creel Comparison

Observed Area 5 impacts (i.e., draft 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-marked Chinook but no other size/mark-status group. For instance, FRAM predicted that a total of 3,511 legal-marked Chinook (3,300 kept and 211 released) would be encountered by anglers participating in the fishery, our field surveys indicate that 3,188 legal-marked Chinook (2,773 kept, 414 released) may have actually been encountered (**Figure 8**, **Table 10**). In contrast, differences between model predictions and field estimates of fishery impacts (encounters and mortalities) were striking for the three other size/mark-status categories (i.e., legal-unmarked; sublegal-marked and -unmarked); FRAM values were substantially (60+%) greater than field estimates in all cases (**Figure 8**, **Tables 10** and **11**). In the extreme case, we estimated sublegal-marked Chinook encounters at 110 based on angler interviews whereas the FRAM-predicted equivalent was 4,040 (i.e., 3,575% higher). In sum, while Area 5 catches were similar to those expected at the start of the season, the handling-and-release impacts of this fishery were far less than anticipated.

Table 10. Comparison of modeled (i.e., using FRAM, model run 2108) and preliminary creel estimates of total Chinook encounters for the Area 5, July 1-Aug. 9, 2008 mark-selective Chinook fishery.

Data Source	Group	Total Encounters	Legal	Sublegal	Landed Only
FRAM Encounters	Unmark.	4,486	2,996	1,490	60
	Mark.	7,551	3,511	4,040	3,300
	Total	12,037	6,507	5,530	3,360
	% Mark.	63	54	73	98
Estimated (Creel) Encounters	Unmark.	2,199	1,869	330	0[a]
	Mark.	3,298	3,188	110	2,819
	Total	5,496	5,057	440	2,819
	% Mark.	60	63	25	100

[a] Though no unmarked Chinook were observed during Intensive sampling, six (3 of which were measured) were documented during Baseline sampling.

Table 11. Comparison of modeled (i.e., using FRAM, model run 2108) and preliminary creel estimates of total Chinook mortalities for the Area 5, July 1-Aug. 9, 2008, mark-selective Chinook fishery.

	FRAM Chinook Mortalities			Estimated Chinook Mortalities		
Mortality Category	Unmark.	Mark.	Total	Unmark.	Mark.	Total
Total (Landed + Released)	802	4,305	5,107	112	2,926	3,038
Released Legal	444	197	641	112	62	174
Released Sublegal	298	808	1,106	0	45	45
Landed Only	60	3,300	3,360	0[a]	2,819	2,819

[a] Though no unmarked Chinook were observed during Intensive sampling, six (3 of which were measured) were documented during Baseline sampling.

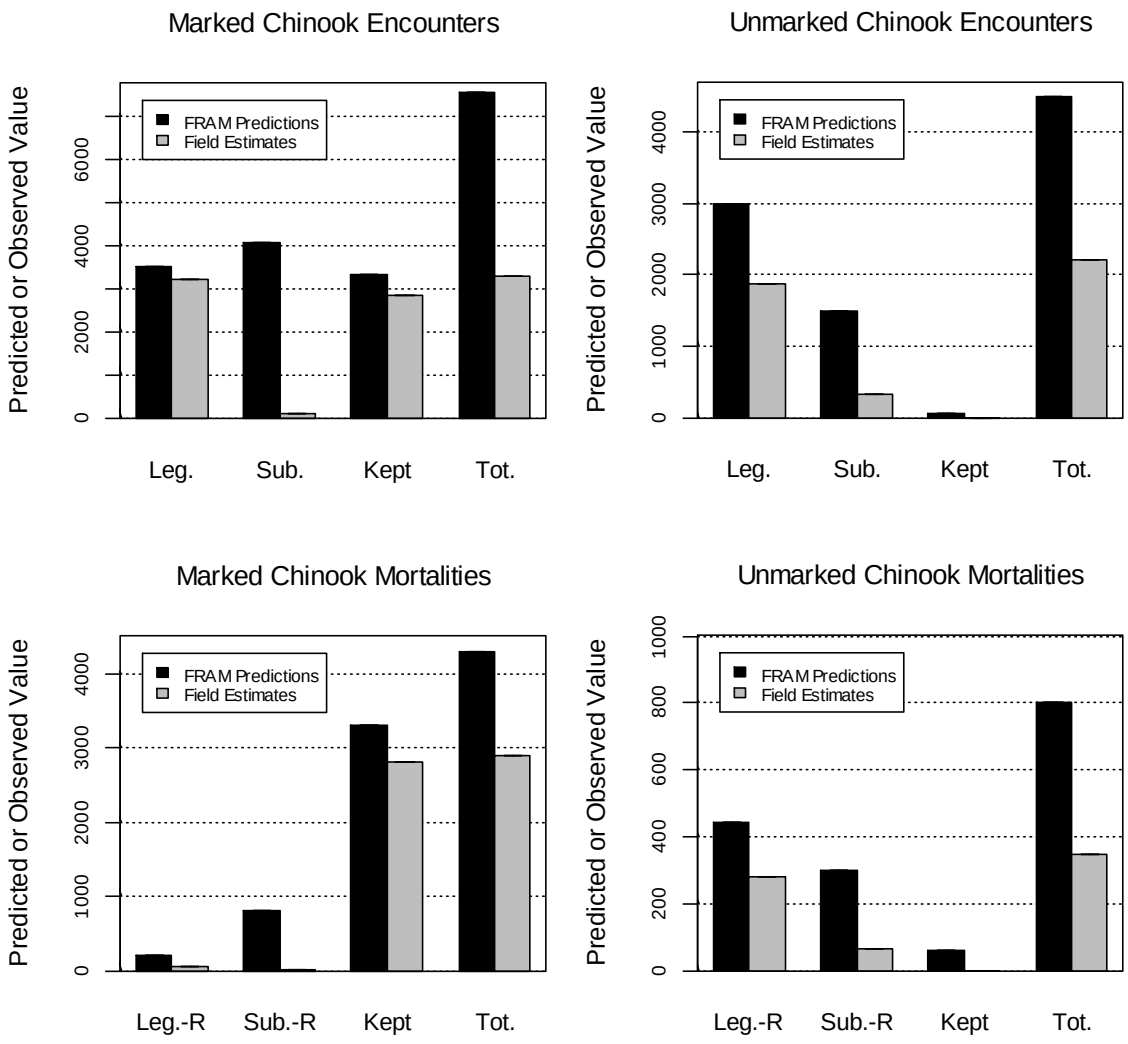

Figure 8. Comparison of modeled (i.e., using FRAM, model run 2108) and preliminary creel estimates of total marked (*left column*) and unmarked (*right column*) Chinook encounters (*upper row*) and mortalities (*lower row*) the Area 5, July 1-Aug. 9, 2008, mark-selective Chinook fishery. *x*-axis labels 'Leg.', 'Sub.' and 'Tot.' correspond to Legal, Sublegal, and Total, whereas the suffix '-R' (mortality plots only) denotes Released.

Estimated CWT-DIT Impacts

Of the 86 coded-wire tags recovered during the summer 2008 Area 5 mark-selective Chinook fishery, 37 belonged to double-index tag (DIT) release groups (**Table 12**). 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 5 fishery. In total, we estimated that 107 unmarked-DIT Chinook were caught and released during the fishery. Given an *sfm* rate of 0.10 for the estimated unmarked DIT encounters, we estimate that as many as 11 of these fish may have died after being released.

Table 12. Summary of preliminary double-index tagged (DIT) Chinook harvest estimates, and estimated total mortality of unmarked DIT Chinook due to hook-and-release impacts resulting from the Area 6 July 1-August 9, 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	2004 2005	1 2	2.8 5.6	5.13 10.25	2.81 5.64	0.28 0.56	0.05 0.10
Grovers Creek Hatchery	2004 2005	1 4	2.8 11.3	5.13 20.50	3.18 14.71	0.32 1.47	0.07 0.35
Chilliwack R. Hatchery	2005	2	5.6	10.25	5.72	0.57	0.11
Kendall Creek Hatchery	2005	1	2.8	5.13	2.83	0.28	0.05
Nisqually Hatchery	2005	3	8.5	15.38	9.52	0.95	0.19
Samish River Hatchery	2005	9	25.4	46.13	23.06	2.31	0.38
Soos Creek Hatchery	2004 2005	1 4	2.8 11.3	5.13 20.50	2.81 11.55	0.28 1.16	0.05 0.22
Spring Creek NFH	2005	8	22.5	41.00	22.72	2.27	0.42
Wallace River Hatchery	2005	1	2.8	5.13	2.86	0.29	0.05
TOTAL		**37**	**104.3**	**189.64**	**107.40**	**10.74**	**2.04**

AREA 6: RESULTS & DISCUSSION

Summary of Sampling Efforts

Between July 1st and August 9th, 2008, samplers staffed three different Area 6 access sites for Baseline sampling (**Table 13**). Each site was visited on an average of 21 days during the fishery, and samplers most frequently sampled at the Ediz Hook Ramp (Port Angles Public Ramp; 52.4% of time), followed by Freshwater Bay (30.2%), and the Port Angeles West Ramp (17.5%). Over all sites and days, visits lasted an average of 6.3 hours during the course of the season.

Table 13. List of sites sampled, with the number of sampling events (site-days), during the Area 6 July 1-Aug. 9, 2008 mark-selective Chinook fishery.

Area 6 Dockside Sample Sites	Sample days per month		Sample Days	% of total
	July	Aug.		
Freshwater Bay Ramp	16	3	19	**30.2%**
Port Angeles Public Ramp, Ediz Hook	24	9	33	**52.4%**
Port Angeles West Ramp	7	4	11	**17.5%**
TOTAL	**47**	**16**	**63**	**100.0%**

Fishery Characteristics

Observations of Fishing Effort and Chinook Catch

From July 1 to August 9, 2008, samplers interviewed 1,574 anglers participating in the Area 6 Chinook MSF. Based on a summation of sample observations made across sites (i.e., taken as an index of fishery-total effort patterns), weekly angling effort was initially low and then increased to a peak, which occurred during the latter part of mid-to-late July (statistical week 30; **Table 14**, **Figure 9**). Effort observations then resumed the levels documented for early half of the fishery. On average, we sampled 262 anglers (148 boat parties) during each week.

Anglers fishing in Area 6 during 2008 experienced above-average success (landed Chinook per angler trip, CPUE), relative to the past five MSF seasons (2003-07). In particular, one in five (CPUE: 0.22) anglers successfully landed Chinook during the 2008 fishery, whereas one in six did, on average, during the previous five seasons (2003-07 mean CPUE: 0.16 [range: 0.10-0.23]; WDFW 2008a). Within the 2008 season, CPUE was high during the first three weeks, peaked during the second week of July at 0.35, and then dropped off continuously over the latter half of the season (**Figure 10**). Weekly success rates reached their lowest levels during the last week of the season when only one in 16 (CPUE = 0.06) Area 6 anglers successfully landed a Chinook.

Across all interviews, samplers observed Area 6 anglers land a total of 350 Chinook, with virtually all (>98%, 345/350) of these fish being marked. The nearly 1,600 interviewed

anglers also reported releasing a total of 259 Chinook (5 marked, 253 unmarked, and 1 with unknown mark status; **Table 15**). On a weekly basis, samplers observed as few as 14 to as many as 102 retained Chinook, and as few as 28 to as many as 68 released Chinook over the course of the 40-day fishery. Nearly a third (28%) of all encounters sampled (i.e., observed harvest) or enumerated (i.e., reported releases) during the season occurred during the second week of July (28; **Figure 11**).

In total, interviewed anglers encountered 609 known (i.e., identified or reported to species during interviews) Chinook salmon during the Area 6 summer selective fishery. Finally, while Area 6 anglers kept only Chinook salmon, they released one unmarked coho salmon (*O. kisutch*), six sockeye salmon (*O. nerka*), and 1 chum salmon (*O. keta*; **Table 15**).

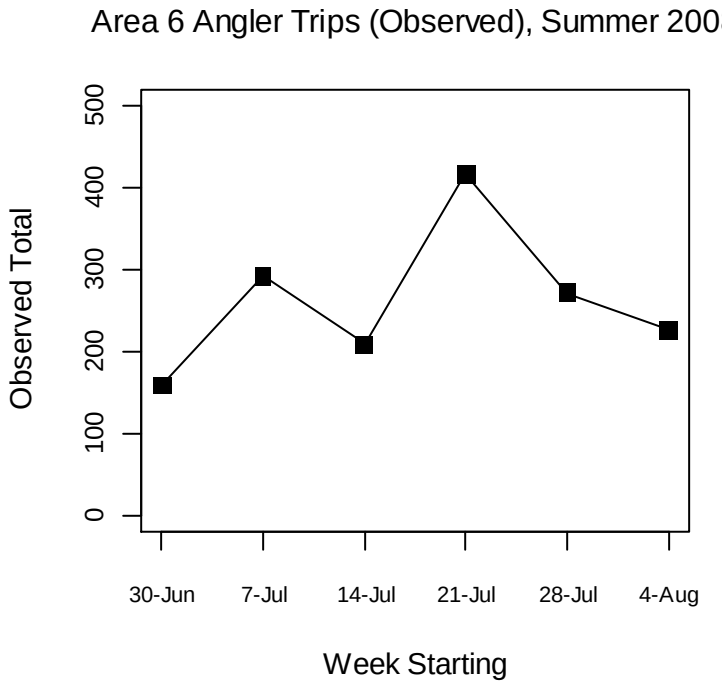

Figure 9. Temporal patterns in fishing effort during the Area 6, July 1-Aug. 9, 2008 mark-selective Chinook fishery. Note: displayed values are sample observations (i.e., summed across sampled sites) and not fishery-total estimates.

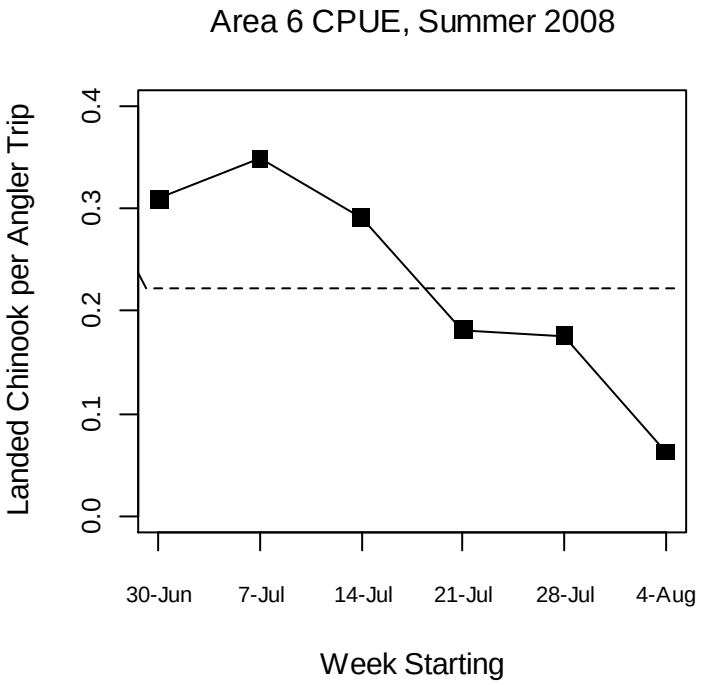

Figure 10. Temporal patterns in CPUE (landed Chinook per angler trip, weekly estimates) during the Area 6 July 1-Aug. 9, 2008 mark-selective Chinook fishery. The horizontal dashed line corresponds to the season-wide CPUE.

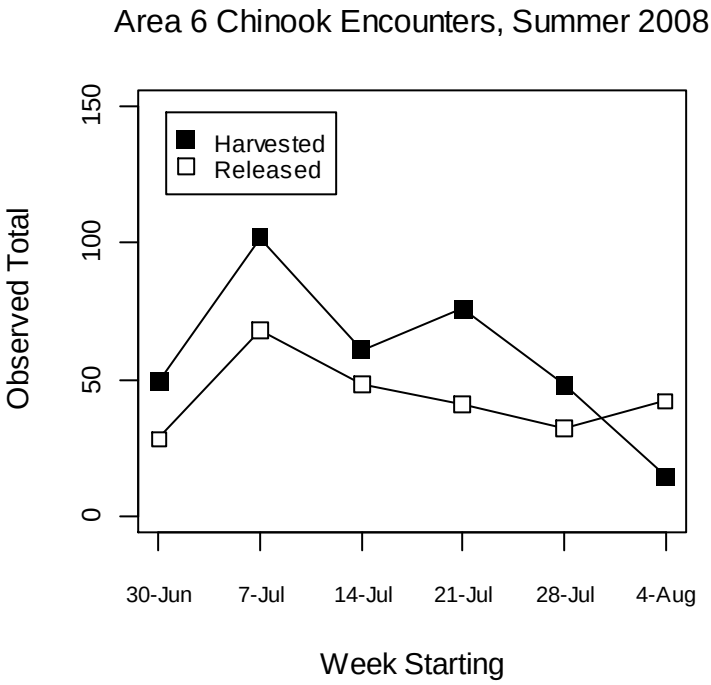

Figure 11. Temporal patterns in weekly observations of harvested Chinook salmon harvest and reported Chinook salmon releases during the Area 6, July 1-Aug. 9, 2008, mark-selective Chinook fishery. Note: displayed values are sample observations (i.e., summed across sampled sites) and not fishery-total estimates.

Table 14. Observations of fishing effort, salmon harvest, and reported salmon releases, by week, for the Area 6, July 1-Aug. 9, 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.		Rel'd Chin.			Other Sp. Released					
Month	Stat Week	Boats	Anglers	AD	UM	AD Coho	UM Coho	AD	UM	UNK	AD Coho	UM Coho	UNK Coho	Sockeye	Chum	UnID'd Salmonid
July	27	85	158	48	1	0	0	0	28	0	0	0	0	0	0	0
	28	169	292	101	1	0	0	1	67	0	0	0	0	0	0	0
	29	122	209	58	3	0	0	2	46	0	0	0	0	0	0	0
	30	226	417	76	0	0	0	0	41	0	0	0	0	0	1	0
	31	151	272	48	0	0	0	1	31	0	0	0	0	6	0	0
Aug.	32	132	226	14	0	0	0	1	40	1	0	1	0	0	0	0
Grand Total:		885	1,574	345	5	0	0	5	253	1	0	1	0	6	1	0

Characteristics of Harvested Chinook

Length and Age.—During the Area 6 Summer selective fishery a total of 340 Chinook were sampled at dockside (**Table 15**). All of these fish were measured and examined for the presence of a CWT. Marked Chinook harvested from Area 6 averaged 77.3 cm TL (range: 57.9-93.4, SD = 6.4; **Figure 13**). All but one (i.e., >99%) of the 340 fish sampled were legally harvestable (≥ 22 in [56 cm] *and* marked). No sublegal fish were sampled.

Of the 340 Chinook sampled, 319 (94%) were successfully aged (**Appendix F**). Based on these samples, we found that nearly two thirds of retained Chinook were three years in age (204/320, 64%), belonging to the 2005 brood. Age-4 fish composed nearly all (114/319, 36%) of the sample remainder, with one age-5 fish also being observed (<1%). Ninety-eight percent of aged Area 6 landings were subyearling outmigrants.

Table 15. Summary of length samples from retained Chinook salmon collected during dockside angler interviews, Area 6, July 1-August 9, 2008.

	Number Sampled		
Mark Type	**Legal-size**	**Sublegal-size**	**Total**
Marked	339	0	339
Unmarked	1	0	1
Total	340	0	340

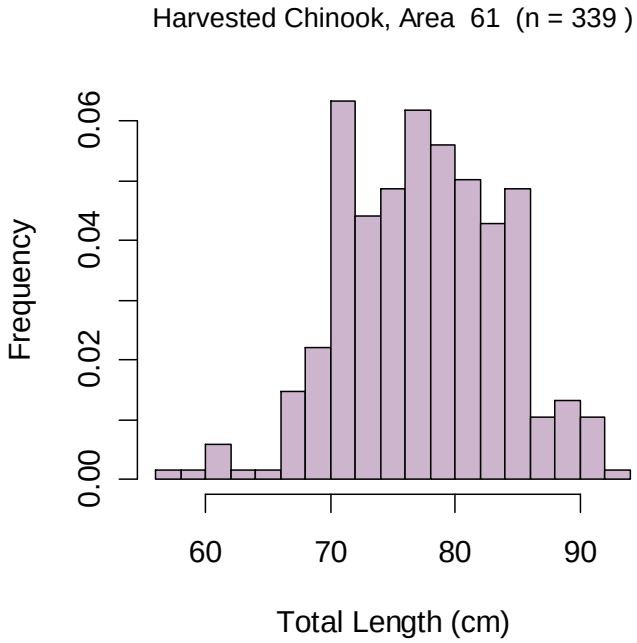

Figure 13. Length-frequency distributions of retained marked Chinook sampled at dockside during the Area 6, July 1-August 9, 2008, mark-selective Chinook fishery.

CWT Samples.— In total, 14 coded-wire tags were recovered from the Area 6 summer 2008 Chinook MSF, the majority of which (11/14 or 78%) were from Puget Sound production facilities. Almost half of the 11 Puget Sound recoveries were from the Central Puget Sound region, whereas similar proportions (~20% of total, each) came from both North and South Puget Sound facilities (**Table 16**). The three non-Puget Sound tags came from Hood Canal, Columbia River, and Canadian (Vancouver Island) releases (one from each). Among individual production facilities represented in this modest CWT sample, no single hatchery predominated (i.e., 1 or 2 tags were from each of 11 release sites). Finally, nine of the 14 (64%) recovered CWTs were associated with double-index tag groups.

Table 16. Summary of coded-wire tags recovered from Chinook salmon harvested during the Area 6 July 1-Aug. 9, 2008 mark-selective Chinook fishery. The field "No. DITs" corresponds to the number of tags that belonged to double-index tag groups. Additionally, one blank CWT was recovered from an Area 6 fish.

Release Region[1]	Release Site	Rearing Location	CWTs Recovered	No. DITs
British Columbia-Vanc. Isl.	Chemainus River	Chemainus Hatchery	1 (7.1%)	
Hood Canal	Purdy Creek	George Adams Hatchery	1 (7.1%)	1
Puget Sound-North	Friday Creek	Samish Hatchery	2 (14.3%)	2
	Whitehorse Springs	Whitehorse Pond	1 (7.1%)	
Puget Sound-Central	Big Soos Creek	Soos Creek Hatchery	1 (7.1%)	1
	Green River	Icy Creek Hatchery	1 (7.1%)	
	Grovers Creek	Grovers Creek Hatchery	1 (7.1%)	1
	Grovers Creek Hatchery	Grovers Creek Hatchery	1 (7.1%)	1
	Issaquah Creek	Issaquah Hatchery	1 (7.1%)	
Puget Sound-South	Chambers Creek	Lakewood Hatchery	1 (7.1%)	
	Clear Creek	Nisqually Hatchery	2 (14.3%)	2
Columbia River	Spring Creek	Spring Creek National Fish Hatchery	1 (7.1%)	1
		Grand Total	14	9

[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).

Encounters Composition

While we did not conduct a test fishery in Area 6 during the summer of 2008, we acquired information about the size/mark-status composition of Chinook encountered in this fishery from the response received as part of our VTR feasibility study. In total we received 59 VTRs, providing information about 108 angler trips and 133 Chinook salmon encounters. Approximately two-thirds (61%) of Area 6 VTR Chinook encounters were marked and all but two individuals (i.e., >98% of total) were larger than the legal size limit (i.e., 22 in [56 cm]). For a more thorough treatment of Area 6 VTR results, see the following section (*VOLUNTARY TRIP REPORT RESULTS & DISCUSSION*).

VOLUNTARY TRIP REPORT RESULTS & DISCUSSION

Sample Size Goals

Between July 1 and August 9, 2008, we received a grand total of 73 usable VTRs, which provided data on 156 Chinook salmon encounters occurring during 156 Area 5 angler trips. For Area 6, we received 58 VTRs encompassing 133 encounters and 108 angler trips (**Table 17**). At these levels, participation was substantially higher than during previous (2003-07) seasons in both areas, especially in Area 6 (**Table 18**). For instance, an average of 25 VTRs (range: 9-65) covering 67 (24-172) angler trips and 90 (35-200) Chinook salmon encounters, and 15 (6-18) VTRs covering 36 (13-46) angler trips and 59 (15-112) encounters, were received during the past five seasons of the Areas 5 and 6, respectively, MSFs (WDFW 2008a). It is noteworthy that similar VTR participation occurred in Area 5 during 2003 (i.e., the high end of the aforementioned ranges), the only other area/season during which a concerted on-the-ground VTR distribution/collection effort occurred. Finally, we achieved the high 2008 participation level despite the fact that total fishing effort was the lowest seen since Chinook MSF regulations were first implemented in the two areas (documented for Area 5, assumed for Area 6).

In terms of meeting the minimum criterion for success under our sample-size objective (i.e., VTR n > test fishery n), VTRs (n = 156 encounters) provided information on 3.1 times as many encounters as did the Area 5 test fishery in 2008 (n = 50) and, on average, during past seasons (2003-07 average n = 89; range: 80-335). In Area 6, total VTR encounters were approximately double (1.7 ×) the average test fishery sample size for the 2003-07 Chinook MSF seasons (80, range: 10-148); test fishing did not occur in Area 6 during 2008. In sum, our 2008 VTR program was a success relative to our *a priori* sample size targets.

Table 17. Detailed Voluntary Trip Report (VTR) sampling results for Areas 5 and 6, July 1-August 9, 2008.

Catch Area	Month	Stat Wk	VTRs (*n*)	Angler Trips	Chinook Encounters						Legal Mark Rate	Overall Mark Rate
					LM Kept	LM Rel'd	LU	SM	SU	TOTAL		
5	July	27	17	43	21	0	8	2	1	32	72%	72%
		28	15	32	19	0	7	0	0	26	73%	73%
		29	12	23	9	1	11	6	5	32	48%	50%
		30	13	29	14	0	11	0	1	26	56%	54%
		31	8	13	4	0	13	0	2	19	24%	21%
	Aug.	32	8	16	7	0	12	0	2	21	37%	33%
Area 5 overall			**73**	**156**	**74**	**1**	**62**	**8**	**11**	**156**	**55%**	**53%**
6	July	27	7	14	11	0	9	0	0	20	55%	55%
		28	13	22	25	0	5	0	0	30	83%	83%
		29	14	25	21	0	12	0	0	33	64%	64%
		30	9	17	9	0	9	0	0	18	50%	50%
		31	11	20	11	1	12	0	0	24	50%	50%
	Aug.	32	5	10	3	0	3	0	2	8	50%	38%
Area 6 overall			**59**	**108**	**80**	**1**	**50**	**0**	**2**	**133**	**62%**	**61%**

Table 18. Areas 5 and 6 VTR results, 2003-2008. Under Chinook salmon encounters, size/mark-status combinations are defined according to the following abbreviations: L = Legal, S = Sublegal, M = marked, U = unmarked.

Area	Season	VTRs	Angler Trips	Chinook salmon encounters				
				LM	LU	SM	SU	Total
5	2003	65	172	36	49	30	85	200
	2004	11	35	4	16	3	12	35
	2005	26	54	9	20	11	23	63
	2006	9	24	10	11	11	3	35
	2007	16	49	28	10	46	32	116
	2003-07 mean	*25*	*67*	*17*	*21*	*20*	*31*	*90*
	2008	**73**[a]	**156**	**75**	**62**	**8**	**11**	**156**
6	2003	18	41	29	38	5	8	80
	2004	18	45	42	62	2	6	112
	2005	18	46	13	24	3	0	40
	2006	6	13	7	8	0	0	15
	2007	16	36	26	15	5	2	48
	2003-07 mean	*15*	*36*	*23*	*29*	*3*	*3*	*59*
	2008	**58**	**108**	**81**	**50**	**0**	**2**	**133**

[a]2/73 VTRs had incomplete effort (i.e., "Angler Trips") information.

VTR Participants: Representation and Diversity

Participation from a representative cross section of participating anglers is needed in order for an "Enhanced VTR" program to provide reliable information about the size/mark-status composition Chinook encountered in a fishery. Regarding the diversity of participation, we received VTRs from 48 and 29 different anglers fishing in Areas 5 and 6, respectively. With only one-sixth of participants individually contributing more than 5% of the encounters total (maximum contribution from any one person = 10.3%), the total VTR *n* was well spread across Area 5 respondents. Reported Chinook encounters were distributed less uniformly across participants in Area 6, where one angler returned more than a third of all VTRs received and reported nearly a quarter (24%) of the encounters total. All remaining Area 6 respondents contributed at a level no greater than 10% to the VTR encounters total. Overall, the diversity of response received during the 2008 Areas 5 and 6 fisheries contrasts sharply with patterns documented for areas/seasons where VTR participation occurs on a strictly voluntary and/or certified-angler basis. For instance, the encounters dataset assembled from the VTR response received during the Area 10 summer 2008 Chinook MSF (n = 49 encounters) was dominated by one angler (i.e., 57% all encounters were from a single respondent; WDFW 2008c).

In addition to qualitatively assessing its diversity, we made an indirect assessment of how well the VTR dataset represented the entire fleet by comparing VTR catch rates (landed Chinook per angler trip, $CPUE_{vtr}$) with those estimated from dockside interview efforts. Because anglers were asked to keep their VTRs if they did not successfully encounter Chinook salmon (kept *or* released), we could only compare $CPUE_{vtr}$ with creel values conditioned on encounter success (i.e., $CPUE_{creel|S}$). In Area 5, estimates of CPUE ($CPUE_{vtr}$ = $CPUE_{creel|S}$ = 0.55) were identical for VTR and dockside data sources (t = 0.003, df = 82.1, P = 0.998; **Figure 14**). In Area 6, catch rates did not differ significantly (t = 1.200, df = 78.1, P = 0.234) between VTR and dockside data sources, although values were on average higher for the former compared to the latter group (i.e., $CPUE_{vtr}$: 0.80 vs. $CPUE_{creel|S}$: 0.68; **Figure 14**). Considering these similarities and the qualitative patterns of respondent diversity, it appears that our enhanced VTR effort was successful at acquiring participation from a representative and diverse subset Areas 5 and 6 anglers.

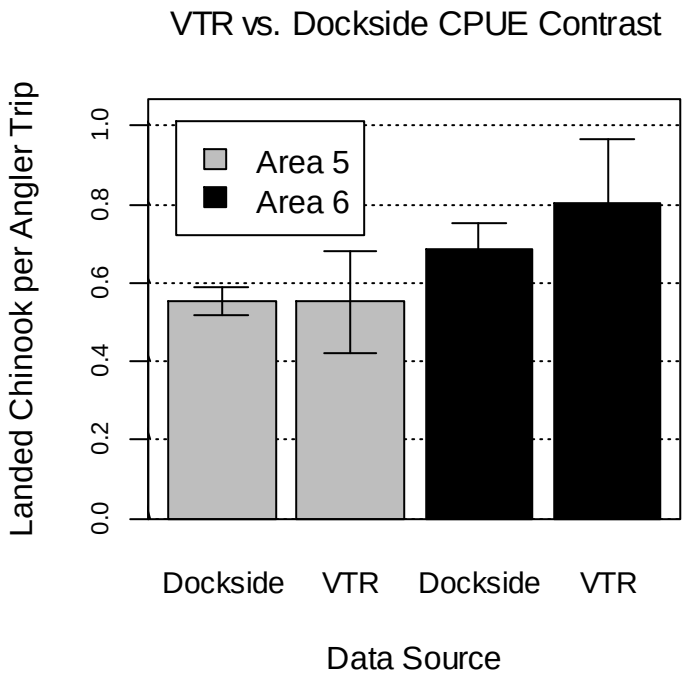

Figure 14. Mean (+/- 95% CI) CPUE (landed Chinook per angler trip) estimated from VTR forms and dockside interview results, Areas 5 and 6 Chinook MSF, July 1-August 9, 2008. Note that dockside CPUE values presented here are computed for anglers successfully encountering (kept or released) at least one Chinook.

VTR vs. Fleet Encounters Composition Comparison (Area 5 Only)

For Area 5, we additionally compared the size/mark-status composition of VTR encounters with that of the test fishery to assess the success of the enhanced VTR effort relative to our second objective. Two lines of evidence suggest that this benchmark was met. First, the frequency of observations in the four separate size/mark-status groups (i.e., LM, LU, SM, SU) was qualitatively similar (**Figure 15**) for VTR and test fishery encounters datasets. Secondarily, though their power was relatively low due to the modest test fishery sample size (β = 0.16 and 0.09, respectively), statistical tests comparing the mark rates and legal-size fractions indicate that these values do not differ between samples (**Table 19**). In particular, the VTR mark rate was 53% whereas that measured in the test fishery was 60% (Fisher's exact test: P = 0.419). Similarly, the estimated legal-size fraction differed between datasets by less than five percent (VTR vs. test fishery: 88% vs. 92%; P = 0.606). Thus, overall it appears that the enhanced VTR effort provided a sample that could serve as a reasonable proxy for the Area 5 test fishery dataset. Considering these similarities in conjunction with sample size potential described above, we conclude that VTRs can provide a cost-effective and reliable alternative to test fishing when distributed/collected in a strategic manner.

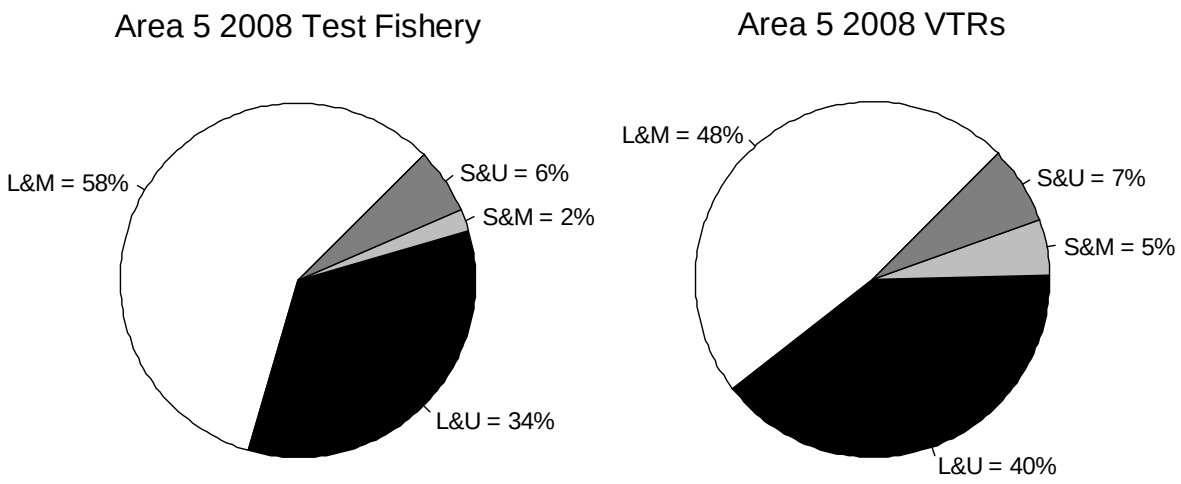

Figure 15. Pie charts depicting the size/mark-status composition for voluntary trip report- and test fishery-based encounters, Area 5 July 1-Aug. 9, 2008.

Table 19. Size/mark-status frequencies and comparison details for the Area 5 test fishery and VTR encounters, July 1-Aug. 9, 2008. The *P*-values provided were generated using Fisher's exact tests.

Parameter	Test Fishery	VTR
Legal-marked *n*	29 (58%)	75 (48%)
Legal-unmarked *n*	17 (34%)	62 (40%)
Sublegal-marked *n*	1 (2%)	8 (5%)
Sublegal-unmarked *n*	3 (6%)	11 (7%)
Total *n*	50	156
Overall Mark Rate ($P = 0.419$)	0.60	0.53
Legal-size Fraction ($P = 0.606$)	0.92	0.88

ACKNOWLEDGEMENTS

This review of the summer 2008 Areas 5 and 6 mark-selective Chinook fisheries is a result of the dedicated efforts of several individuals. Larry Bennett (Peninsula Sampling Supervisor) and his sampling crew collected creel, test-fishery, and on-the-water survey data throughout the season in both Areas 5 and 6. Jaron Sikes and Steve Grace conducted test fishing, as well as on-the-water boat surveys in Area 5. Dockside samplers stationed in Areas 5 and 6 included Jessica Slipper, Kimberley McFarlen, Connie Warren, Raese Reeves, Chris Burns, Lars Swartling, and Sara Witczak. Sara Witczak and Connie Warren worked as roving samplers dedicated to distributing and collecting Voluntary Trip Reports to/from Areas 5 and 6 anglers.

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Finally, this document benefitted greatly from the thorough reviews of Bob Conrad at the Northwest Indian Fisheries Commission and WDFW staff. Their collective critiques of the reduced sample design employed during the summer of 2008 helped us better define the quality of estimates in an immediate and long-term context.

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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[11] estimators of encounters-by-class (i.e., the four size [legal, sublegal] × mark-status [marked, unmarked] groups) to season-wide impact 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)[12]. $\hat{E}_i$ is estimated as:

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

Test-fishery Encounter Composition

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

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

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

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

[12] 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.

$\hat{p}_{LU\,i}$ = 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*), $\hat{p}_{XY\,i}$ and its variance is estimated as:

(2) $\hat{p}_{XY\,i} = n_{XY\,i} / n_i$, and

(3) $\text{var}(\hat{p}_{XY\,i}) = [\hat{p}_{XY\,i}(1-\hat{p}_{XY\,i})]/(n_i - 1)$,

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

Encounters by Size/Mark-status Class

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

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

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

$\hat{E}_{SU\,i}$ = 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*, $\hat{E}_{XY\,i}$ is obtained from:

(4) $\hat{E}_{XY\,i} = \hat{E}_i * \hat{p}_{XY\,i}$

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*[13] 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*)

[13] 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 $\hat{d}_{XYK}$.

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

$$(5) \qquad \hat{d}_{XMK} = n_{XMK} / n_{MK}$$

$$(6) \qquad \mathrm{var}(\hat{d}_{XMK}) = [\hat{d}_{XMK} * (1 - \hat{d}_{XMK})] / (n_{MK} - 1),$$

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. 5 and 6) 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*) is estimated as:

$$(8) \qquad \hat{K}_{XM\,i} = \hat{d}_{XMK} * \hat{N}_{MK\,i}$$

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

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

$\hat{K}_{SU\,i}$ = 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 Eqn. 8 above but using unmarked fish proportions and monthly retention estimates.

Estimating Release Numbers by Class

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

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

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

$\hat{R}_{SU\,i}$ = 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 ($\hat{E}_{XY\,i}$) and retention ($\hat{K}_{XY\,i}$) during month *i*. The estimator is

$$\hat{R}_{XY\,i} = \hat{E}_{XY\,i} - \hat{K}_{XY\,i} \qquad (9)$$

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

$\hat{M}_{LMK\,i}$ = estimated mortality due to legal (*L*), marked (*M*) Chinook harvest in month *i* (= $\hat{K}_{LM\,i}$).
$\hat{M}_{LUK\,i}$ = estimated mortality due to harvest of legal (*L*), unmarked (*U*) Chinook in month *i* (= $\hat{K}_{LU\,i}$).
$\hat{M}_{SMK\,i}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SM\,i}$).
$\hat{M}_{SUK\,i}$ = estimated mortality due to harvest of sublegal (*S*), marked (*M*) Chinook in month *i* (= $\hat{K}_{SU\,i}$).

Release-mortality Estimates

$\hat{M}_{LMR\,i}$ = estimated post-release mortality for legal (*L*), marked (*M*) Chinook in month *i*
$\hat{M}_{LUR\,i}$ = estimated post-release mortality for legal (*L*), unmarked (*U*) Chinook in month *i*
$\hat{M}_{SMR\,i}$ = estimated post-release mortality for sublegal (*S*), marked (*M*) Chinook in month *i*
$\hat{M}_{SUR\,i}$ = 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:

$$\hat{M}_{XYR\,i} = \hat{R}_{XY\,i} * sfm_Y \qquad (10)$$

Season-wide Total and Class-specific Mortality Estimation

$\hat{M}_{total}$ = total season-wide Chinook salmon mortality; this parameter is computed as the sum of all monthly retention and release mortality estimates [i.e., $\hat{M}_{total} = \sum_{i=1}^{\max i} (\hat{M}_{XYK\,i} + \hat{M}_{XYR\,i})$] 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 across the season for just that group.

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 and formulae 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).

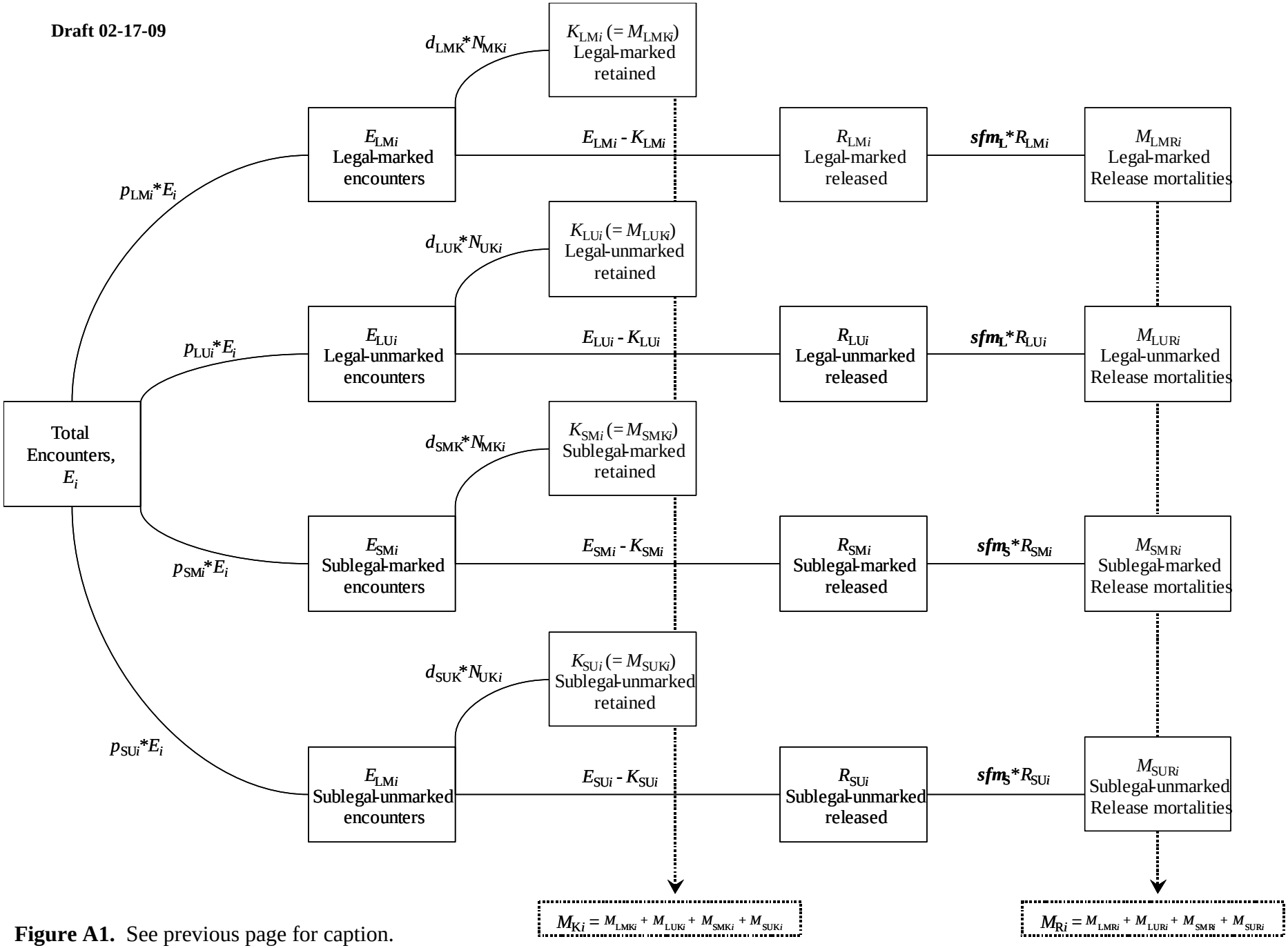

Figure A1. See previous page for caption.

Appendix B. Statistical week calendar for 2008. Note that grayed weeks correspond to those during which Areas 5 and 6 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 5 (July 1-August 9, 2008) mark-selective Chinook fishery. Sample counts and totals are for adipose-clipped (AD) Chinook only. Note that for the 2008 season, the "Intensive" survey was an intentionally reduced version of past (full) monitoring levels.

Sample Source	Stat. Weeks	Date Range	No. AD Chinook Sampled	Estimated Chinook Retained	Sample Rate
"Intensive" Survey Only	27-32	1 Jul-9 Aug.	157	2,819	5.6%
Baseline Survey Only	27-32	1 Jul-9 Aug.	843	2,819	29.9%
Pooled Data	27-32	1 Jul-9 Aug.	1,000	2,819	35.5%

Appendix D. Total number of anglers intercepted in Area 5 during on-the-water surveys between July 1 and August 9, 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
Anchor at Sekiu	0	0.000	1	0.003
Coho Resort	52	0.116	47	0.125
Curley's	37	0.083	19	0.051
Neah Bay	0	0.000	1	0.003
Olson's East	64	0.143	61	0.163
Olson's General	3	0.007		0.000
Olson's Ramp & Docks	111	0.248	119	0.317
Olson's West	18	0.040	11	0.029
Pillar Point	0	0.000	9	0.024
Private Beach	2	0.004		0.000
San Juan Vista Drive	2	0.004	2	0.005
Silver King	17	0.038	20	0.053
Tacoma	0	0.000	3	0.008
Van Riper's General	0	0.000	2	0.005
Van Riper's North	58	0.129	16	0.043
Van Riper's South	84	0.188	62	0.165
Whiskey Creek	0	0.000	2	0.005
Total Anglers	**448**	**1.000**	**375**	**1.000**

Appendix E. Size measures of sites sampled during the Area 5 July 1-Aug. 9, 2008 creel survey, by statistical week. WD and WE correspond to weekday and weekend strata, respectively.

Stat Week	Day Type	Prop'n Effort In Sample Frame			
			Olson's Ramp & Dock	Olson's East	Van Riper's South
27	WD	0.547	0.302	0.116	0.129
	WE	0.606	0.292	0.131	0.183
28	WD	0.547	0.302	0.116	0.129
	WE	0.606	0.292	0.131	0.183
29	WD	0.636	0.234	0.177	0.225
	WE	0.645	0.317	0.163	0.165
30	WD	0.527	0.259	0.113	0.155
	WE	0.645	0.317	0.163	0.165
31	WD	0.527	0.259	0.113	0.155
	WE	0.645	0.317	0.163	0.165
32	WD	0.527	0.259	0.113	0.155
	WE	0.645	0.317	0.163	0.165

Appendix F. Age composition of retained (dockside samples) and encountered (test fishery samples) Chinook salmon, Areas 5 and 6 (dockside only), summer 2008. AD = marked or adipose-fin clipped Chinook, UM = unmarked (unclipped) Chinook.

Area	Source	Mark-status group	Period	Age[1] 2.1	3.1	3.2	4.1	4.2	5.1	5.2	Total
5	Dockside	AD	Season	11	731	25	148	14	3	3	935
			(%)	(1%)	(78%)	(3%)	(16%)	(1%)	(0%)	(0%)	
	Test Fishery	AD	Season	0	24	1	1	0	0	0	26
			(%)	(0%)	(92%)	(4%)	(4%)	(0%)	(0%)	(0%)	
	Test Fishery	UM	Season	1	10	0	6	0	0	0	17
			(%)	(6%)	(59%)	(0%)	(35%)	(0%)	(0%)	(0%)	
6	Dockside	AD	Season	0	203	1	111	3	1	0	319
			(%)	(0%)	(64%)	(0%)	(35%)	(1%)	(0%)	(0%)	

[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 5 and 6 July 1-August 9, 2008 mark-selective Chinook fisheries. In addition to the 100 tags listed below, two orphan tags (codes 633578 and 612507; Area 5) and one blank tag (Area 6) were also recovered.

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingH	Release Agency	DIT Code(s)	FL (cm)	Sex	Recov Mark	Release Mark	Label
05	1-Jul	633285	05	GROVERS CR 15.0299	GROVERS CR H	SUQ	DIT: 210682	75		AD	AD	50801
05	1-Jul	210599	04	BAKER R 03.0435		WDFW		82		AD	AD	50804
05	1-Jul	210588	04	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		86		AD	AD	50802
05	1-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR H	WDFW		74	M	AD	AD	50567
05	1-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR H	WDFW		76		AD	AD	50803
05	2-Jul	052971	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052873	77		AD	AD	50805
05	2-Jul	632880	04	GORST CR 15.0216	GORST CR REARING PND	SUQ		74		AD	AD	50568
05	4-Jul	052873	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052874	73		AD	AD	50806
05	5-Jul	632972	04	ISSAQUAH CR 08.0178	ISSAQUAH H	WDFW		71		AD	AD	50807
05	5-Jul	632897	04	PURDY CR 16.0005	GEORGE ADAMS H	WDFW	DIT: 632966, 632967	82		AD	AD	50857
05	5-Jul	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		66	M	AD	AD	50570
05	6-Jul	052874	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052873	75		AD	AD	50809
05	6-Jul	632880	04	GORST CR 15.0216	GORST CR REARING PND	SUQ		75		AD	AD	50753
05	6-Jul	632874	04	SKOKOMISH R 16.0001	RICKS PD (LLTK)	WDFW		67		AD	AD	50808
05	6-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	73		AD	AD	50858
05	6-Jul	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		74		AD	AD	50571
05	7-Jul	632877	04	GREEN R 09.0001	ICY CR H	WDFW		75		AD	AD	50811
05	7-Jul	633286	05	CLEAR CR 11.0013C	NISQUALLY H	NISQ	DIT: 210681	68		AD	AD	50810
05	8-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	66		AD	AD	50573
05	8-Jul	633375	05	VOIGHT CR 10.0414	VOIGHTS CR H	WDFW		66		AD	AD	50572
05	9-Jul	052874	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052873	78	F	AD	AD	50859
05	11-Jul	632799	04	COLUMBIA R - GENERAL		WDFW		73		AD	AD	50901
05	12-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	71		AD	AD	50902
05	12-Jul	632876	04	WALLACE R	WALLACE R	WDFW		73		AD	AD	

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingH	Release Agency	DIT Code(s)	FL (cm)	Sex	Recov Mark	Release Mark	Label
				07.0940	H							50903
05	12-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR H	WDFW		81		AD	AD	50812
05	13-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	69		AD	AD	50813
05	13-Jul	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		65		AD	AD	50574
05	14-Jul	052873	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052874	76		AD	AD	50814
05	14-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	74		AD	AD	50575
05	17-Jul	633285	05	GROVERS CR 15.0299	GROVERS CR H	SUQ	DIT: 210682	77		AD	AD	50815
05	17-Jul	633286	05	CLEAR CR 11.0013C	NISQUALLY H	NISQ	DIT: 210681	63		AD	AD	50860
05	18-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	69		AD	AD	50816
05	19-Jul	632799	04	COLUMBIA R - GENERAL		WDFW		83		AD	AD	50817
05	19-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	69		AD	AD	50576
05	19-Jul	210571	05	TULALIP CR 07.0001	BERNIE GOBIN HATCH	TULA		61		AD	AD+OT	41268
05	21-Jul	052874	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052873	78		AD	AD	50818
05	22-Jul	633287	05	COWLITZ R 26.0002	COWLITZ SALMON HATCH	WDFW		57		AD	AD	50819
05	22-Jul	633468	05	WALLACE R 07.0940	WALLACE R H	WDFW		51		AD	AD	50820
05	23-Jul	052972	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052873	78		AD	AD	50578
05	23-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	66		AD	AD	50577
05	23-Jul	633381	05	WALLACE R 07.0940	WALLACE R H	WDFW	DIT: 633264	63		AD	AD	50855
05	23-Jul	632786	04	CHAMBERS CR 12.0007	CHAMBERS CR + GARRISON	WDFW		82		AD	AD	50579
05	23-Jul	632871	04	CHAMBERS CR 12.0007	GARRISON H	WDFW		72		AD	AD	50853
05	24-Jul	185238	05	R-CHILLIWACK R	H-CHILLIWACK R	CDFO	DIT: 185030, 185031, 185032	75		AD	AD	50905
05	24-Jul	632964	04	VOIGHT CR 10.0414	VOIGHTS CR H	WDFW		87		AD	AD	50856
05	25-Jul	632874	04	SKOKOMISH R 16.0001	RICKS PD (LLTK)	WDFW		72		AD	AD	50580
05	26-Jul	632967	04	BIG SOOS CR 09.0072	SOOS CREEK H	WDFW	DIT: 632897, 632966	81	F	AD	AD	50581
05	27-Jul	632972	04	ISSAQUAH CR 08.0178	ISSAQUAH H	WDFW		86		AD	AD	50583
05	27-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	67		AD	AD	50862
05	28-Jul	633375	05	VOIGHT CR	VOIGHTS CR	WDFW		66		AD	AD	

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingH	Release Agency	DIT Code(s)	FL (cm)	Sex	Recov Mark	Release Mark	Label
				10.0414	H							50821
05	29-Jul	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	59		AD	AD	50822
05	29-Jul	633174	05	JOHN CR 16.0253	RFEG 6 HOOD CANAL	WDFW		57		AD	AD+OT	50823
05	30-Jul	633582	05	SNK BLW GRANDE RONDE	LYONS FERRY H	WDFW		64		AD	AD	50585
05	31-Jul	632882	05	ELOCHOMAN R 25.0236	ELOCHOMAN H	WDFW		75		AD	AD	50907
05	31-Jul	633382	05	FINCH CR 16.0222	HOODSPORT H	WDFW		64		AD	AD	50586
05	31-Jul	633382	05	FINCH CR 16.0222	HOODSPORT H	WDFW		74		AD	AD	50906
05	1-Aug	633366	05	PURDY CR 16.0005	GEORGE ADAMS H	WDFW	DIT: 633365	68		AD	AD	50587
05	1-Aug	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	53		AD	AD	50589
05	1-Aug	633172	05	NOOKSACK R -NF 01.0120	KENDALL CR H	WDFW	DIT: 633171	54		AD	AD+OT	50588
05	1-Aug	632871	04	CHAMBERS CR 12.0007	GARRISON H	WDFW		72		AD	AD	50590
05	2-Aug	633596	05	COLUMBIA R - GENERAL	WELLS H	WDFW		55		AD	AD	50908
05	2-Aug	210592	04	GROVERS CR H	GROVERS CR H	SUQ	DIT: 632790	84		AD	AD	50592
05	2-Aug	633286	05	CLEAR CR 11.0013C	NISQUALLY H	NISQ	DIT: 210681	73		AD	AD	50591
05	3-Aug	052873	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052874	80		AD	AD	50593
05	4-Aug	633592	05	WENATCHEE R 45.0030	DRYDEN POND	WDFW		53		AD	AD	50826
05	4-Aug	633372	05	BIG SOOS CR 09.0072		WDFW	DIT: 633371	58		AD	AD	50824
05	4-Aug	633285	05	GROVERS CR 15.0299	GROVERS CR H	SUQ	DIT: 210682	61		AD	AD	50827
05	4-Aug	210571	05	TULALIP CR 07.0001	BERNIE GOBIN HATCH	TULA		55		AD	AD+OT	50825
05	6-Aug	185725	05	R-PUNTLEDGE R	H-PUNTLEDGE R	CDFO		76		AD	AD	50864
05	6-Aug	094451	05	UMATILLA R	UMATILLA H	ODFW		56		AD	AD	50829
05	6-Aug	633382	05	FINCH CR 16.0222	HOODSPORT H	WDFW		63		AD	AD	50865
05	6-Aug	633174	05	JOHN CR 16.0253	RFEG 6 HOOD CANAL	WDFW		57		AD	AD+OT	50828
05	7-Aug	185032	05	R-CHILLIWACK R	H-CHILLIWACK R	CDFO	DIT: 185030, 185031, 185154	74		AD	AD	50866
05	7-Aug	633174	05	JOHN CR 16.0253	RFEG 6 HOOD CANAL	WDFW		86		AD	AD+OT	50594
05	7-Aug	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	74		AD	AD	50596
05	7-Aug	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		65		AD	AD	50595
05	7-Aug	632871	04	CHAMBERS CR 12.0007	GARRISON H	WDFW		73		AD	AD	50597
05	8-Aug	633598	05	SNK BLW GRANDE	LYONS FERRY H	WDFW		51		AD	AD+ELI/LER	50598

Area	Recov Date	Tag Code	BY	ReleaseSite	RearingH	Release Agency	DIT Code(s)	FL (cm)	Sex	Recov Mark	Release Mark	Label
				RONDE								
05	9-Aug	094437	05	CLACKAMAS R	CLACKAMAS H	ODFW	?	?	?	?	?	50873
05	9-Aug	632886	05	KALAMA R 27.0002	KALAMA FALLS H	WDFW		58	M	AD	AD	50867
05	9-Aug	633598	05	SNK BLW GRANDE RONDE	LYONS FERRY H	WDFW		55		AD	AD+ELI/LER	50871
05	9-Aug	633598	05	SNK BLW GRANDE RONDE	LYONS FERRY H	WDFW		55		AD	AD+ELI/LER	50874
05	9-Aug	633285	05	GROVERS CR 15.0299	GROVERS CR H	SUQ	DIT: 210682	71		AD	AD	50868
05	9-Aug	633366	05	PURDY CR 16.0005	GEORGE ADAMS H	WDFW	DIT: 633365	79		AD	AD	50869
05	9-Aug	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		59		AD	AD	50599
05	9-Aug	210671	05	KALAMA CR 11.0017	KALAMA CR H	NISQ		56		AD	AD	50872
06	5-Jul	632877	04	GREEN R 09.0001	ICY CR H	WDFW		84		AD	AD	50752
06	5-Jul	633285	05	GROVERS CR 15.0299	GROVERS CR H	SUQ	DIT: 210682	75		AD	AD	50751
06	6-Jul	210592	04	GROVERS CR H	GROVERS CR H	SUQ	DIT: 632790	71		AD	AD	50650
06	6-Jul	632972	04	ISSAQUAH CR 08.0178	ISSAQUAH H	WDFW		80		AD	AD	50651
06	9-Jul	633369	05	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 633368	68		AD	AD	50652
06	11-Jul	210684	05	WHITEHORSE SPRINGS	WHITEHORSE POND	COOP		70		AD	AD	49909
06	12-Jul	632794	04	FRIDAY CR 03.0017	SAMISH H	WDFW	DIT: 632795	76		AD	AD	50653
06	13-Jul	632783	04	CLEAR CR 11.0013C	NISQUALLY H	NISQ	DIT: 210589	78		AD	AD	50654
06	19-Jul	632967	04	BIG SOOS CR 09.0072	SOOS CREEK H	WDFW	DIT: 632897, 632966	86		AD	AD	50757
06	19-Jul	632783	04	CLEAR CR 11.0013C	NISQUALLY H	NISQ	DIT: 210589	74		AD	AD	50756
06	26-Jul	185210	05	R-CHEMAINUS R	H-CHEMAINUS R	CDFO		73		AD	AD	50655
06	26-Jul	052873	05	SPRING CR 29.0159	SPRING CR NFH	FWS	DIT: 052871, 052872, 052874	76		AD	AD	50758
06	29-Jul	633366	05	PURDY CR 16.0005	GEORGE ADAMS H	WDFW	DIT: 633365	71		AD	AD	50759
06	9-Aug	632978	04	CHAMBERS CR 12.0007	LAKEWOOD H	WDFW		81		AD	AD	50656

Appendix H. Fishery-total estimates of retained and released salmon (Chinook and other species) catch for the Area 5 summer 2008 Chinook MSF. Displayed Chinook harvest values are equivalent to those in **Table 3**; whereas the release estimates displayed in **Table 3** 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.

				Effort		Retained Chinook		Other Sp. Retained		Released Chinook			Other Sp. Released	
Month	Stat. Week	Start Date	End Date	Boats	Anglers	AD	UM[1]	AD Coho	Chum	AD	UM	Unk.	UM Coho	UnID'd
July	27	30-Jun	06-Jul	893	2,139	372	0	0	0	0	392	0	0	0
	28	07-Jul	13-Jul	925	2,272	240	0	0	0	40	123	0	0	17
	29	14-Jul	20-Jul	1,271	2,815	288	0	0	21	43	397	21	0	0
	30	21-Jul	27-Jul	792	1,627	629	0	0	0	0	275	0	12	0
	31	28-Jul	03-Aug	1,207	2,698	917	0	0	0	44	1,220	89	0	0
August	32	04-Aug	10-Aug	622	1,454	373	0	3	0	199	856	0	0	0
Season Total:				5,710	13,004	2,819	0	3	21	326	3,263	110	12	17

[1] Although no unmarked Chinook were observed during Intensive sampling, six (3 measured) were documented during Baseline sampling; if marked/unmarked proportions are estimated from pooled Baseline and Intensive catch observations and used to partition total harvest (2,816), an estimated 17 UM Chinook were harvested during the fishery.

Appendix I. Revised total and size/mark-status group-specific estimates of Chinook encounters for the Areas 5 and 6 MSF, 2003-2007, 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. Estimates include a combination of private and charter anglers.

Area	Year	Date Range	Retained Chinook				Released Chinook				Total Encounters
			LM	LU	SM	SU	LM	LU	SM	SU	
5	2003	July 5 – August 3	2,251	53	225	0	336	3,435	1,656	5,174	13,131
	2004	July 1 – August 8	2,706	0	194	0	404	4,017	1,167	2,462	10,950
	2005	July 1 – August 10	1,520	23	100	26	227	1,418	1,210	1,459	5,984
	2006	July 1 – August 14 & August 18 – 21	3,105	10	196	7	464	3,125	1,010	2,212	10,129
	2007	July 1 – August 4 & August 9	2,969	23	280	94	444	2,509	1,371	1,118	8,808
	2008	July 1 – August 9[a]	2,773	0	45	0	414	1,869	65	330	
6	2003	July 5 – August 3	941	22	0	0	141	1,283	52	103	2,542
	2004	July 1 – August 8	669	5	2	0	100	820	42	11	1,649
	2005	July 1 – August 10	404	0	0	4	60	790	70	-4	1,324
	2006	July 1 – August 14 & August 18 – 21	338	0	2	8	50	494	-2	-8	882
	2007	July 1 – August 4 & August 9	715	7	7	0	107	404	9	0	1,249
	2008	July 1 – August 9[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[a]The 2008 Area 5 fishery was sampled for coarse in-season estimation; values presented are thus draft estimates subject to replacement upon the finalization of Catch Record Card (CRC) estimates. The Area 6 fishery, in contrast, was not sampled for in-season or (immediately) post-season estimation of catch or encounters; estimates of this fishery will be made when CRC results become available.