A multi-year assessment of the Marine Areas 5 and 6 selective Chinook fishery: 2003-2007

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FINAL WORKING DRAFT

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A Multi-year Assessment of the Marine Areas 5 and 6 Selective Chinook Fishery: 2003-2007

March 14, 2008

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EXECUTIVE SUMMARY

Introduction

Five years of the Area 5 and 6 "pilot" mark-selective Chinook salmon (*Oncorhynchus tshawytscha*) fishery, including the monitoring/sampling programs needed for evaluation of the fishery, have been completed. This multi-year report has been produced to review achievement of the purpose for implementing pilot selective Chinook fisheries in Areas 5 and 6 during the 2003 through 2007 seasons. The pilot fishery purpose is:

> "The purpose of the 'pilot' fishery is to collect information necessary to enable evaluation and planning of potential future mark-selective fisheries. The 'pilot' fishery provides a basis for determining if the data needed to estimate critical parameters can be collected and if the sample sizes needed to produce these estimates with agreed levels of precision can be realistically obtained."

These monitoring and sampling programs were designed to collect and provide data to estimate the following parameters:

- the mark rate in the fishery;
- the incidence of partial adipose clips;
- the number of fish retained or landed;
- the number of unmarked fish released;
- the number of unmarked fish retained;
- the number of marked fish released;
- the number of the Chinook encounters that are of sub-legal size;
- the stock composition of the mortalities;
- estimates of marked and unmarked mortalities of double-index tagged (DIT) and other CWT stocks.

With the exception of partial adipose-clip incidence (*bullet 2*) and DNA-based stock composition (*bullet 8*), we evaluate each of the above parameters in this multi-year review document. Additionally, we present analyses of several other parameters of significance to the evaluation and future management of selective Chinook fisheries.

This report was completed by WDFW, while incorporating extensive review and input from the Tribes. We review and analyze results of the monitoring/sampling program to evaluate if the intended objectives have been achieved. These objectives include: 1) collect information necessary to enable evaluation and planning of future potential Chinook mark-selective fisheries; and 2) determine if the data needed to estimate critical parameters can be collected and if the sample sizes needed to produce these estimates with agreed levels of precision can be realistically obtained.

During the summers of 2003 through 2007, a selective Chinook recreational fishery was implemented in waters of the Strait of Juan de Fuca including Marine Area 5 and the western portion of Marine Area 6 (hereafter: Areas 5 and 6). Each year the fishery was scheduled to start

in early July and run continuously until either the quota of harvested Chinook was attained or a set number of days was reached, whichever came first. Anglers were allowed to retain two marked (adipose fin clipped) Chinook salmon $\geq$ 22" (56 cm) as part of their daily limit, and were required to immediately release, unharmed, any unmarked Chinook caught. During the Chinook Selective Fishery anglers were also allowed to retain pink (*O. gorbuscha*), sockeye (*O. nerka*), and marked hatchery coho (*O. kisutch*) salmon.

Methods

During the summers of 2003 through 2007, we implemented separate sampling programs in Areas 5 and 6 in order to collect the data necessary to estimate daily estimates of total catch (landed and released) and total effort which could be expanded to weekly, monthly, and ultimately season-total values. Our sampling program incorporated comprehensive and complementary data collection strategies, including: 1) dockside-based angler interviews and catch sampling ("creel sampling"); 2) on-the-water total (instantaneous) effort surveys; 3) test fishing; and 4) voluntary reports of completed trips provided by charter boats and private anglers.

Results

Creel Sampling Results

Over the 5 years of study, the combined Areas 5 and 6 fishery lasted from 30 to 49 days. The harvest quota was obtained each year, except for 2005. Total fishing effort averaged 22,000-34,000 angler trips per year (angler trips and anglers are used interchangeably throughout the document) and varied as a function of season length and catch fishing success. Chinook harvest ranged from 2,078 to 4,096 and was within 5% of the quota during years when it was met. On average, 81% of the Chinook harvest occurred in Area 5. Estimated total released Chinook encounters ranged from 6,408 to 14,841, the majority of which occurred in Area 5 each year. The number of Chinook released for every Chinook harvested declined by ~50% (from 4.2 to 2.1) across the five years of the fishery. Chinook harvest per angler (C/F) ranged from 0.06 to 0.19 and averaged 0.13 for all 5 years. For all legally harvestable salmon species combined (i.e., Chinook, coho, and pink), C/F ranged from 0.18 to 0.81; angling effort appeared to be correlated with total (all salmon species) C/F but not C/F for any particular salmon species.

Based on dockside sampling of landed catch and angler-reported release estimates for known mark-status Chinook, overall Chinook mark rates (legal + sublegal) were consistently higher in Area 6 than Area 5 and increased consistently from 2003 (0.24) to 2007 (0.45). The percentage of harvested Chinook that were unmarked (sublegal-size and legal-size) ranged from 0.14% to 3.03%.

During the five seasons, dockside samplers measured the lengths of 3,517 Chinook. Harvested Chinook in Area 6 were signficantly larger than those taken in Area 5. Over 92% of the Chinook harvested were legal-size and marked; 4-7% of Chinook harvest was sublegal-size and 0-3% were unmarked.

Test Fishery Results

Test boat samplers averaged 37 days on fishing annually in Area 5 and 40 days in Area 6, yielding over 1,000 Chinook encounters. Samplers fished predominantly using downriggers (>69%), as this was the predominant private-fleet fishing mode, and caught over 90% of their Chinook using this method. Season-total Chinook encounters averaged 266 for the pooled areas and total mortalities attributable to test fishing ranged from 25 to 82 annually. The majority of Area 5 test-fishery encounters were legal-size, except during 2003; Area 6 encounters were almost exclusively legal-size. Test-fishing data indicated that marked proportions were higher in Area 5 than in Area 6 in all years; Area-5 mark rates increased over the last 5 years but showed no apparent trend in Area 6. Although Chinook mark-status/size proportions differed markedly between areas, both showed progressive increases in the legal-size and marked proportion over the course of the study. Chinook encountered by test boats were significantly larger in Area 6 than in Area 5.

Voluntary Trip Report Results

The number of Chinook reported on Voluntary Trip Reports (VTRs) varied dramatically over the 5 years of the fishery, ranging from 37 (2006) to 213 (2003). VTR-based estimates of legal-size Chinook mark rates ranged from 20 to 100% and, similar to test boats, VTRs suggested that this value was higher in Area 6 than Area 5. Further, VTRs indicated that very few (< 20%) sublegal-size fish were present in Area 6. Marked, legal-size Chinook release rates estimated from VTRs ranged from 0 to 14% and averaged 5% for all years and both areas.

Encounters and Total Mortalities

Annual encounter estimates for both areas combined ranged from 8,558 to 18,662 using Method 1 and 6,362 to 13,476 using Method 2. Method-1 estimates of total encounters for the combined areas were consistently higher Method-2 values for all years. Season-total mortality estimates (harvest and release) for the pooled areas ranged from 3,465 to 6,356 using Method 1 and 3,078 to 5,449 using Method 2. Estimated total (both methods) unmarked encounters and unmarked mortalities generally declined across the 5-year study period. The ratio of unmarked mortalities (Method 1 or 2) to harvested marked legal-size Chinook dropped steadily from 2003 through 2007, e.g. from 0.73 to 0.32.

CWT analysis

Over 540 coded wire tags (CWTs) were collected during the Areas 5 and 6 selective Chinook fisheries. Puget Sound and Columbia River stocks contributed the highest proportion of CWTs. Only five of the recovered CWTs were from stocks originating from rivers on the Washington side of the Strait of Juan de Fuca. The number of Double Index CWT recoveries ranged from 33 to 41, which translates into an unmarked DIT mortality estimate that ranged from 11 to 16.

Enforcement

The number of contacts made by enforcement officers ranged from 439 to 846 annually. Of those contacts, the proportion with sublegal-size Chinook was less than 0.01 for all areas and years. The proportion of contacts with unmarked Chinook ranged from 0.00 to 0.03.

SECTION I SUMMARY AND DISCUSSION

Catch and Effort

The Areas 5 and 6 selective Chinook fisheries were driven by catch rate. During years that fishing was good, angler trips were up; during years that fishing was poor, angler trips were down. Surprisingly, the Chinook catch rate does not appear to be the main factor, but rather it appears that the overall salmon catch rate is the main factor responsible for how many angler trips are expended each season.

Selective fisheries effort was higher than effort during previous non-selective periods. For 2006 and 2007, the selective fisheries effort in Area 5 was lower than the effort in 2001, but was higher than the effort in 2002. Results of this study suggest that given the low catch rate of coho in 2003 through 2007, the addition of the selective Chinook fishery increased effort (angler trips) in each year of the fishery relative to what effort would have been without the selective Chinook fishery. Effort in Area 5 increased over what was seen during the 1994-2000 period, when no Chinook retention was allowed and coho fishing was closed at times. However, effort was considerably less than that seen for the 1984-1993 period. Effort in Area 6 does not show an increase compared to the 1994 through 2000 period. Opening a selective Chinook season did not increase effort to levels that were higher than or even near historical values.

Another issue that concerned managers and anglers prior to implementation of the 5/6 fishery was whether or not Chinook salmon mark rates would be adequate for successful fishing under mark-selective regulations; legal-size Chinook mark rates for 5/6 have been good and increased in recent years. Anglers have been able to retain 50% of all legal-size Chinook encountered.

Average daily havest has ranged from approximately 50 to 115 fish per day. For future fisheries planning, assuming 100 Chinook harvested per day would be a good conservative estimate. Assuming 100 fish harvested per day for a thirty-day fishery would equate to 3,000 Chinook. For comparison, if the actual number harvested was 116 fish per day (the highest value observed), the harvest would be 3,480 or 16% over the predicted value.

CWT Analyses

Based on CWT recoveries, the Area 5 and 6 selective Chinook fishery appears to impact mainly Puget Sound and Columbia River stocks. For Strait of Juan de Fuca hatchery stocks, less than 1 percent of all CWT recoveries occur in Washington recreational fisheries; in contrast, nearly 29 percent of the recoveries occurr in Canada and Alaska. Based on our estimates of unmarked DIT

Chinook mortalities, the overall bias introduced to the CWT program due to this fishery is extremely low.

Enforcement Compliance Compared to Creel Compliance

For most areas and years, creel-survey results suggest a higher proportion of either unmarked or sublegal-size Chinook retention than enforcement reports indicate. However, both creel survey and enforcement data suggest compliance was high (90% during all years and in both areas).

SECTION II: Assessment of the selective fishery sampling program and analysis methods

Sampling intensity-related questions:

In general, we successfully met sampling objectives. During the five study years, the precision of both harvest and effort estimates approached or exceeded the 0.15 precision objective. Sample-size objectives for dockside encounters (100 / month) were met in most cases, the exception being Area 6 (2005-2007 during August). Weekly sample rates (*n* fish examined / estimated harvest) exceeded the CWT sample-rate goals, ranging from 0.154 to 0.544 in Area 5 and 0.162 to 0.777 in Area 6. At the season-total level, sample rates ranged from 0.227 to 0.276 in Area 5 and from 0.326 to 0.558 in Area 6. Finally, test-fishery sampling objectives were generally well met in Area 5, but not Area 6.

Comparing Private Fleet, Test Fishing, and VTR data

A key assumption of our monitoring program is that the test-fishery and private-fleet encounter composition (i.e., frequency by size/mark-status class) is the same (Assumption 6). To evaluate this assumption, we compared the mark rates, length, and mark-status/size composition of fish caught by the private fleet (from creel surveys and VTRs) and and test fishers.

Length–frequency distributions (for legal-marked Chinook) were similar when compared between test fishery and creel samples within areas and years, but remarkably different when compared between areas and within sampling methods and years. Thus, while both the test fishery and fleet "sampled" legal-marked Chinook in a manner that could discriminate gross differences between areas, they produced statistically indistinguishable length results within areas. Mark rate and mark-status/size comparison results were more variable than those from length comparisons. First, overall mark rates estimated from creel surveys occasionally differed with those estimated from both test-fishery and VTR datasets during most years in Area 5, but only one year in Area 6. Second, test-fishery and VTR mark-rate estimates differed infrequently. Third, for the majority of area-year combinations, legal-size Chinook mark rate estimates produced from test-fishery and VTR data were statistically indistinguishable. Finally, mark-status/size comparisons suggested similarlity between groups but produced inconsistent results.

Estimation of Total Encounters, Method 1 versus Method 2

To determine whether Method 1 or Method 2 provides a more accurate estimate of total Chinook encounters in selective fisheries, we evaluated: *i*) Method-1 and -2 total-encounters estimators and their associated assumptions, *ii*) the sensitivity of estimators to assumption violations, and *iii*) the validity of assumptions based on indirect evaluations using empirical data. Method 1 (M1, sum of creel-based estimates for all Chinook encounters categories) and Method 2 (M2, creel-based estimate of legal-marked Chinook landed catch expanded by test-fishery legal-marked proportion) differ computationally and in terms of the assumptions they require for accurate encounters estimation. M1 accuracy relies on the ability and/or willingness of anglers to accurately recall and/or report caught-and-released Chinook encounters (*Assumption 3*). The accuracy of M2 estimates depends on whether or not anglers report all legal-marked Chinook encountered (*Assumption 5*) and the extent to which the size/mark-status composition of test-fishery encounters mirrors that seen by private anglers (*Assumption 6*).

Our M1 vs. M2 sensitivity analysis revealed that: *i*) when Assumptions 3 and 5 are not met, M1 and M2 estimates are affected similarly, *ii*) estimates are most sensitive to Assumption 6 departures, and *iii*) due to compensating effects, M2 has the potential to yield accurate encounters estimates when both Assumption 5 and 6 are imperfectly met. Next, we considered available empirical evidence to gauge the plausibility of Assumptions 3, 5, and 6. For Assumption 3 ("Anglers accurately report released Chinook encounters"), we reviewed pertinent literature, considered patterns in M1 relative to M2 estimates, and inspected raw interview data (i.e., release–frequency distributions). Based on this, we concluded that Assumption 3 is unlikely to be perfectly met—particularly during high-encounters periods—and that in general anglers probably over-report released Chinook encounters. Though few data exist for evaluating Assumption 5, available information suggests that it is violated to a minor degree. Based on voluntary trip reports, we estimate that anglers may release approximately 5% (range: 0-14%) of the legal-marked Chinook that they encounter. Finally, we considered the likelihood of meeting Assumption 6 in our test fishery vs. creel/VTR comparison described above. This evaluation suggested that Assumption 6 is reasonably met in the Areas 5 and 6 sampling program.

FRAM Performance in Selective Fishery Planning

FRAM predictions were relatively accurate for the Area 5 and 6 selective Chinook fishery. Whereas estimated marked legal- and sublegal-size Chinook catch often exceeded FRAM predictions, unmarked legal-size Chinook catch never exceeded predicted values. Unmarked sublegal-size fish exceeded the FRAM predictions (zero harvest) in 3 of 5 years. Total unmarked landings were 1 to 26% of FRAM predictions.

For encounters, Method 1 estimates exceeded model predictions in 4out of 5 years for marked legal-size and 1 out of 5 years for unmarked sublegal-size fish. **Despite the fact that Method 1 estimates are likely biased high (see M1 vs. M2 section), estimated total unmarked Chinook encounters never exceeded FRAM predictions.** Method 2 estimates of total marked legal-size encounters exceeded FRAM predictions less frequently. Total unmarked encounters estimates

(Method 2) never exceeded model predictions, though unmarked sublegal-size encountes did so in 1 year. For mortalities (harvest + release mortality), Method 1 estimates exceeded FRAM in most cases for marked legal-size and total marked fish and in one year for marked and unmarked sublegal-size fish. **Despite the fact that Method 1 estimates are likely biased high, estimated total unmarked Chinook mortality never exceeded FRAM predictions.** Across the four mark-status/size categories, comparisons of Method 2 mortality estimates with FRAM predictions yielded similar results as the encounters comparsions.

For selective fishery parameters used in model runs, unmarked retention error ranged <1% to 2%, well below the FRAM value (8%). Marked release error ranged 24-37% (M1 estimates), much greater than the FRAM value (6%). Whereas unmarked and marked sublegal-size retention error are modeled as zero in FRAM, empirical estimates for these respective parameters were 0-8% and 6-19%.

SECTION II SUMMARY AND DISCUSSION

Sampling Intensity

Our monitoring and sampling programs were designed to collect the data needed to reliably estimate several selective fishery parameters. With few exceptions, our monitoring program was effective at sampling the 5 and 6 selective Chnook fisheries. Harvest estimates met the 15% precision objective in all years that the quota was achieved, effort estimates always met the objective; and the CWT sample rate goal was always met. Based on these results, we believe that our dockside program for summer selective Chinook fisheries with quotas should remain unchanged. Although sampling success was high for the Area 5 test fishery, Area 6 test fishers met sampling objectives less than 50% of the time. However, the objective of 100 encounters is probably unrealistic for Area 6 given that total fleet encounters ranged 683-1,614 during years when the goal was not met. An alternative test fishing objective for short duration, low catch rate fisheries should be investigated.

Comparing Private Fleet, Test Fishing, and VTR data

Based on our results, we conclude that test boat catches are representative of angler catches for the following reasons:

- The mean lengths and length–frequency distributions of legal-size marked Chinook caught by test fishers were similar to those for Chinook caught by private fleet anglers.
- Length samples acquired via test fishing and from the private fleet (creel) both displayed clear between-area (within year) differences.
- Test fishery and VTR estimates of overall mark rates were similar.
- Legal-size Chinook mark rate estimates from VTRs and the test fishery were similar; where differences occurred, they were not in a single and consistent direction (i.e., +/-)
- Mark-status/size composition estimates from VTRs differed from test-fishery estimates in only 3/10 year/area comparisons.

CONCLUSIONS

Prior to implementation of the 2003 selective Chinook fishery, managers identified several questions about the magnitude and impacts of such fisheries that needed to be addressed through monitoring and evaluation.

Fishery Monitoring and Results

The use of the Murthy type estimator and test fishing worked well to describe the fishery. Opening of this selective Chinook fishery did not lead to effort levels that are substantially higher than historical levels and in fact, effort was well below historical levels. The mark rate during this fishery ranged from about 40-60%, and for legal-size fish from about 35-65%, which increased over time. The proportion of sublegal-size fish in Area 5 dropped from 0.54 in 2003 to 0.33 in 2007, and never exceeded 0.06 of the catch in Area 6. The number of fish released per landed dropped throughout the duration of fisheries from 4.2 to 2.0. Total fishing related Chinook mortalities ranged from 2,839 to 6,193. Puget Sound and Columbia River origin stocks comprise the bulk of the fishery. Very few Strait of Juan de Fuca origin stocks are caught in this fishery. Very few DIT fish are caught in this fishery and the effect on the DIT mark rates appears undetectable. Angler compliance exceeded 90% at all times

Use of FRAM to Predict Selective Fishery Impacts

FRAM encounter predictions were generally higher than analogous creel estimates. They were on average 16% higher than Method 1 and 64% higher than Method 2 estimates; however, FRAM tended to underestimate marked, and overestimate unmarked, encounters and catch. Mean unmarked retention error estimates ranged 0.7% (Method 1) to 0.9% (Method 2), with no single year/method exceeding 2%; FRAM's value (8%) significantly exceeds these estimates. FRAM uses 6% for legal-marked release error in selective Chinook fisheries. Suvey estimates for this parameter ranged from 24-37%, with a mean of 28%; VTRs yielded 5% as an estimate. FRAM models 150 encounters per test fishing boat per month. The average number of actual test fishing encounters per area and month was 157 in Area 5 and 71 in Area 6.

Method 1 versus Method 2

Though it is impossible to know with certainty the true number of Chinook salmon encountered in a particular fishery, both Method 1 and Method 2 have the potential to yield biased estimates. For this reason, it may be more productive to define the set of conditions under which one method is expected to yield better (i.e., less biased) estimates than the other and/or determine defensible means for adjusting for measurable biases when they occur.

Length and Duration of Monitoring

Very little additional knowledge was gained after the first three years of monitoring and evaluation. Since catch per effort (C/f) can be computed from baseline sampling, it could be

used along with relative changes in effort to monitor gross changes in the fishery in lieu of the intensive sampling that has occurred to date.

Conservation Objectives

The estimated mortalities of unmarked Chinook were less than predicted in FRAM models used during the pre-season planning process for every year of the fishery.

OVERALL RECOMMENDATIONS

- With the existing sampling program and Methods 1 and 2 as starting points, WDFW and tribal technical staff should work towards a mutually agreeable encounters and mortalities estimation framework.
- The dockside interview process should be modified to quantify the extent of intentional legal-marked Chinook release activity for the entire recreational fleet.
- In areas with sufficient test boat samples, VTRs add relatively little additional information. However, VTRs can provide useful information on mark rate and sublegal-size to legal-size ratios when test fishing is not conducted.
- We recommend utilizing the most efficient method of catching fish on test boats in order to boost sample size and increase precision.
- With the high mark rate of legal-size Chinook (40-60%), the low rate of sublegal encounters, the absence of local stock CWTs, and the low number of fish released per harvested fish, the Area 6 fishery would be a very good choice for expanded angler opportunity.
- We recommend a maximum of 3 years of monitoring for short-duration (less than 3 months) selective fisheries unless inter-year variation suggests additional years of monitoring are necessary.
- Adjust the FRAM input parameter for unmarked retention error to a value of 2%.
- Defer a decision on a new value for mark release error pending resolution on methodology.
- Continue to model 150 Chinook encounters per test fishing boat and month if necessary.
- No FRAM change to model sublegal retention is proposed.

INTRODUCTION

Five years of the Area 5 and 6 "pilot" mark-selective Chinook salmon (*Oncorhynchus tshawytscha*) fishery, including the monitoring/sampling programs needed for evaluation of the fishery, have been completed. This multi-year report has been produced to review achievement of the purpose for implementing pilot selective Chinook fisheries in Areas 5 and 6 during the 2003 through 2007 seasons. The pilot fishery purpose is stated in the State-Tribal agreement documents (Northwest Treaty Tribes and the Washington Department of Fish and Wildlife 2007):

> "The purpose of the 'pilot' fishery is to collect information necessary to enable evaluation and planning of potential future mark-selective fisheries. The 'pilot' fishery provides a basis for determining if the data needed to estimate critical parameters can be collected and if the sample sizes needed to produce these estimates with agreed levels of precision can be realistically obtained."

These mark-selective fisheries were planned making assumptions about the performance of the fishery and how the fishery will affect wild (unmarked) and hatchery (marked) Chinook salmon. For example, the total number of marked and unmarked Chinook salmon encountered in these fisheries was estimated during the pre-season planning process using the Chinook FRAM and assumptions about fish abundance and angler effort levels. The sampling and monitoring programs in place for the "pilot" fisheries will aid verification of these assumptions. More fundamentally, results of the programs will be used to determine if the data needed to provide usable estimates of critical parameters can be collected.

These monitoring and sampling programs were designed to collect and provide data to estimate the following parameters, as listed in the State-Tribal agreement documents (Northwest Treaty Tribes and the Washington Department of Fish and Wildlife 2007), which we will evaluate in this multi-year report:

- the mark rate in the fishery: marked and unmarked encounters estimated by both on-water and shore-based programs;
- the incidence of partial adipose clips: estimated by both shore-based and on-water programs;
- the number of fish retained or landed: marked and unmarked fish estimated using a shore-based program, including CWT and scale-age sampling;
- the number of unmarked fish released: estimated by shore-based and on-water programs;
- the number of unmarked fish retained: estimated by a shore-based program and compared to enforcement program estimates;
- the number of marked fish released: estimated by a shore-based program in conjunction with on-water mark rate encounter estimates;
- the number of the Chinook encounters that are of sub-legal size: estimated by shore-based and on-water programs;

- the stock composition of the mortalities: estimated by CWT recoveries via dockside sampling and DNA samples in the test fishery [note: the DNA samples have been collected but not analyzed for stock composition];
- estimates of marked and unmarked mortalities of double-index tagged (DIT) and other CWT stocks.

With the exception of partial adipose-clip incidence (*bullet 2*) and DNA-based stock composition (*bullet 8*), we evaluate each of the above parameters in this multi-year review document. Additionally, we present analyses of several other parameters of significance to the evaluation and future management of selective Chinook fisheries.

Mark-selective fisheries provide fishery managers a means of reducing harvest rates on unmarked, mostly wild stocks, relative to alternative, non-selective fisheries. This conservation benefit of mark-selective fisheries may be offset by reduced accuracy or precision with estimates of mortalities on wild fish. In non-selective fisheries, much of the mortality on unmarked or wild stocks can be estimated using information collected by directly surveying the landed catch (creel or catch record system and some type of dock-side sampling program). However, fish that die in the process of being caught and released, incidental mortalities, must be estimated indirectly with information provided by programs designed to estimate the number of fish encountered and released. The principle focus of "Pilot" mark-selective fisheries recently implemented by Co-manager agreement in Puget Sound for Chinook salmon is to evaluate new and alternative programs designed specifically for this purpose.

Another source of uncertainty introduced by mark-selective fisheries is the increased reliance on assumptions about the proportion of released fish that are expected to die. The effect of uncertainty about release mortality rates on fishery mortality estimates is not a subject of this report.

This report was completed by WDFW, while incorporating extensive review and input from the Tribes. We review and analyze results of the monitoring/sampling program to evaluate if the intended objectives of the first five years of pilot fisheries in Areas 5 and 6 have been achieved. These objectives include: 1) collect information necessary to enable evaluation and planning of future potential Chinook mark-selective fisheries; and 2) determine if the data needed to estimate critical parameters can be collected and if the sample sizes needed to produce these estimates with agreed levels of precision can be realistically obtained. The intent is to complete this review and evaluation in a timely manner to inform managers as they plan the 2008 season.

Our multi-year report contains two sections, each of which addresses separate aspects of the Areas 5 and 6 selective fisheries. In Section I, we present the modeling, sampling, and estimation methods that were employed in our evaluation of these two fisheries; provide resulting estimates of key fishery parameters; and discuss their patterns and significance on both a within- and between- area and season basis. In Section II, we address four topical questions relating to how the sampling, estimation, and modeling of the Areas 5 and 6 fisheries has been conducted over the past five seasons. These questions and their associated analyses are

presented and discussed in a manner that aims facilitate discussions for improved selective fisheries monitoring in the future.

STUDY AREA

During the summers of 2003 through 2007, a selective Chinook recreational fishery was implemented in waters of the Strait of Juan de Fuca including Marine Area 5 and the western portion of Marine Area 6 (Figure 1). Marine Areas 5 and 6 (hereafter: Areas 5 and 6) are located in Washington waters of the Strait of Juan de Fuca, running from the Sekiu River easterly to Low Point, and from Low Point to approximately Whidbey Island, respectively (Figure 1). Area 5 has public access only at Sekiu/Clallam Bay and at Pillar Point. Although empirical data has not been collected, Area 5 is generally regarded as a "destination" location, meaning that anglers tend to make multiple day trips there due to the distance from any large city. Area 6 on the other hand, has public access throughout the length of the area, including Whiskey Creek, Freshwater Bay, Ediz Hook, Port Angeles, Sequim, and Port Townsend. Area 6 attracts relatively few multiple day trips and is generally fished by local anglers living near Sequim and Port Angeles, or by anglers trailering their boat for the day from other parts of Puget Sound. Chinook selective fishing in Area 6 was open only from Low Point easterly to Ediz Hook because the eastern portion of Area 6 has many more boat ramps and other access points, and would have required substantially more sampling effort to obtain precise estimates of harvest and effort. Additional closures to help achieve fishery objectives were established: 1) in the eastern half of Marine Area 4; 2) near the mouths of the Sekiu and Hoko rivers; 3) near the mouth of the Elwha River; and 4) in Port Angeles Harbor.

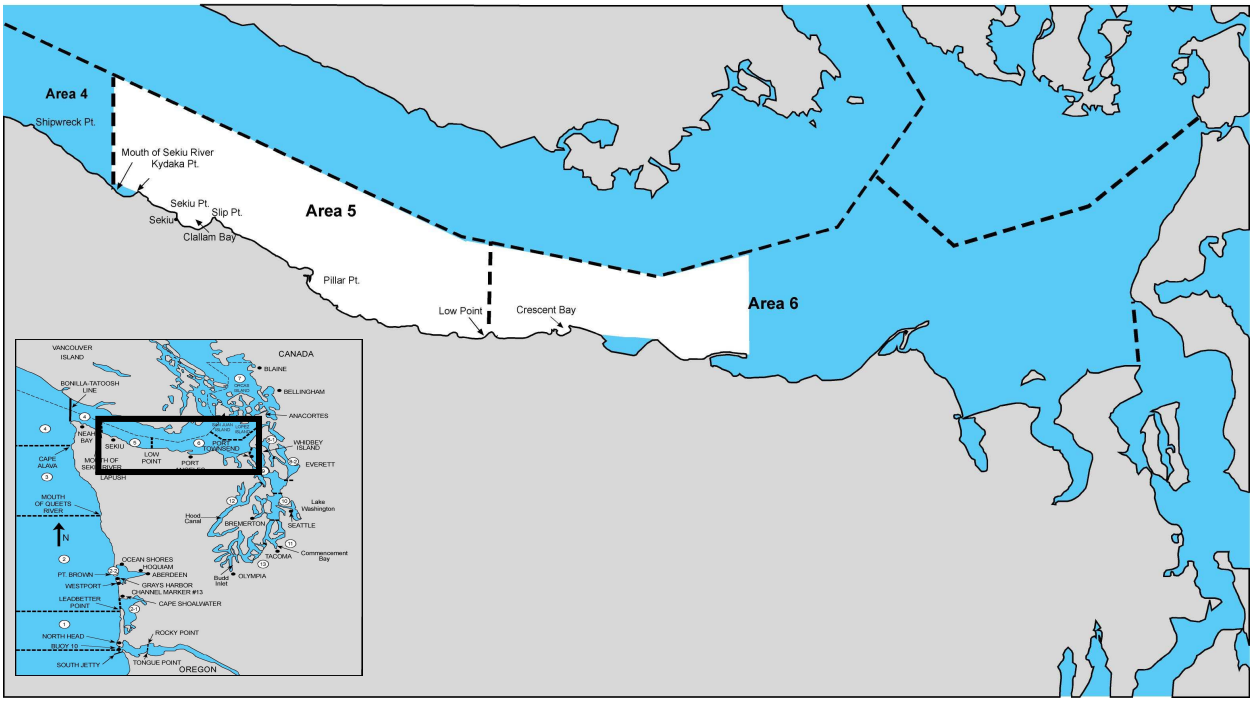


Figure 1. Map of Marine Catch Areas 5 and 6 in Puget Sound, where the selective Chinook fishery occurred during 2003 through 2007.

FISHERIES OVERVIEW

Each year the fishery was scheduled to start in early July and run continuously until either the quota of harvested Chinook was attained or a set number of days was reached, whichever came first (Table 1). Anglers were allowed to retain two marked (adipose fin clipped) Chinook salmon $\geq$ 22" (56 cm) as part of their daily limit, and were required to immediately release, unharmed, any unmarked Chinook caught. During the Chinook Selective Fishery anglers were also allowed to retain pink (*O. gorbuscha*), sockeye (*O. nerka*), and marked hatchery coho (*O. kisutch*) salmon.

Table 1. Dates and Chinook harvest quotas for the Areas 5 and 6 selective Chinook fishery, 2003 through 2007. The fishery closed upon reaching the scheduled closing date or when the quota was harvested, whichever came first.

Year	Opening Date	Scheduled Closing Date	Maximum Possible Days Open	Quota
2003	July 5	August 14	41	3,500
2004	July 1	August 10	41	3,500
2005	July 1	August 10	41	3,500
2006	July 1	August 31	62	3,500
2007	July 1	August 31	62	4,000

SECTION I: WITHIN AND BETWEEN-YEAR PATTERNS IN FISHERY PARAMETERS

METHODS

Overview

From 2003 through 2007, we implemented separate sampling programs in Areas 5 and 6 (Figure 1) in order to collect the data necessary to estimate critical fishery parameters. Preliminary analyses of the 2003 through 2006 fisheries were completed and are reported by Thiesfeld and Hagen-Breaux (2005a, 2005b), and WDFW (2005, 2006, 2007a). For each area, the general study design was built around Murthy's population-total estimator (Murthy 1957, Cochran 1977) and was focused specifically on obtaining daily estimates of total catch and total effort. The program incorporated comprehensive and complementary data collection strategies, including: 1) dockside-based angler interviews and catch sampling; 2) on-the-water total (instantaneous) effort surveys; 3) test fishing; and 4) voluntary reports of completed trips provided by private anglers (Figure 2).

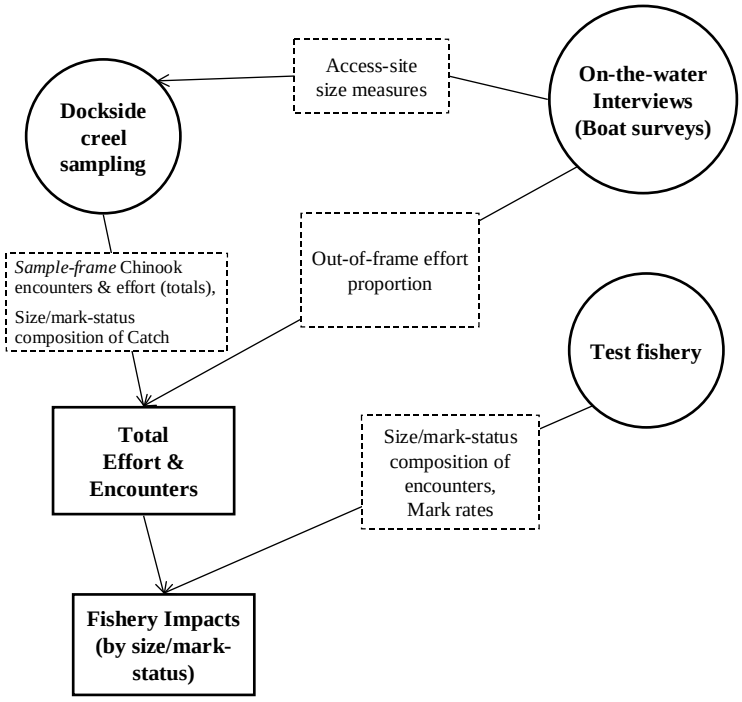


Figure 2. Conceptual diagram of the monitoring plan implemented to estimate fishery impacts in Areas 5 and 6 for their 2003-2007 mark-selective Chinook seasons. Circles represent sampling programs, dashed boxes represent key parameters that are estimated using data from a given program (i.e., the data necessary for estimating other parameters, e.g., age composition, are collected but not depicted), and solid boxes depict bottom-line quantities estimated using combined programs. As depicted, 'Encounters' includes both harvested and released Chinook salmon.

Dockside Sampling

Catch and effort were estimated by creel surveys following the procedures detailed in WDF and NWIFC (1992), with the exception that expansion factors (i.e., cluster sizes or "size measures") were determined in-season, rather than using previously determined effort levels. Thus, our dockside angler-interview efforts followed a two-stage stratified cluster sample design. At the first stage, we selected sample days from all available selective-fishery days from two time-based strata; at the second stage, we randomly selected (with probability proportional to size, PPS) fishery-access points (i.e., public ramps, boathouses, etc.) at which we interviewed anglers (the clusters) to collect data about their fishing trips and to sample their catch.

Sampling Strata and Shifts

In order to maximize the accuracy and precision of our estimates of fishery-related parameters, we incorporated temporal stratification into our sample design. We divided each week into "weekday" (Monday through Thursday; low effort days) and "weekend" (Friday, Saturday, and Sunday; moderate to high effort days) sample strata; we scheduled two randomly selected days in the Monday-Thursday (weekday) stratum and all weekend days (Friday, Saturday, and Sunday) for dockside sampling. On selected sample days and at selected access sites (described

below), sample shifts lasted from dawn until dark so that samplers could intercept all boats and anglers departing the fishery from that site.

Sample Frame and Site Selection

Before the start of the fishery, we determined our access-site sample frame based on a compilation of all known, publicly accessible (i.e., sampleable), and moderate-to-high effort boat-launch facilities present in Areas 5 and 6. Access sites with low effort, as determined from boat survey data (see "Boat surveys" section below), were excluded from our sample frame. Two access sites were randomly chosen for sampling on each scheduled sample day using a weighted random site-selection process. A computer program developed by Mark Hino, WDFW Fish and Wildlife Biologist, was used to select two sites for each sampling day based on their "size" or "weight" (i.e., the proportion of angler effort contained in the sample frame that on average uses the site based on boat-survey estimates; Murthy 1957, Cochran 1977) according to a PPS-without-replacement algorithm. The "size" estimates (proportion of effort for each site) used during the site selection was based on the effort distribution obtained from boat surveys (described below).

Dockside Interview Procedures

On each day scheduled for sampling during the selective Chinook fisheries, 1-3 ramp samplers (depending on day length, anticipated effort, etc.) were stationed at each selected access site so that they could interview all anglers as they exited the fishery at these locations. Samplers interviewed anglers and collected data on trip duration and encounter (fish retained and/or released) composition, by species and mark status (unmarked vs. marked or adipose-fin clipped; Chinook and coho salmon only); data on the size-status (i.e., legal or sublegal) of released fish were not collected. In addition, samplers inspected all landed Chinook and coho salmon for the presence of coded-wire tags (CWT) using wand CWT detectors and snouts were collected from all fish containing CWTs. Biological measurements (fork lengths, total lengths) and scale samples were also acquired from a sample of landed Chinook. Total lengths were not collected in 2003 and 2004. Fork lengths were converted to total lengths for analysis using the recommended equations presented in Conrad and Gutmann (1996). In addition, samplers logged counts of all anglers and fish exiting the fishery at sampled access sites and any anglers/boats missed were counted and recorded on sampling forms (i.e., for use during the estimation process).

Additionally, given their daily exposure to anglers participating in the selective Chinook fisheries, dockside samplers educated anglers about regulations and the proper release of unmarked or sublegal Chinook salmon when time allowed. They relayed that mark-selective regulations permitted the retention of two marked (adipose fin-clipped) Chinook salmon >22 in (>56 cm) per day and required the immediate release (outside the gunwales and without boating) of all unmarked Chinook encountered. Dockside samplers also offered anglers a "dehooker" with an accompanying pamphlet which described proper dehooker use, selective fisheries in general, and accurate species/mark-status (i.e., adipose-fin clipped vs. unmarked) identification. Samplers reminded anglers that in addition to marked Chinook, they could retain other salmon

species (no minimum size) during the selective Chinook season, under a total combined daily limit of two salmon.

Finally, to help shape test-fishing efforts (described below under "Test Fishing") on an in-season basis, dockside samplers collected data on the type and frequency of fishing methods employed by the private fleet during angling excursions. Specifically, samplers inquired about and recorded the predominant (based on time) angling method that was employed for boats that successfully encountered Chinook. Responses were recorded on the sampling form according to the following five fishing method categories: 1) weight and bait (i.e., mooching or slow trolling with lead and herring/anchovy); 2) downrigger trolling (using hardware, bait, or both in combination); 3) jigging (i.e., drifting and jerking pole up and down, e.g., using Buzz Bombs, Point Wilson Darts, or Crippled Herring); 4) diver trolling (e.g., trolling with a Deep Six or a Pink Lady using hardware, bait, or both in combination); and 5) other methods (e.g., fly fishing). Based on these responses, test fishers fished using the same methods in approximately the same proportions as the recreational fleet (see WDFW 2007b and 2007c).

Boat Surveys

In order to obtain precise and up-to-date size measures (i.e., for site selection and within-frame total estimation) and out-of-frame effort proportion estimates (i.e., for expanding catch and effort estimates for our sample frame to fishery-total values), we incorporated on-the-water effort surveys (boat surveys) to estimate the proportion of angler effort originating from different fishery-access points. Boat surveys were comprehensive in space (i.e., they spanned the entirety of each Marine Area) and were assumed to be instantaneous in time. To maximize angler contact, surveys were scheduled during periods of peak fishing effort.
While traversing each area, the boat-survey samplers attempted to intercept all actively fishing boats, and asked occupants how many anglers were on board and where they intended to tie up or exit the fishery upon completing their trip. We excluded non-fishing vessels and vessels that were under way from our sample.

We conducted a minimum of two and an average of four boat surveys per month in each area, separately. Additional boat surveys were conducted whenever significant changes in effort patterns were anticipated (e.g., if access sites or fisheries in adjacent marine areas opened or closed). Using the most recent boat-survey results, we calculated the size measures of sites contained in the sample frames for each week during the selective fishery season.

Test Fishing

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 in the Areas 5 and 6 fisheries, we operated 2 WDFW-staffed test boats (one in each area) for the entirety of the 2003 through 2007 seasons. Each test boat had a crew consisting of two WDFW technicians, each of which fished with a single rod. Test fishers fished approximately five days per week (Monday through Friday) during each season, and assisted with other tasks if weather precluded fishing. Test fishers were also involved with on-the-water boat surveys.

Test-boat crews focused their fishing efforts at locations in both areas that optimized their overall encounter rate (i.e., to increase precision) and mirrored choices made by the at-large private fleet. Starting in 2004, to better ensure the accuracy of test-fishing data, samplers fished for Chinook with similar methods and gear as the recreational fleet. We prescribed the proportions of time that the test boats should spend fishing with different methods based on dockside interview results from the preceding week (described above under "*Dockside Interview Procedures*"). In both areas, downriggers were the predominate method used by anglers to encounter Chinook. For each test-boat hook-up, the encounter number, time sampled, species, mark status, and DNA vial number (if applicable) was recorded. Care was taken to handle all fish as gently as possible. Chinook that were not lost via "drop off" were brought on board and measured in a cotton mesh net. Samplers recorded the fork length, total length (except in 2003 and 2004), and mark status, and collected three scales for each Chinook brought on board. In 2003 and 2004, fork lengths were converted to total lengths for analysis using the recommended equations presented in Conrad and Gutmann (1996). Scales were collected following procedures outlined by the International North Pacific Fisheries Commission (1963), to enable age analysis of Chinook encountered in the fishery.

In addition, samplers used scissors to remove a 1-cm^2 section of tissue from the dorsal fin or the caudal fin of all Chinook brought on board, and then placed the sample in a solution of ethanol. Tissue samples were collected to obtain DNA for future genetic analysis of stock composition (i.e., *DNA-based stock composition estimates are presently unavailable*). Data collected by the two test boats were used to estimate the size/mark-status composition of Chinook encounters and legal mark rates (i.e., % of legal-sized fish that were marked) in the recreational fishery. These size/mark-status group (legal-marked, legal-unmarked, sublegal-marked, sublegal-unmarked) proportions were ultimately used to apportion total Chinook encounters to these same classes for use in fishery-impact estimation (Appendix A). **In contrast to the annual reports where these proportions were weighted by catch, in this document we use unweighted season-long proportions** (see Appendix B for discussion of this methodology change). In addition, size distributions (i.e., length-frequency histograms) were derived from test-fishing data for both marked and unmarked groups, separately, for each year.

Voluntary Trip Reports

Additional data on the size/mark-status composition and mark rates of Chinook encountered during the fisheries were obtained from anglers who submitted Voluntary Trip Reports (VTRs) in each season. In 2003, VTRs were distributed to any angler that expressed interest. Starting in 2005, participating anglers were asked to attend a class lasting from 30-45 minutes during which they received information on salmon species identification and became familiar with the VTR forms, what data to collect, how to fill out the forms, and how to turn in the forms. On VTR forms, anglers were asked to record the date, number of anglers, target species, CRC Area, encountered species (if they positively identified the fish), including each Chinook or coho salmon, whether the fish was kept or released, total length to the nearest $1/8^{th}$ in (0.3 cm), and whether the fish was adipose fin-clipped or not clipped. Based on this information, we estimated the mark rate of legal and sublegal Chinook and then compared these results with test-fishing data and VTRs. In addition, we estimated the legal-marked release rate where possible, as the magnitude of this quantity bears directly on the accuracy of "Method-2" estimates of total

encounters. Due to self-selection and non-response issues associated with sampling anglers using VTRs in Areas 5 and 6, however, this estimate (among others obtained from VTRs) may be biased relative to the entire private fleet.

Estimation Methods

Pre-season Fishery Modeling with FRAM

The Fishery Regulation Assessment Model (FRAM) was used to estimate fishing impacts in the selective Chinook fisheries for preseason assessment purposes. In contrast to our fishery-sampling program, FRAM evaluations are conducted using both areas combined (i.e., it is parameterized for modeling Areas 5 and 6 as a single unit). Based on the set of fishery parameters and stock abundances input to the model, FRAM provides estimates of landed catch, total mortality, and the number of Chinook encountered (i.e. brought to the boat), by stock and age. For each year, FRAM inputs for this fishery include the mark-selective fishery landed catch quota (3,500 in 2003-06, 4,000 in 2007) and several fishery related parameters (Table 2). FRAM contains three specific selective fishery parameters:

1. "Marked Release Error" is the proportion of the legal-marked Chinook encountered that are released,
2. "Unmark Retention Error" is the proportion of legal-unmarked Chinook encounters that are improperly retained.
3. "Selective Fishery Release Mortality" (sfm) is the release mortality on legal size Chinook.

Two other fishery-related mortality rates input to FRAM, "Release Mortality" and "Drop-off Mortality", are used in non-selective fisheries, as well. Although not a FRAM input per se, the algorithms in FRAM do not account for retention of sublegal fish; i.e. sublegal retention error is zero.

FRAM fishery input parameters were discussed and accepted by state and tribal co-managers prior to the annual season setting process. The values used in FRAM for the 2003-07 Areas 5 and 6 selective Chinook fishery are shown in Table 2. The same rates were used in all years These rates are based on a combination of studies, anecdotal reports, or simply as an agreed-to value for modeling purposes (e.g. Drop-off). The selective fishery parameters (Marked Release Error and Unmarked Retention Error) were not developed from specific studies for this fishery.

Table 2. Input parameter values used in FRAM pre-season fishery modeling for the combined Areas 5 and 6 selective Chinook fisheries set for the 2003 through 2007 seasons.

Parameter	Value	Applies to	Notes
Marked Release Error [1/]	0.06	Legal-marked encounters	
Unmarked Retention Error [1/]	0.08	Legal-unmarked encounters	
Selective Fishery Release Mortality (sfm)	0.10	Legal encounters	Same as Chinook nonretention
Release Mortality (sublegal size)	0.20	Sublegal encounters	Same as non-selective
Drop-off Mortality	0.05	Legal encounters	Same as non-selective
Marked sublegal retention error [1/]	0.00	Marked sublegals	FRAM algorithm assumption
Unmarked sublegal retention error [1/]	0.00	Unmarked sublegals	FRAM algorithm assumption

[1/] FRAM values can be compared with creel survey estimates from the Areas 5/6 pilot fishery study.

Creel-based Estimates of Catch, Releases, and Effort

Using data acquired from sampled access sites, we estimated total daily encounters (by group, according to the classes enumerated during dockside sampling; e.g., retained-marked Chinook, released unmarked Chinook, retained-marked coho, etc.) and effort for anglers accessing the fishery from all sites contained in our Area-5 and Area-6 sample frames, separately, using dockside counts and the size measures of sites sampled on scheduled sample days. Angler trips and anglers are used interchangeably throughout the document to represent effort. We then expanded dockside-frame estimates to daily totals based on the proportion of total fishing effort originating from access sites that were not contained in our sample frame (Figure 2). Finally, we expanded daily estimates to stratum (weekday vs. weekend), weekly, monthly, and ultimately season totals. We used a Microsoft Access application developed by Kurt Reidinger (WDFW Fish and Wildlife Biologist) to enter sample data, generate expanded estimates, and produce appropriate variances for all sampled strata.

Sample-frame total catch and effort were estimated using Murthy's total estimator (Murthy 1957; Cochran 1977):

$$\hat{Y} = \frac{\left[(1-P_2)*(E_1/P_1)+(1-P_1)*(E_2/P_2)\right]}{(2-P_1-P_2)} \quad (1)$$

where:

$\hat{Y}$ = daily estimator (e.g., anglers, marked Chinook retained, etc.),
P = proportion of effort (size measure) at sites *1* and *2*, and
E = sampled (observed) count at site *1* and *2*.

The variance around sample-frame totals was estimated according to:

$$V\left(\hat{Y}\right) = \frac{(1-P_1)(1-P_2)(1-P_1-P_2)}{\left(2-P_1-P_2\right)^2} * \left[\frac{E_1}{P_1} - \frac{E_2}{P_2}\right]^2 \quad (2)$$

All accounting for missed boats/anglers was done within WDFW's Microsoft Access catch-estimate system; using the average catch-per-boat estimated for a given site-day combination and the number of missed boats logged on forms, an estimate of unobserved catch was incorporated into the sample-frame totals. An analogous computation was made to account for the number of anglers not interviewed from the missed boats.

Finally, we expanded daily catch and effort estimates generated for our sample frame to fishery totals based on the proportion of effort (estimated from boat-survey data) that originated from out-of-frame access sites:

$$\hat{Y}_{adj} = \frac{\hat{Y}}{(1-\hat{p}_{nonsampled})} = \frac{\hat{Y}}{\hat{q}} \quad (3)$$

where:

$\hat{Y}_{adj}$ = daily estimator after expansion by an estimate of the proportion of effort that originated from the non-sampled access sites, and

$\hat{q}$ = expansion factor to account for the proportion of effort originating from out-of-frame access sites, $\hat{p}_{nonsampled}$ (i.e., sites not included in the sample frame and therefore never sampled).

The variance of expanded total estimates was approximated as:

$$V\left(\hat{Y}_{adj}\right) = \hat{Y}_{adj}^{\ 2} * \left[\frac{\hat{V}(\hat{Y})}{\hat{Y}^2} + \frac{\hat{V}(\hat{q})}{\hat{q}^2}\right] \quad (4)$$

The reliability of estimates of Chinook landings, releases, and/or effort obtained using the above-described approach depends on the validity of the following four assumptions:

- Boat surveys provide unbiased estimates of access-site size measures and out-of-frame effort proportions (*Assumption 1*);
- Relative angling effort originating from a particular access site (i.e., its size measure) is proportional to total catch landed at that site (*Assumption 2*);
- All anglers exiting the fishery at sampled site are interviewed and they accurately report all salmon caught and kept or released (if boats are missed they are counted and catch and effort estimates are expanded appropriately (*Assumption 3*); and
- Catch per unit effort does not differ significantly between in-frame and out-of-frame sites (*Assumption 4*).

Although Conrad and Alexandersdottir (1993) assessed the effects of *Assumption* 2 violations on estimates of catch and effort for Puget Sound salmon fisheries, *Assumptions 1*, *3*, and *4*, have not been explicitly evaluated to date (Appendix C).

A slight change to previously reported estimates was undertaken for this multi-year analysis. We pursued an additional estimation step to apportion a percent of unidentified salmon released to the released-Chinook category; we did this on a monthly time step according to the composition of known-species salmon releases (i.e., based on expanded Murthy estimates generated from interview data). This quantity–apportioned unidentified salmon ($\hat{N}_{AUS}$) hereafter–is derived from estimated quantities [unidentified salmon, $\hat{N}_{US}$, and the proportion of Chinook in estimated releases ($\hat{p}_{Chin} = \hat{N}_{Chin} / \sum \hat{N}_{ID'd-salmon}$)], and has an estimator (5) and variance (6) of:

(5) $$\hat{N}_{AUS} = \hat{N}_{US} * \hat{p}_{Chin}$$

(6) $$V(\hat{N}_{AUS}) = V(\hat{N}_{US}) * \hat{p}_{Chin}{}^2 + \hat{N}_{US}{}^2 * V(\hat{p}_{Chin}) - V(\hat{N}_{US}) * V(\hat{p}_{Chin}),$$

where, also based on estimates:

(7) $$V(\hat{p}_{Chin}) = \hat{p}_{Chin}{}^2 * \left[\frac{V(\hat{N}_{Chin})}{\hat{N}_{Chin}{}^2} + \frac{V(\hat{N}_{ID'd-salmon})}{\hat{N}_{ID'd-salmon}{}^2} \right] + V(\hat{N}_{Chin}) * \left[\frac{V(\hat{N}_{ID'd-salmon})}{\hat{N}_{ID'd-salmon}{}^4} \right]$$

Total Chinook Encounters Estimation: Methods 1 and 2

We estimated the total number of Chinook encountered during the selective Chinook fisheries during each season using two different estimation approaches ("Method 1" and "Method 2"). Under Method 1 (the harvest-plus-reported-releases method), we simply summed Murthy estimates and variances for all Chinook encounter sub-categories (i.e., retained marked and unmarked Chinook; released marked, unmarked, and unknown-mark-status Chinook; and apportioned unidentified salmon releases), which were estimated according to the process outlined above, to estimate total Chinook encounters. Relative to Method 2, the reliability of Method-1 estimates depends on how accurately anglers recall and report the number of salmon released, and their mark status, during their trips. Past studies suggest that there is a tendency for over-reporting of releases in Puget Sound and other fisheries (e.g., Noviello 1998; Sullivan 2003), the magnitude of this "prestige bias" has not been quantified for selective Chinook fisheries.

Under Method-2 (the harvest-only method), we estimated total Chinook encounters by combining fishery-total estimates of retained legal-marked Chinook (outlined above) with test-fishery data on the size/mark-status composition of the pool of encountered Chinook salmon. Relative to Method 1, the reliability of Method-2 estimates depends on the degree to which anglers release marked legal-size Chinook. Specifically, we estimated total Chinook encounters ($\hat{E}_{tot}$) for each month, then summed these to get a season total by expanding creel-based

estimates of legal-marked Chinook retention ($\hat{N}_{LM}$) by the test-fishing estimate of the legal-marked proportion in the encountered Chinook pool ($\hat{p}_{LM}$) (see Appendix A for variance details):

(8) $$\hat{E}_{tot} = \hat{N}_{LM} / \hat{p}_{LM}$$

Thus, in addition to the usual assumptions affecting the accuracy of Murthy-based estimates of legal-marked Chinook retention (*Assumptions 1-4*), the Method-2 estimation approach also assumes:

- Anglers accurately identify and retain all legal-marked Chinook encountered during fishing trips (*Assumption 5*). If anglers intentionally (e.g., releasing legal-marked Chinook in order to catch and retain larger individuals) or unintentionally (e.g., measurement error) release legal-marked Chinook, Method-2 estimates will have a negative expected bias (relative to the true, unknown value).
- The extent to which test-boat samplers accurately mimic the private fleet in angling behavior also affects the accuracy of Method-2 estimates (i.e., the size/mark-status composition experienced by the private fleet is identical to that seen in the test fishery; *Assumption 6*).

The performance of Method-1 and -2 estimators (and the associated validity of assumptions) under the range of fishery conditions present in Areas 5 and 6 will be addressed in detail in Section II of this report.

Fishery Impacts (Encounters and Mortalities) by Size/Mark-Status Group

Method-1 and-2 encounter estimates were decomposed to size/mark-status categories using a combination of creel estimates, test-fishery data (size/mark status composition), and dockside observations of landed catch (for apportioning retained-marked and -unmarked fish to size classes). While this and the subsequent mortality-estimation routine are detailed in Appendix A, we briefly describe the process here. For both Method-1 and -2 estimates (separately), we apportioned total Chinook encounters to the four size/mark-status categories of legal-marked (LM), sublegal-marked (SM), legal-unmarked (LU), and sublegal-unmarked (SU) based on the composition of test-boat encounters; thus, *Assumption 6* (i.e., similar encounter composition for the test boat and private fleet) also applies to our mortality estimation scheme. We then estimated total release mortality due to each area (Areas 5 and 6) and year's (2003-2007) selective fishery by applying size-specific mortality rates to release estimates for the four Chinook size/mark-status classes (LM, LU, SM, and SU). We applied a release mortality rate of 15% to LM and LU (i.e., 10% release plus a drop-off mortality approximated as 5% of legal-size encounters) and 20% to SM and SU encounter estimates, respectively, for direct comparison to FRAM. We then added retention mortality estimates (i.e., harvest) for each size/mark-status group to release mortality estimate for that same group to obtain total class-specific mortality. Mortalities (and their variances) were calculated on a season-total basis.

Finally, we pooled encounter and mortality estimates for Areas 5 and 6 and compared these Area-5 and 6 composite values to pre-season modeled (FRAM) encounters and mortalities, for each size and mark status category, and for each year separately. Further, given that Method-1 and -2 encounter estimates are likely to include some degree of bias (assumed positive and negative, respectively) relative to the true number of Chinook encountered in Areas 5 and 6 during each season, we contrasted FRAM predictions with the ranges bounded by the two estimates. Though our FRAM (predicted) versus observed (i.e., post-season estimates) comparisons are qualitative in nature, we present the 95% confidence intervals associated with observed estimates to provide perspective on statistical uncertainty about differences. It should be noted, however, that these CIs do not incorporate uncertainty due to the release mortality rates applied (i.e., sfm_L and sfm_S in Appendix C, both are assumed constants) and therefore the intervals are underestimated.

Coded-Wire Tagged (CWT) Chinook Impacts

To understand the potential effects of the selective Chinook fisheries on CWT-based cohort-reconstruction efforts, we estimated the number of unmarked-tagged Chinook mortalities that occurred during the course of the selective fishery for each year. Thus, we acquired information on recovered CWT's for all double index tag (DIT) groups encountered and then applied the methods described by WDFW (2002) to estimate the number of unmarked-DIT Chinook that were encountered and the number of these fish that subsequently died due to handling and release impacts.

The approach used to estimate unmarked-DIT mortalities in the selective fishery was developed by the Selective Fisheries Evaluation Committee – Analysis Work Group (SFEC-AWG 2002) and were evaluated by a workgroup consisting of State and Tribal biologists and statisticians, including members of SFEC-AWG (Joint Coho DIT Analysis Workgroup 2003). Given our interest in the effects of mark-selective fisheries on the CWT program, we used a selective fishery mortality rate (*sfm*) of 10% to estimate unmarked-DIT mortalities in our analysis; this is the same release mortality rate used in FRAM legal-Chinook model runs, *less drop-off mortality* (5% of legal encounters). We used 10% instead of 15% (we apply above to all legal releases), however, because unseen drop-off mortality is theoretically equivalent for marked and unmarked fish and present in both selective and non-selective recreational Chinook fisheries. Thus, our estimates of unmarked-DIT mortalities are analogous to impacts in excess of those that would occur under non-selective regulations.

For each year, we estimated encounters and mortalities for each recovered DIT individually and then summed estimates for each hatchery, brood year, and area, because the sampling rate changed throughout the fishery and was different between areas (WDFW 2002). Thus, the estimated number of unmarked mortalities was calculated as:

$$\hat{U}_a^{MSF} = \lambda^{REL} \hat{M}_a^{MSF} sfm \quad (9)$$

with associated variance:

$$Var(\hat{U}_a^{MSF}) \approx \left(\lambda^{REL}\right)^2 sfm^2 \hat{M}_a^{MSF} \frac{1-s}{s} \quad (10)$$

where:

sfm = selective fishing mortality rate (10%, *excludes drop-off mortality*),
$U_{a,i}^{MSF}$ = aged *a* unmarked DIT mortalities from stock *i* in the selective fishery,
$M_{a,i}^{MSF}$ = aged *a* marked DIT mortalities from stock *i* in the selective fishery,
s = sampling rate of the catch,
λ^{REL} = unmarked to marked ratio *at release* for fish in a DIT group, and
$Var(U_{a,i}^{MSF})$ = variance of $U_{a,i}^{MSF}$.

In addition to estimating unmarked-DIT mortalities, we pooled all CWTs (DIT and otherwise) recovered during the fishery and, based on this total, report the proportional contribution (unexpanded recoveries) of different hatcheries to the total Chinook harvest.

SECTION I: RESULTS

Pre-Season FRAM Results

Preseason FRAM run results for the combined Areas 5 and 6 mark-selective Chinook fishery for 2003 through 2007 are shown in Table 3. Areas 5 and 6 are treated as one fishery in FRAM; consequently separate estimates for each Area are not produced. These estimates calculated in FRAM incorporate all fishery inputs and marked and unmarked stock abundances for each year. A specialized output from FRAM called the Selective Fishery Report contains more detailed results by stock and age (Appendix D).

Creel Survey Results

Over the 5 years of the study, the fishery has lasted from 30 to 49 days (Figure 3). During 2006 and 2007, the fishery was closed for assessment purposes and then was re-opened from 1 to 4 days to harvest the remainder of the quota (Table 4). The harvest quota was obtained each year, except in 2005 when catch per angler was extremely low, and consequently 2005 was the only year the scheduled closing date was the actual closing date.

Table 3. Pre-season FRAM estimates for the combined Areas 5 and 6 selective Chinook fishery, 2003 through 2007.

		Encounters		Landed Catch		Total Mortality	
Year	Size Class	Marked	Unmarked	Marked	Unmarked	Marked	Unmarked
2003	Legal	3,045	7,976	2,862	638	3,032	1,771
	Sublegal	2,815	4,585	0	0	563	917
	All	5,860	12,561	2,862	638	3,595	2,688
2004	Legal	3,043	7,993	2,861	639	3,031	1,774
	Sublegal	2,690	4,935	0	0	538	987
	All	5,733	12,928	2,861	639	3,569	2,761
2005	Legal	3,071	7,664	2,887	613	3,059	1,701
	Sublegal	2,615	4,875	0	0	523	975
	All	5,686	12,539	2,887	613	3,582	2,676
2006	Legal	3,238	5,699	3,044	456	3,225	1,265
	Sublegal	3,625	3,570	0	0	725	714
	All	6,863	9,269	3,044	456	3,950	1,979
2007	Legal	3,757	5,850	3,532	468	3,743	1,298
	Sublegal	3,805	3,625	0	0	761	725
	All	7,562	9,475	3,532	468	4,504	2,023

Fishing Effort

Total effort ranged between approximately 22,000 and 34,000 angler trips per year (angler trips and anglers are used interchangeably throughout the document; Table 4, Figure 4 and Appendix E). Effort was effected by the length of the season and angler success. The highest effort occurred in 2005, the longest of the 5 seasons at 49 days, and the lowest effort occurred in 2007, the second shortest season at 36 days. The majority of effort was expended in Area 5, ranging from 79% in 2003 to 88% in 2005 and 2006 (Table 5). On average, 85% of the effort occurred in Area 5. The number of anglers per day ranged from 536 per day in 2006 to 831 per day in 2005 (Figure 5).

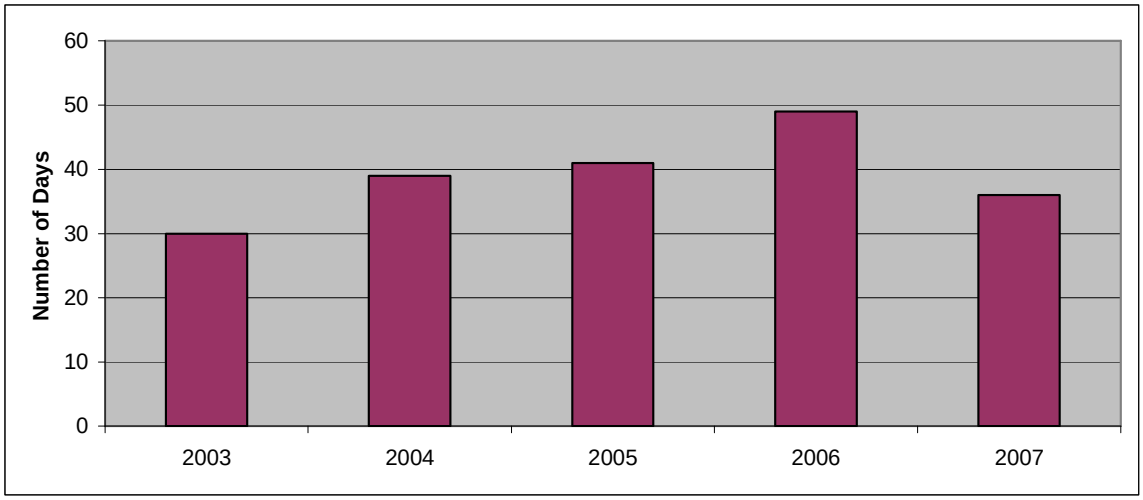


Figure 3. Number of days the Area 5 and 6 selective Chinook fishery was open for Chinook retention, 2003 through 2007.

Table 4. Recreational salmon catch estimates from creel surveys during the Chinook Mark-Selective Fisheries in Marine Areas 5 and 6 combined, 2003 through 2007. Values may not add exactly due to rounding error.

			Trips		Harvested			Released (Method-1 Estimates)			
Year	Fishery	Dates Open	Boats	Anglers	Chinook	Coho	Pink	Unidentified or Other	Chinook	Coho	Pink
2003	5 and 6	July 5 – August 3	10,665	24,593	3,493	5,364	5,608	930	14,841	22,902	3,342
2004	5 and 6	July 1 – August 8	12,960	29,425	3,576	9,537	33	116	13,802	25,926	40
2005	5 and 6	July 1 – August 10	14,084	34,086	2,078	3,723	14,850	120	6,408	10,431	3,904
2006	5 and 6	July 1 – August 14 & August 18 - 21	11,485	26,253	3,666	976	0	138	8,816	1,996	0
2007	5 and 6	July 1 – August 4 & August 9	9,628	22,051	4,096	2,714	11,148	475	8,620	7,692	4,401

Table 5. Recreational salmon catch estimates from creel surveys during the Chinook Mark-Selective Fisheries in Marine Areas 5 and 6 separately, 2003 through 2007. Values may not add exactly due to rounding error.

			Trips		Harvested			Released (Method-1 Estimates)			
Year	Fishery	Dates Open	Boats	Anglers	Chinook	Coho	Pink	Unidentified or Other	Chinook	Coho	Pink
2003	Area 5	July 5 – August 3	8,008	19,398	2,529	5,258	5,147	894	13,118	22,447	3,148
2004	Area 5	July 1 – August 8	10,709	25,174	2,900	9,459	30	113	12,392	25,800	37
2005	Area 5	July 1 – August 10	11,968	30,115	1,669	3,710	14,609	118	5,772	10,381	3,894
2006	Area 5	July 1 – August 14 & August 18 - 21	9,779	23,177	3,318	976	0	138	8,482	1,996	0
2007	Area 5	July 1 – August 4 & August 9	7,883	18,830	3,367	2,666	10,503	375	7,803	7,543	4,401
2003	Area 6	July 5 – August 3	2,657	5,195	964	107	461	36	1,732	455	194
2004	Area 6	July 1 – August 8	2,251	4,251	676	78	3	3	1,409	126	3
2005	Area 6	July 1 – August 10	2,116	3,971	408	13	241	2	636	50	10
2006	Area 6	July 1 – August 14 & August 18 - 21	1,706	3,077	349	0	0	0	334	0	0
2007	Area 6	July 1 – August 4 & August 9	1,745	3,221	729	48	645	100	817	149	253

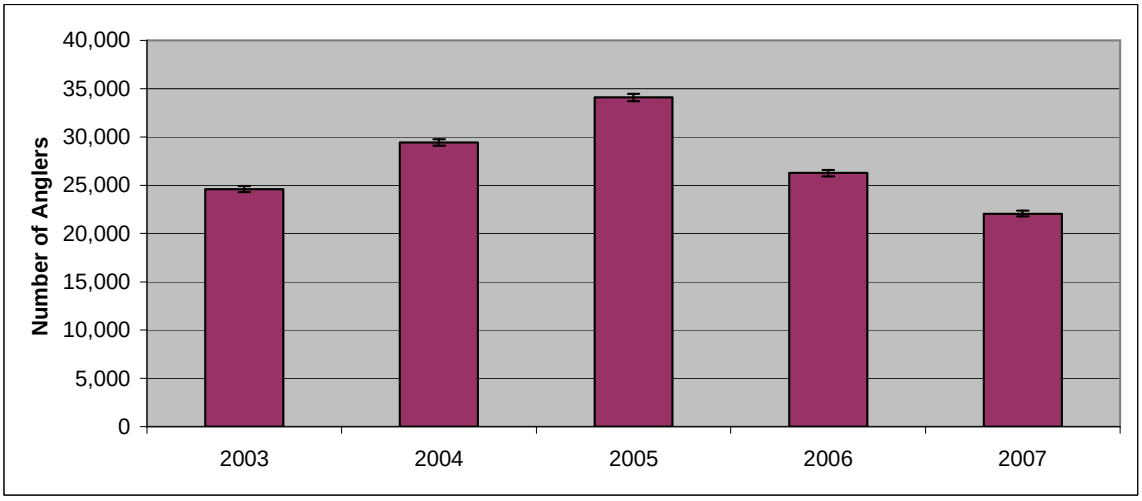


Figure 4. Total number of angler trips, and 95% confidence intervals, in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

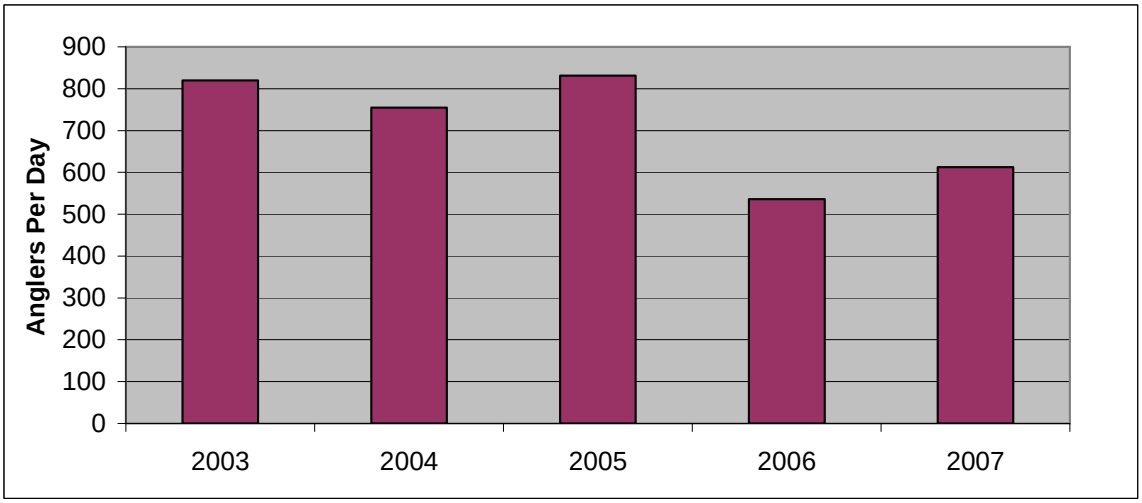


Figure 5. Total number of anglers per day participating in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Chinook Encounters: Estimated Harvest and C/F

The number of Chinook harvested ranged from 2,078 in 2005, the year the quota was not achieved, to 4,096 in 2007 (Figure 6 and Appendix F), the year with the highest quota (4,000). In each year the quota was achieved, the estimated harvest was within 5% of the quota. The average number of Chinook harvested per day ranged from 51 in 2005 to 116 in 2003 (Figure 7). The majority of the Chinook harvest occurred in Area 5, ranging from 72% in 2003 to 91% in 2006. On average, 81% of the Chinook harvest occurred in Area 5.

The number of Chinook released ranged from 6,408 in 2005 to 14,841 in 2003 (Figure 6 and Appendix F). Note that releases in this section do not include any of the "unknown" salmon released. The majority of the Chinook encountered and released occurred in Area 5, ranging from 88% in 2003 to 96% in 2006. On average, 91% of the Chinook released occurred in Area 5. The number of Chinook released for every Chinook harvested declined throughout the fishery, from 4.2 released/harvested in 2003 to 2.1 released/harvested in 2007 (Figure 8). The decline in the ratio of released to harvested Chinook occurred as the mark rate of legal-size Chinook increased from 2003 to 2007 (Figure 9, see "Test Fishing" for mark rates).

Catch (harvested) of Chinook per angler (C/f) ranged from 0.06 in 2005 to 0.19 in 2007 (Figure 10), or 1 harvested Chinook for every 16 anglers in 2005 to 1 for every 5 anglers in 2007. For the 5 years of the fishery, the unweighted average catch per angler was 0.13 or 1 Chinook harvested for every 9 anglers. Catch per angler was higher in Area 6 every year except 2006 (Figure 11). For the 5 years of the fishery, the unweighted average catch per angler was 0.12 in Area 5 and 0.16 in Area 6.

The total harvested catch per unit effort for Chinook, coho and pink combined ranged from 0.18 fish per angler in 2006 to 0.81 fish per angler in 2007 (Figure 12). The number of anglers per day appears to be correlated with total catch per angler and unrelated to catch per angler of any individual species.

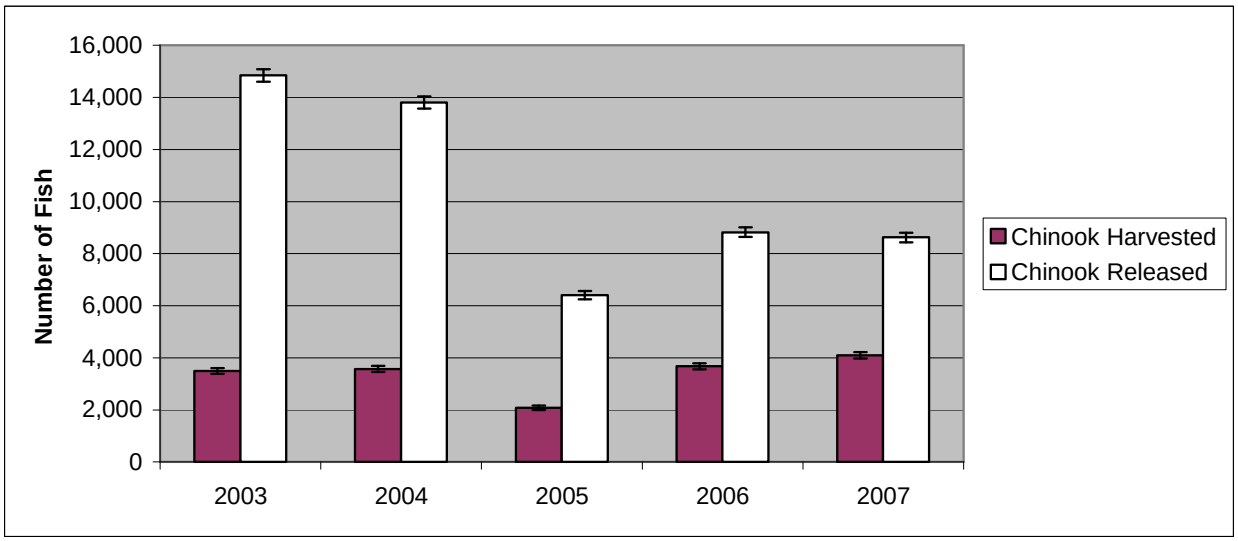


Figure 6. Number of Chinook harvested and released, and 95% confidence intervals, in the Area 5 and 6 selective Chinook fishery, 2003 through 2007. Does not include Chinook that may have been reported as unknown salmon species released.

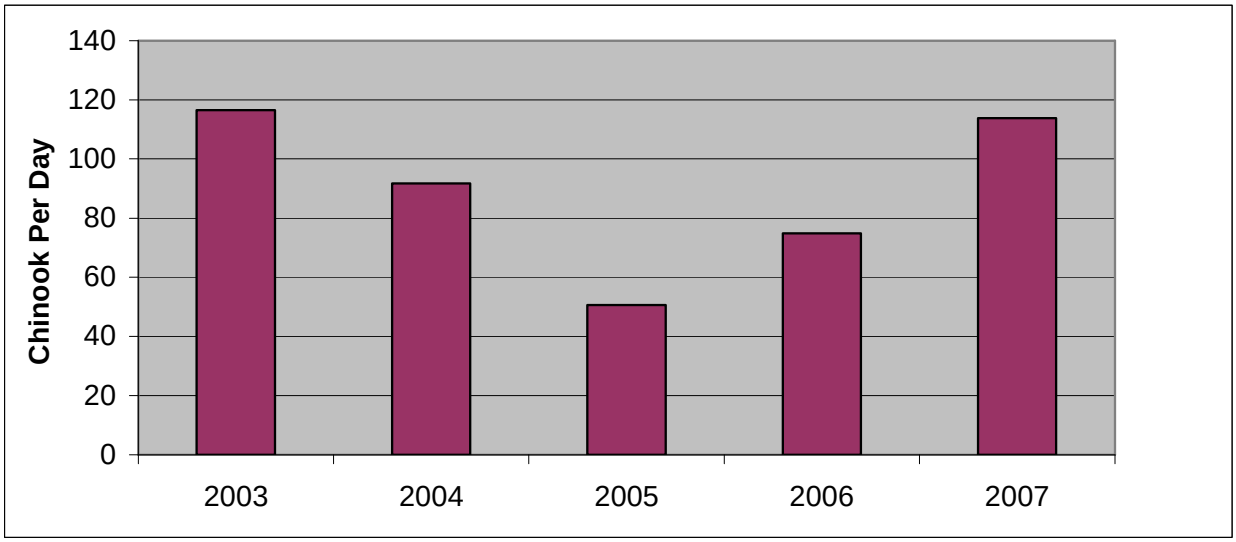


Figure 7. Average number of Chinook harvested per day in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

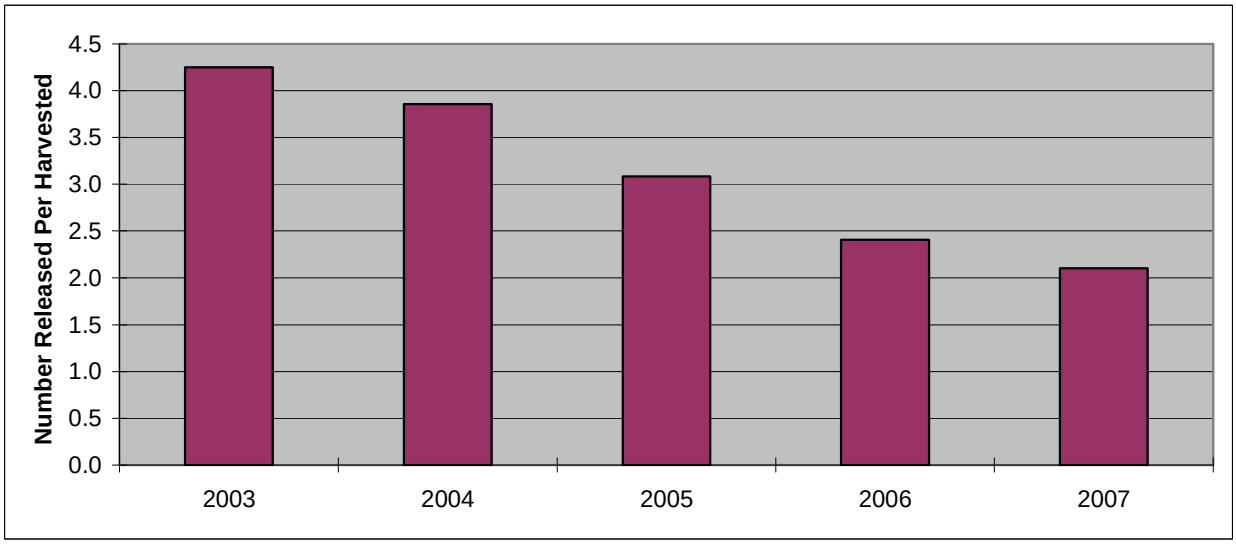


Figure 8. Number of Chinook released for each Chinook harvested in the Area 5 and 6 selective Chinook fishery, 2003 through 2007. Does not include Chinook that may have been reported as unknown salmon species released.

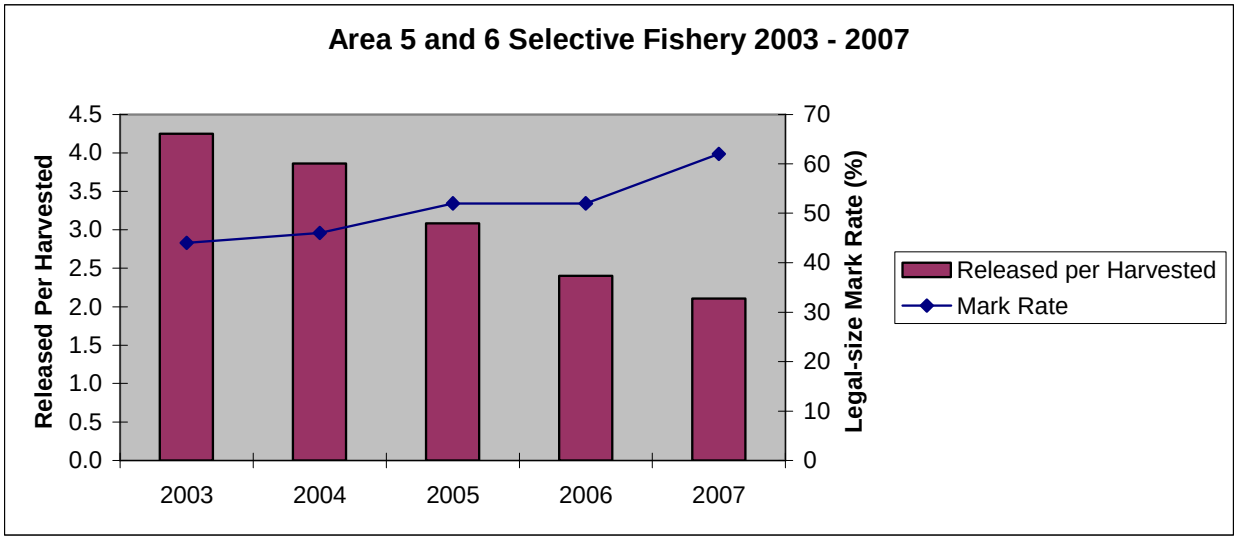


Figure 9. Number of Chinook released per Chinook harvested compared to legal-size Chinook mark rate in the Area 5 and 6 selective Chinook fishery, 2003 through 2007. Does not include Chinook that may have been reported as unknown salmon species released.

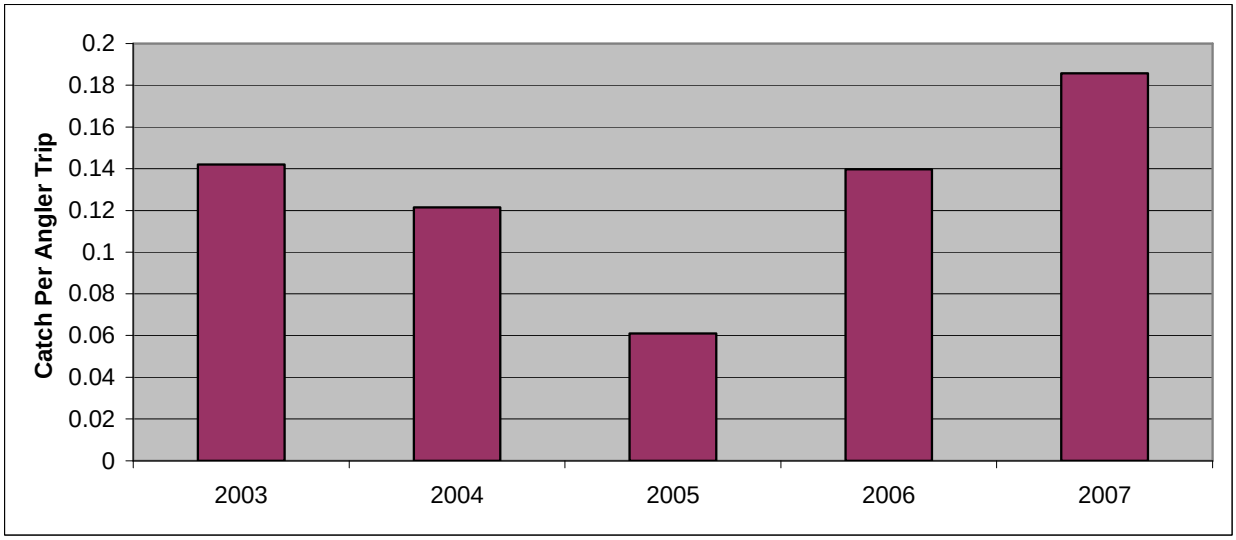


Figure 10. Chinook catch per angler trip (harvested) in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

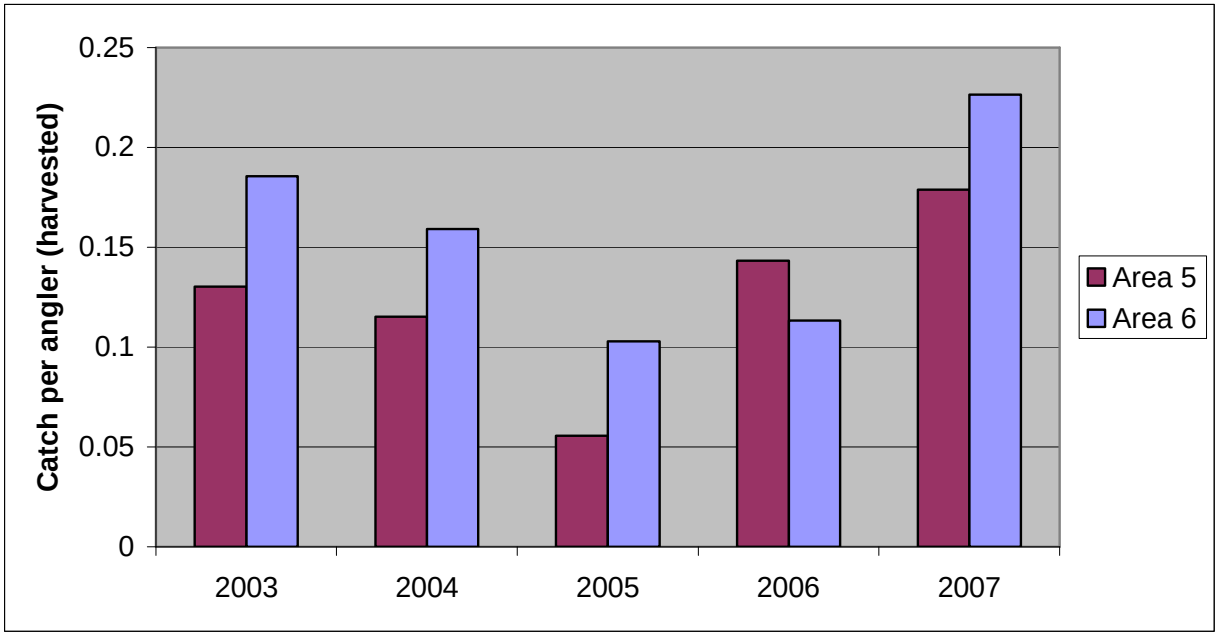


Figure 11. Chinook catch per angler trip (harvested) by area in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

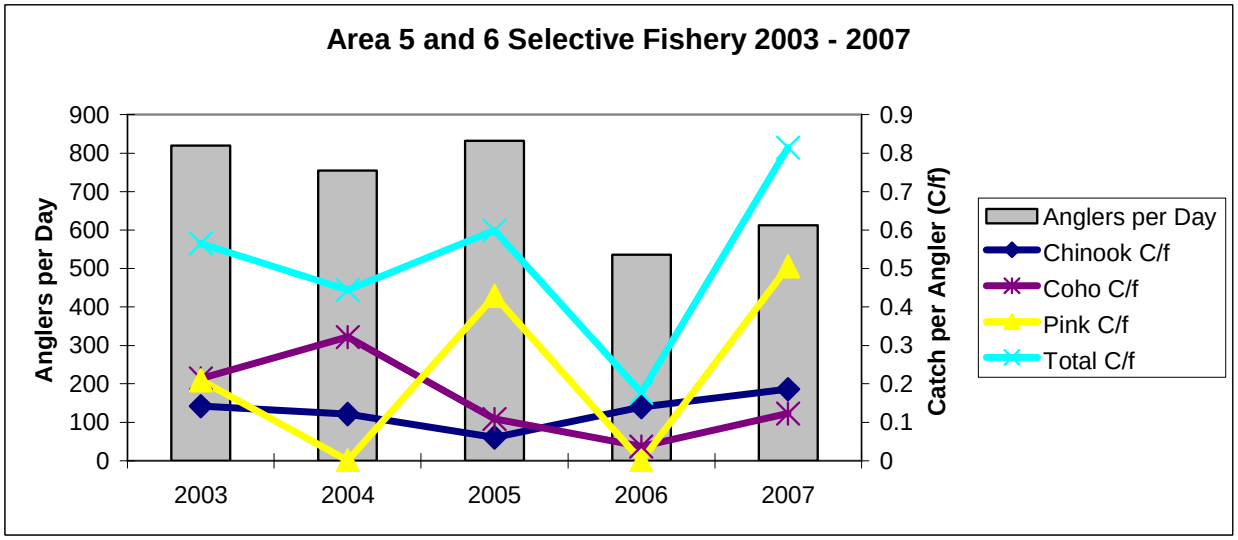


Figure 12. Number of anglers per day compared to catch per angler (C/f) in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Creel Survey Mark Rates and Size Composition

Based on dockside sampling of landed catch and angler-reported release estimates for known mark-status Chinook (i.e., excluding apportioned unidentified salmon and unknown mark-status categories), mark rates of Chinook were always higher in Area 6 than in Area 5, and mark rates increased from 0.24 in 2003 to 0.45 in 2007 (Table 6). Area and year specific data from which mark rates were calculated are reported in Appendix G. During the 5 years of the fishery, the percentage of harvested Chinook that were unmarked (sublegal-size and legal-size) ranged from 0.14% in 2004 to 3.03% in 2005 and 2007 (Table 7).

Table 6. Mark rates of Chinook reported by anglers interviewed during dockside creel surveys in the Area 5 and 6 selective Chinook fishery, 2003-2007.

	Creel Survey Mark Rate		
Year	Area 5	Area 6	Overall
2003	0.219	0.377	0.245
2004	0.255	0.341	0.265
2005	0.315	0.469	0.335
2006	0.459	0.510	0.462
2007	0.441	0.543	0.454

Table 7. Proportion of harvested Chinook observed during dockside creel surveys that were unmarked in the Area 5 and 6 selective Chinook fishery, 2003-2007.

	Proportion of Harvest Unmarked		
Year	Area 5	Area 6	Overall
2003	0.021	0.023	0.022
2004	0.000	0.007	0.001
2005	0.029	0.010	0.026
2006	0.005	0.024	0.007
2007	0.035	0.010	0.030

During the five seasons of dockside-sampling efforts, dockside samplers measured the lengths of 3,517 Chinook. Harvested Chinook were larger in Area 6 than in Area 5 and mean lengths were significantly different between areas each year (Table 8). Between 4 and 7 percent of the harvested Chinook measured were smaller than the 22-inch minimum size (Table 9). The highest retention of sublegal-size Chinook occurred in Area 5 during 2007 when 10% of the harvested Chinook were less than the minimum size. Odd-numbered years (2003, 2005 and 2007) had the highest rates of sublegal-size retention error, possibly because anglers may have confused juvenile Chinook as pink salmon. The proportion of measured Chinook that were legal-size and marked ranged from 0.92 to 0.96 for both Areas combined during the 5 years of the fishery (Tables 10 and 11). The proportion of measured Chinook that were unmarked ranged from 0.00 to 0.03 for both Areas combined during the 5 years of the fishery.

Table 8. Mean lengths and statistical comparisons of Chinook harvested by anglers in the Area 5 and 6 selective Chinook fishery, 2003-2007.

	Area 5		Area 6		
Year	Samples	Mean Length (mm)	Samples	Mean Length (mm)	T Test
2003	77	655	32	763	** $\rho < 0.01$
2004	404	723	269	808	** $\rho < 0.01$
2005	453	683	148	746	** $\rho < 0.01$
2006	852	682	150	775	** $\rho < 0.01$
2007	834	702	398	766	** $\rho < 0.01$

Table 9. Proportion of harvested Chinook measured for length during dockside creel surveys that were sublegal-size in the Area 5 and 6 seledctive Chinook fishery, 2003-2007.

	Proportion of Harvest less than 22 inches		
Year	Area 5	Area 6	Overall
2003	0.090	0.000	0.064
2004	0.067	0.004	0.042
2005	0.079	0.020	0.065
2006	0.061	0.000	0.052
2007	0.103	0.010	0.073

Table 10. Number of Chinook in four mark status/size categories from retained fish measured for length during creel surveys in the Area 5 and 6 selective Chinook fishery, 2003-2007.

Year	Area	Legal-size Marked	Legal-size Unmarked	Sublegal-size Marked	Sublegal-size Unmarked
2003	5	70	1	7	0
	6	31	1	0	0
	Total	101	2	7	0
2004	5	377	0	27	0
	6	268	0	1	0
	Total	645	0	28	0
2005	5	409	8	27	9
	6	145	0	0	3
	Total	554	8	27	12
2006	5	794	3	50	2
	6	149	1	0	0
	Total	943	4	50	2
2007	5	742	4	70	16
	6	392	2	4	0
	Total	1,134	6	74	16

Table 11. Proportions of Chinook in four mark status/size categories from retained fish measured for length during creel surveys in the Area 5 and 6 selective Chinook fishery, 2003-2007.

Year	Area	Legal-size Marked	Legal-size Unmarked	Sublegal-size Marked	Sublegal-size Unmarked
2003	5	0.90	0.01	0.09	0.00
	6	0.97	0.03	0.00	0.00
	Total	0.92	0.02	0.06	0.00
2004	5	0.93	0.00	0.07	0.00
	6	1.00	0.00	0.00	0.00
	Total	0.96	0.00	0.04	0.00
2005	5	0.90	0.02	0.06	0.02
	6	0.98	0.00	0.00	0.02
	Total	0.92	0.01	0.04	0.02
2006	5	0.94	0.00	0.06	0.00
	6	0.99	0.01	0.00	0.00
	Total	0.94	0.00	0.05	0.00
2007	5	0.89	0.00	0.08	0.02
	6	0.98	0.01	0.01	0.00
	Total	0.92	0.00	0.06	0.01

Estimated Releases & Total Chinook Encounters

Very few fish were reported as unknown salmon released by anglers reporting their catch to dockside samplers. Nonetheless, we apportioned some of these unknown salmon as Chinook based on the percent of the known releases that were Chinook. The total number of fish re-classified from unknown salmon released to released Chinook varied from 31 in 2005 to 328 in 2003 (Table 12). Most of the unknown salmon released were from Area 5. After apportioning these salmon, the total number of Chinook encounters reported by anglers ranged from a low of 8,517 in 2005 to a high of 18,662 in 2003.

Table 12. Estimates of total Chinook encounters from creel surveys in the Area 5 and 6 selective Chinook fishery, 2003-2007, after apportioning unknown releases into species based on their respective percent of known releases.

		Known Chinook Enounters from Creel	Number of Unknown Releases Apportioned as Chinook	Final Estimated Chinook Encounters from Creel
Area 5	2003	15,647	303	15,950
	2004	15,292	29	15,321
	2005	7,442	30	7,471
	2006	11,800	109	11,909
	2007	11,170	148	11,317
Area 6	2003	2,686	26	2,712
	2004	2,085	3	2,088
	2005	1,044	1	1,045
	2006	683	0	683
	2007	1,546	67	1,614
Total	2003	18,334	328	18,662
	2004	17,378	32	17,410
	2005	8,486	31	8,517
	2006	12,482	110	12,592
	2007	12,716	215	12,931

Test Fishery Results

Fishing Methods and Effort

Over the two areas and five seasons, Area 5 and Area 6 samplers fishing on test boats spent 2,316 hours pursuing Chinook salmon. Test fishing effort and fishing-method details for 2003 through 2006 are summarized in prior post-season reports (Thiesfeld and Hagen-Breaux 2005a, 2005b, WDFW 2005, 2006, 2007a). In terms of effort descriptors used to characterize the angling public, this translates into a total of 772 angler trips (Table 13). Test boat samplers averaged 37 days on the water during each year in Area 5 and 40 days in Area 6 over the five years, and all missed fishing days were due to a combination of inclement weather and/or boat-maintenance issues. During all years and in both Areas, samplers fished predominately using downriggers (>69% in all cases; Figure 13), as this was also the predominant private-fleet fishing mode (>53% in 5 and >62% in 6). Despite attempting to mimic angler's methods starting in 2004, most of the Chinook caught by test fishing were still caught using downriggers. Over 90% of the Chinook caught by test fishing were caught on downriggers every year in Area 5 and 100% in Area 6. Total mortalities attributable to the very extensive test fishing in the Areas 5 and 6 selective Chinook fisheries ranged from a high of 82 in 2003 to a low of 25 in 2007 (Table 13).

Table 13. Summary of test fishing effort and Chinook encounters for the Areas 5 and 6 selective Chinook test fisheries, 2003 through 2007.

	2003		2004		2005		2006		2007	
Attribute	Area 5	Area 6	Area 5	Area 6	Area 5	Area 6	Area 5	Area 6	Area 5	Area 6
Fishing time (h)	247	221	224	248	241	215	309	299	138	221
Boat trips	40	40	33	37	39	36	50	51	24	36
Anglers	80	80	66	74	78	72	100	102	48	72
Legal-marked Encounters	66	63	48	69	40	7	74	4	31	50
Legal-unmarked Encounters	89	76	62	74	33	10	65	6	23	25
Sublegal-marked Encounters	48	3	21	4	30	0	25	0	15	1
Sublegal-unmarked Encounters	132	6	38	1	34	0	46	0	11	0
Total Encounters	335	148	169	148	137	17	210	10	80	76
C/F (Enc's / h)	1.36	0.67	0.75	0.60	0.57	0.08	0.68	0.03	0.58	0.34
Legal-marked Mortalities	10	9	7	10	6	1	11	1	5	8
Legal-unmarked Mortalities	13	11	9	11	5	2	10	1	3	4
Sublegal-marked Mortalities	10	1	4	1	6	0	5	0	3	0
Sublegal-unmarked Mortalities	26	1	8	0	7	0	9	0	2	0
Total Mortalities	59	23	28	22	24	3	35	2	13	11

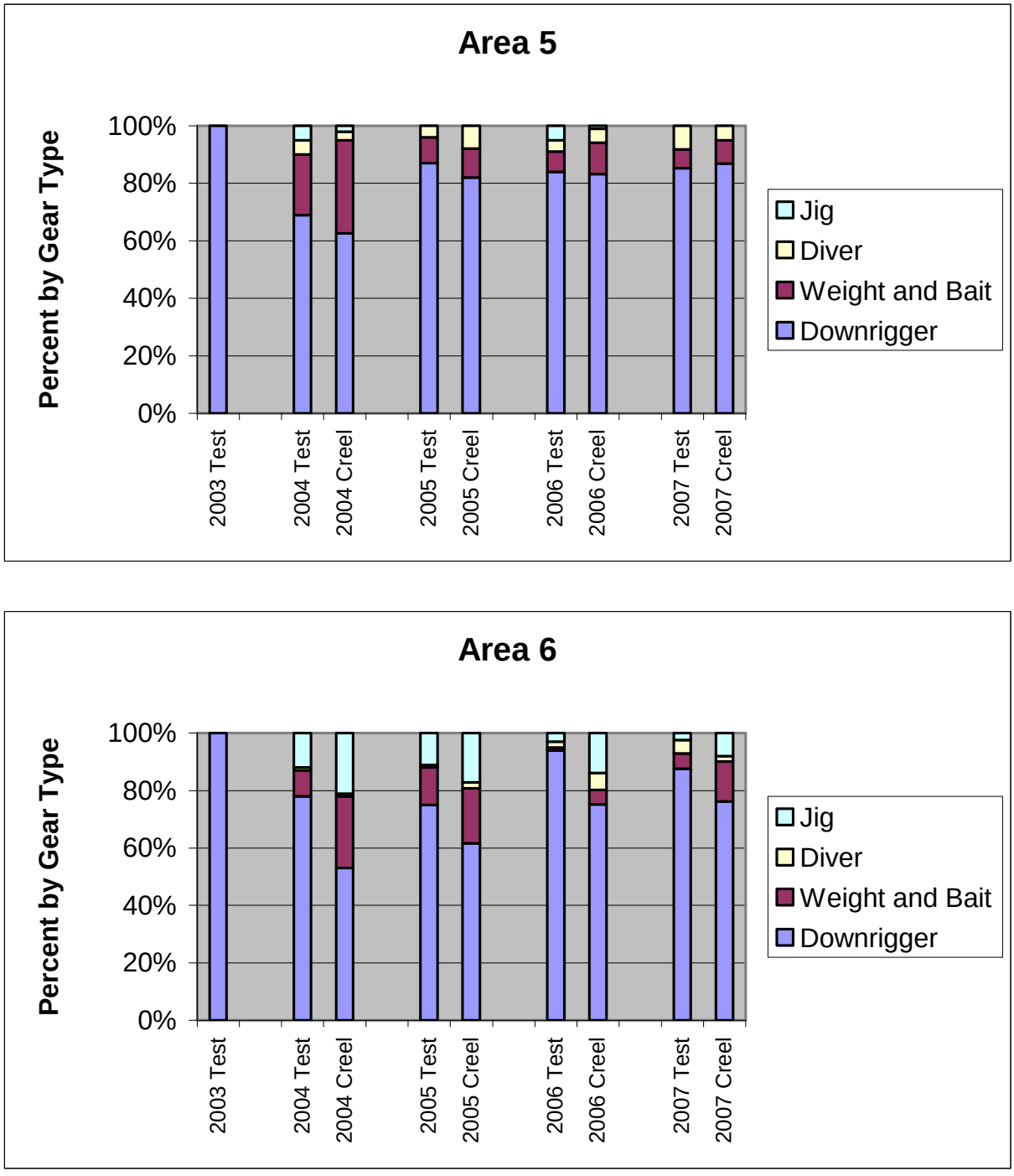


Figure 13. Percent of time that test boats fished various gear types compared to the percent of Chinook encountered by gear type by anglers in the Area 5 and 6 selective Chinook fisheries, 2003-2007.

Total Encounters and Size/Mark-status Composition

Most of the Chinook caught in Area 5 were below the 22-inch minimum size (sublegal-size) in 2003, but most were larger than 22 inches in 2004 through 2007 (Figure 14). Fish caught in Area 6 were almost exclusively larger than 22 inches (Figure 15). The proportion of Chinook that were marked was higher in Area 5 than in Area 6 (Figure 16). Mark rates in Area 5 appeared to increase during the 5 years of the fishery, but no trend is apparent in Area 6. The proportion of Chinook in four mark-status/size categories differed markedly between areas (Figure 17). For both areas, the proportion of Chinook that were legal-size and marked increased over the course of the study, while the proportion of sublegal-size unmarked fish declined (Figure 17 and Table 14).

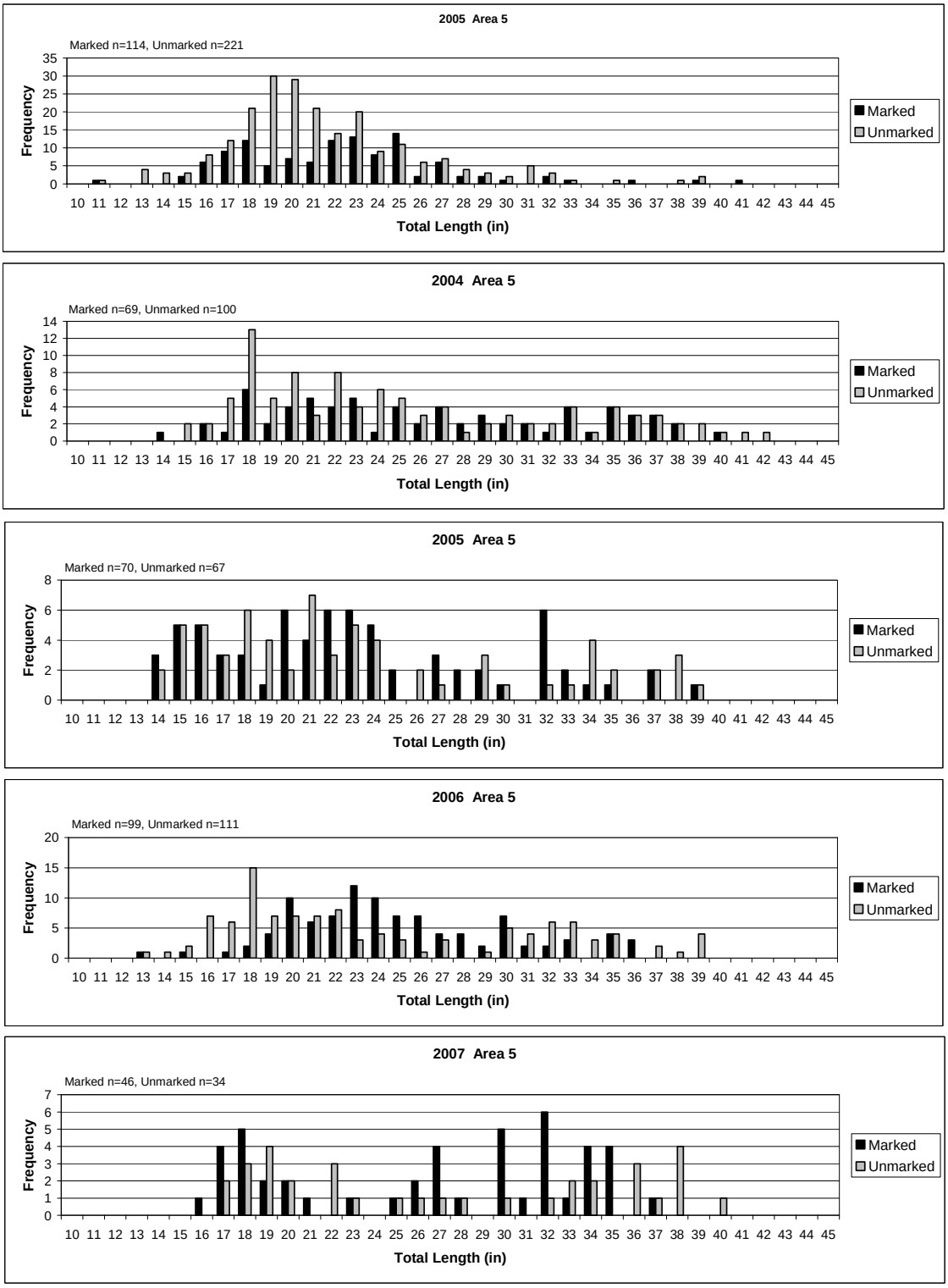


Figure 14. Length frequency histograms for Chinook caught by samplers on test fishing boats in Area 5 during selective Chinook fisheries, 2003 through 2007.

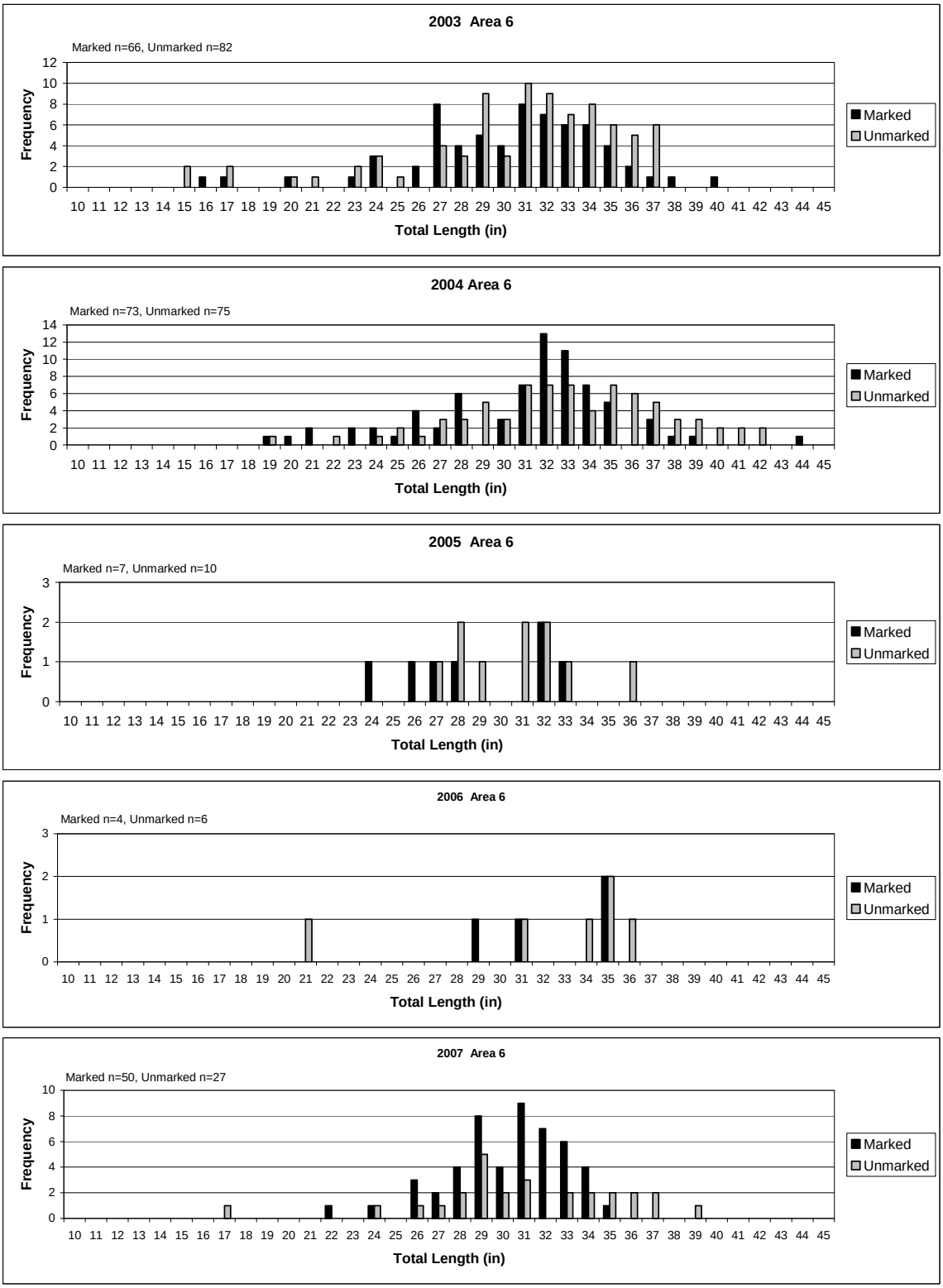


Figure 15. Length frequency histograms for Chinook caught by samplers on test fishing boats in Area 6 during selective Chinook fisheries, 2003 through 2007.

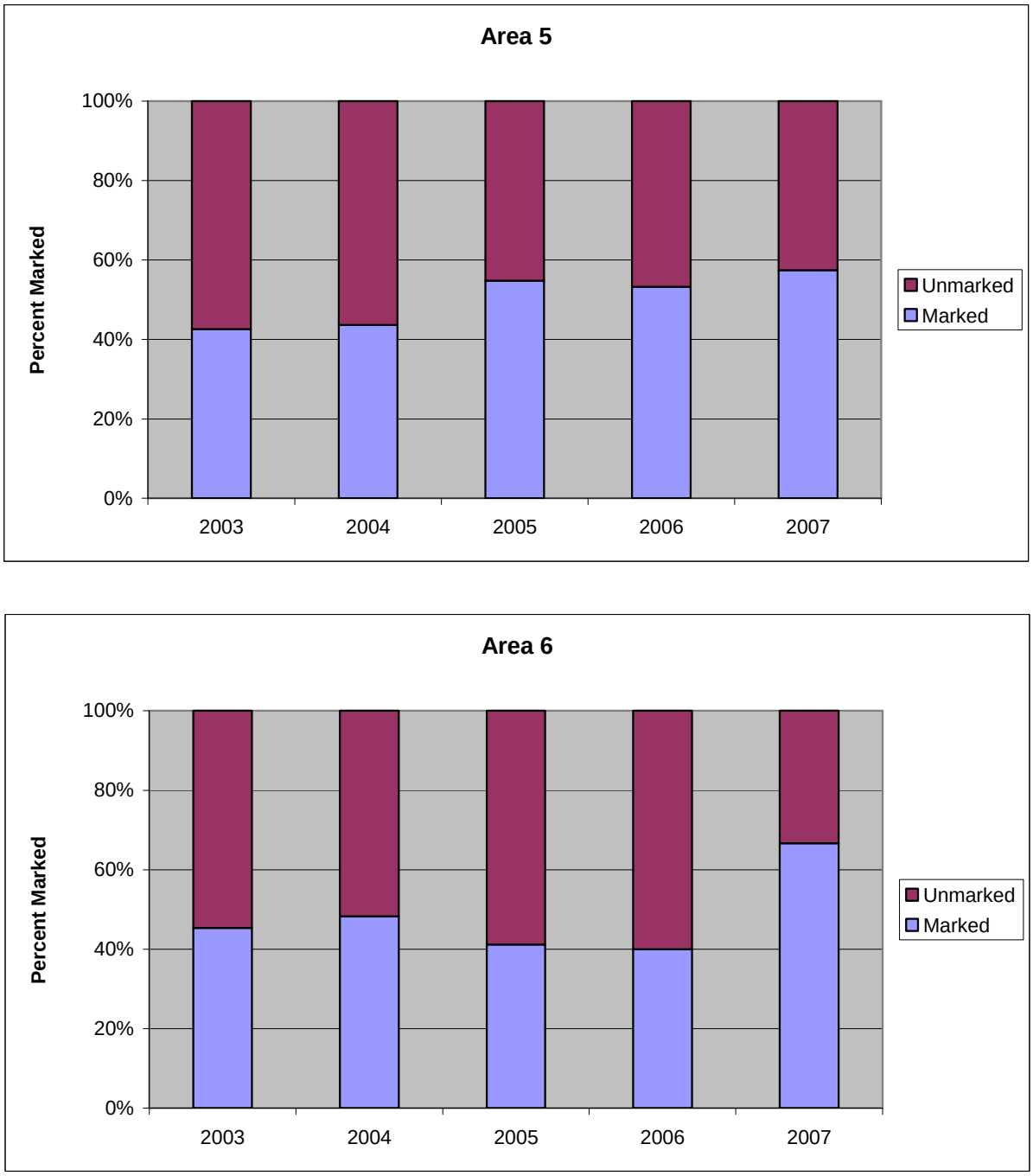
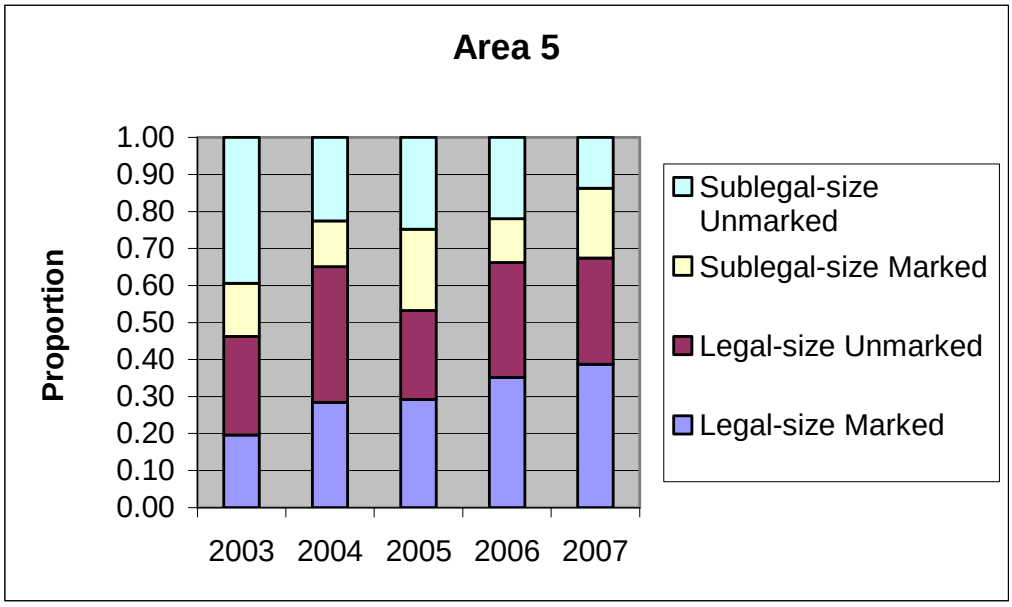


Figure 16. Proportions of marked and unmarked Chinook caught by samplers on test fishing boats in Areas 5 and 6 during selective Chinook fisheries, 2003-2007.



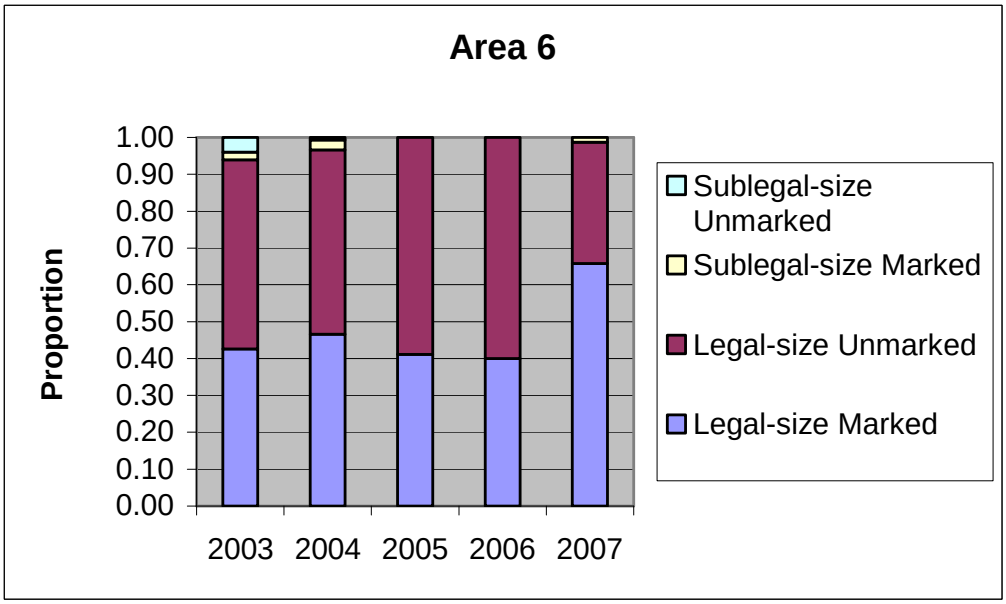


Figure 17. Proportions in four mark status/size categories of Chinook caught by test boats in Areas 5 and 6 during selective Chinook fisheries, 2003-2007.

Table 14. Proportions of Chinook in four mark status/size categories, and 95% confidence intervals, caught by test boats during the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	0.1970	0.0005	0.0427	0.2657	0.0006	0.0474	0.1433	0.0004	0.0376	0.3940	0.0007	0.0524
	6	0.4257	0.0017	0.0799	0.5135	0.0017	0.0808	0.0203	0.0001	0.0228	0.0405	0.0003	0.0319
2004	5	0.2840	0.0012	0.0682	0.3669	0.0014	0.0729	0.1243	0.0006	0.0499	0.2249	0.0010	0.0631
	6	0.4662	0.0017	0.0806	0.5000	0.0017	0.0808	0.0270	0.0002	0.0262	0.0068	0.0000	0.0132
2005	5	0.2920	0.0015	0.0764	0.2409	0.0013	0.0719	0.2190	0.0013	0.0695	0.2482	0.0014	0.0726
	6	0.4118	0.0151	0.2412	0.5882	0.0151	0.2412	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2006	5	0.3524	0.0011	0.0648	0.3095	0.0010	0.0627	0.1190	0.0005	0.0439	0.2190	0.0008	0.0561
	6	0.4000	0.0267	0.3201	0.6000	0.0267	0.3201	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2007	5	0.3875	0.0030	0.1074	0.2875	0.0026	0.0998	0.1875	0.0019	0.0861	0.1375	0.0015	0.0759
	6	0.6579	0.0030	0.1074	0.3289	0.0029	0.1063	0.0132	0.0002	0.0258	0.0000	0.0000	0.0000

Test Fishery Size Analysis

Mean lengths (marked and unmarked combined) of Chinook encountered by test boats were significantly different between Area 5 and Area 6 for all five years of the study (Table 15). Mean lengths of Chinook caught in Area 6 were always larger than mean lengths of Chinook caught in Area 5.

Table 15. Mean length and statistical comparison of Chinook caught by test boats during the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

	Area 5		Area 6		
Year	Samples	Mean Length (mm)	Samples	Mean Length (mm)	T Test
2003	335	566	148	784	** $\rho < 0.01$
2004	169	665	148	824	** $\rho < 0.01$
2005	137	607	17	774	** $\rho < 0.01$
2006	210	651	10	843	** $\rho < 0.01$
2007	80	699	77	788	** $\rho < 0.01$

Voluntary Trip Reports

The number of Chinook reported on Voluntary Trip Reports varied dramatically over the 5 years of the fishery (Table 16). Whereas 213 angler trips were recorded in 2003, only 37 were recorded in 2006. Low sample sizes were recorded in Area 5 in 2004 and 2006, and in Area 6 in 2005 through 2007. In 2007, 80 of the 116 Chinook reported on VTRs, or 69%, were from a single boat. Seventy-three of those 80 Chinook, representing 63% of the total VTR catch, were caught during a 6-day period in late July.

Because anglers were discouraged from handling fish that were to be released and were not allowed to bring wild fish into their boat, there was potential for measurement error and mis-classification of fish as marked or unmarked. Nonetheless, the mark rate for legal-size fish ranged from 20 to 74% (Table 17). Similar to test boats, VTRs suggested that the proportion of marked legal-size Chinook was higher in Area 6 versus Area 5, and that very few sublegal-size fish were present in Area 6 (Table 18). Sublegal-size Chinook never comprised more than 20% of the encounters in Area 6. The number of marked legal-size Chinook released by anglers and recorded on VTRs ranged from 0 to 14%, with a mean for all years and both areas of 5% (Table 19). The highest release rate occurred in Area 5 during 2003 when 5 legal-size marked fish were released. Of the five reported releases, four of those were by a single WDFW biologist, which may bias the release rate high.

Table 16. Summary of fishing effort and Chinook encounters reported by anglers on Voluntary Trip Reports for the Areas 5 and 6 selective Chinook test fisheries, 2003 through 2007.

	2003		2004		2005		2006		2007	
Attribute	**Area 5**	**Area 6**	**Area 5**	**Area 6**	**Area 5**	**Area 6**	**Area 5**	**Area 6**	**Area 5**	**Area 6**
Boat trips	65	18	11	18	26	18	9	6	16	16
Anglers	172	41	35	45	54	46	24	13	49	36
Legal-marked Encounters	36	29	4	42	9	13	10	7	28	26
Legal-unmarked Encounters	49	38	16	62	20	24	11	8	10	15
Sublegal-marked Encounters	30	5	3	2	11	3	11	0	46	5
Sublegal-unmarked Encounters	85	8	12	6	23	0	3	0	32	2
Total Encounters	179	80	35	112	63	40	35	15	116	48

Table 17. Mark rate of legal-size Chinook recorded by anglers on Voluntary Trip Reports during the Area 5 and 6 selective Chinook fishery, 2003-2007.

		Legal-size Mark Rate		
Year	Area	Estimate	Variance	+/- 95% CI
2003	5	0.4235	0.0029	0.1057
	6	0.4328	0.0037	0.1195
2004	5	0.2000	0.0084	0.1799
	6	0.4038	0.0023	0.0948
2005	5	0.3103	0.0076	0.1714
	6	0.3514	0.0063	0.1559
2006	5	0.4762	0.0125	0.2189
	6	0.4667	0.0178	0.2613
2007	5	0.7368	0.0052	0.1419
	6	0.6341	0.0058	0.1493

Table 18. Proportions of Chinook in four mark status/size categories, and 95% confidence intervals, caught by anglers reporting their catches on Voluntary Trip Reports (VTRs) during the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	0.2011	0.0009	0.0589	0.2737	0.0011	0.0655	0.1676	0.0008	0.0549	0.3575	0.0013	0.0704
	6	0.3625	0.0029	0.1060	0.4750	0.0032	0.1101	0.0625	0.0007	0.0534	0.1000	0.0011	0.0662
2004	5	0.1143	0.0030	0.1069	0.4571	0.0073	0.1675	0.0857	0.0023	0.0941	0.3429	0.0066	0.1596
	6	0.3750	0.0021	0.0901	0.5536	0.0022	0.0925	0.0179	0.0002	0.0246	0.0536	0.0005	0.0419
2005	5	0.1429	0.0020	0.0871	0.3175	0.0035	0.1159	0.1746	0.0023	0.0945	0.3651	0.0037	0.1198
	6	0.3250	0.0056	0.1470	0.6000	0.0062	0.1538	0.0750	0.0018	0.0827	0.0000	0.0000	0.0000
2006	5	0.2857	0.0060	0.1519	0.3143	0.0063	0.1560	0.3143	0.0063	0.1560	0.0857	0.0023	0.0941
	6	0.4667	0.0178	0.2613	0.5333	0.0178	0.2613	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2007	5	0.2414	0.0016	0.0782	0.0862	0.0007	0.0513	0.3966	0.0021	0.0894	0.2759	0.0017	0.0817
	6	0.5417	0.0053	0.1425	0.3125	0.0046	0.1325	0.1042	0.0020	0.0873	0.0417	0.0008	0.0571

Table 19. Number of legal-size marked Chinook kept and released by anglers reporting their catch on Voluntary Trip Reports during the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Year	Area	Number Kept	Number Released	Percent Released
2003	5	31	5[a]	13.9
2003	6	28	0	0.0
2004	5	4	0	0.0
2004	6	39	3	7.1
2005	5	9	0	0.0
2005	6	13	0	0.0
2006	5	10	0	0.0
2006	6	7	0	0.0
2007	5	19	1	5.0
2007	6	16	0	0.0
Overall	Both	176	9	5.0

a. Four of the five fish were released by a single WDFW employee.

Encounters and Total Mortalities

Despite concerns about angler's ability to accurately measure fish and determine the mark status, due to low samples sizes from the test boat in Area 6, we utilized a combined data set (test boat and VTRs) to determine the proportions of Chinook in each of the four mark status/size categories in both 2005 and 2006 (Table 20).

Annual encounter estimates for both areas combined ranged from 8,558 to 18,662 using Method 1 and from 6,362 to 13,476 using Method 2 (Table 21 and Appendix H). Note that the 8,558 estimated encounters in 2005 using Method 1 is slightly higher than reported in Table 12. This slight increase is because negative release numbers were set to zero. For years of low encounters, the difference between methods was as low as 2,196 fish (2005) while in the years with the higher encounters, the difference was as high as 6,447 fish (2004). Annual encounter estimates for both areas combined were always higher using Method 1 versus Method 2 (Table 21 and Appendix H). All of the Area 5 total encounter estimates were higher using Method 1, while in Area 6, the Method 1 estimates were higher in 2003, 2004, and 2007, but were slightly lower in 2005 and 2006. For Areas 5 and 6 combined, total encounter estimates for each of the four mark status/size categories were always higher using Method 1 versus Method 2 (Table 22). However, for separate areas, three of thirty Method 1 estimates were lower than Method 2 (by default, Method 2 estimates of legal-size marked are set at 0; Appendix H). The number of unmarked encounters generally declined each year of the fishery, except that all encounters were very low in 2005 (Table 22).

Annual mortality estimates, including both harvest and release mortalities, for both areas combined ranged from 3,221 to 6,193 using Method 1 and from 2,839 to 5,228 using Method 2 (Table 23). For years of low encounters, the difference between methods was as low as 382 fish (2005) while in the years with the higher encounters, the difference was as high as 1,069 fish (2004). Annual mortality estimates for both areas combined were always higher using Method 1 versus Method 2 (Table 24 and Appendix H). The number of unmarked mortalities generally declined each year of the fishery, except that all mortalities were very low in 2005 (Table 24). Whichever method is used to estimate mortalities, the ratio of unmarked mortalities to harvested marked legal-size Chinook has dropped steadily from 2003 through 2007 (Figure 18). The ratio ranged from 0.50 to 0.68 in 2003 and from 0.20 to 0.27 in 2007.

Table 20. Combined VTR and test fishing data set used to determine proportions of Chinook in four mark status/size categories in Area 6 during 2005 and 2006.

Year	Method	Legal-size Marked	Legal-size Unmarked	Sublegal-size Marked	Sublegal-size Unmarked
2005	Test	7	10	0	0
	VTR	13	24	3	0
	Total	20	34	3	0
	Proportion	0.351	0.596	0.053	0.000
2006	Test	4	6	0	0
	VTR	7	8	0	0
	Total	11	14	0	0
	Proportion	0.440	0.560	0.000	0.000

Table 21. Estimated total encounters in the Area 5 and 6 selective Chinook Fishery.

Method 1

		Total Encounters		
Year	Area	Estimate	Variance	+/- 95% CI
2003	5	15,950	1,166,116	2,117
	6	2,712	59,645	479
	Total	18,662	1,225,761	2,170
2004	5	15,321	1,333,383	2,263
	6	2,088	32,160	351
	Total	17,410	1,365,543	2,290
2005	5	7,471	401,963	1,243
	6	1,087	57,899	472
	Total	8,558	459,862	1,329
2006	5	11,909	720,091	1,663
	6	731	15,263	242
	Total	12,640	735,354	1,681
2007	5	11,317	1,498,925	2,400
	6	1,614	39,957	392
	Total	12,931	1,538,883	2,431

Method 2

		Total Encounters		
Year	Area	Estimate	Variance	+/- 95% CI
2003	5	11,265	1,018,826	1,978
	6	2,211	42,913	406
	Total	13,476	1,061,738	2,020
2004	5	9,528	716,143	1,659
	6	1,434	16,221	250
	Total	10,963	732,364	1,677
2005	5	5,206	260,606	1,001
	6	1,156	81,037	558
	Total	6,362	341,644	1,146
2006	5	8,811	421,237	1,272
	6	778	21,055	284
	Total	9,589	442,292	1,303
2007	5	7,987	724,545	1,668
	6	1,087	13,005	224
	Total	9,073	737,551	1,683

Table 22. Estimated encounters by mark status/size categories of Chinook and 95% confidence intervals based on Method-1 and -2 approaches for the Areas 5 and 6 selective Chinook seasons 2003 through 2007. Note, values displayed are based on apportioned (by test-fishery composition) pooled encounter estimates, less retained Chinook estimates (i.e., Method-1 estimates of apportioned unknown salmon and unknown mark-status Chinook have been reclassified and integrated into release estimates accordingly, See Appendix A for details).

Method 1

	Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
Year	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI
2003	4,341	343,272	1,148	5,595	288,752	1,053	2,338	143,926	744	6,388	449,810	1,315
2004	5,324	463,102	1,334	6,665	448,080	1,312	1,961	168,641	805	3,460	285,720	1,048
2005	2,586	186,999	848	2,423	103,798	631	1,691	80,966	558	1,858	88,100	582
2006	4,535	329,771	1,126	4,068	190,604	856	1,420	78,924	551	2,617	136,055	723
2007	5,269	623,799	1,548	3,868	413,048	1,260	2,198	286,151	1,048	1,596	215,885	911

Method 2

	Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
Year	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI	Encounters	Variance	+/- 95% CI
2003	3,192	67,255	508	4,103	314,644	1,099	1,658	123,039	688	4,523	556,799	1,463
2004	3,375	50,488	440	4,213	397,581	1,236	1,223	92,120	595	2,152	192,175	859
2005	1,924	38,747	386	1,941	145,330	747	1,201	73,189	530	1,296	84,377	569
2006	3,443	59,009	476	3,157	207,851	894	1,051	57,018	468	1,938	118,413	674
2007	3,684	64,152	496	2,713	336,516	1,137	1,550	199,090	875	1,126	137,793	728

Table 23. Estimated total mortalities in the Area 5 and 6 selective Chinook Fishery.

Method 1				
		Total Mortalilties		
Year	Area	Estimate	Variance	+/- 95% CI
2003	5	4,959	101,250	624
	6	1,234	9,628	192
	Total	6,193	110,878	653
2004	5	5,021	84,573	570
	6	891	4,933	138
	Total	5,912	89,505	586
2005	5	2,708	35,883	371
	6	513	15,926	247
	Total	3,221	51,809	446
2006	5	4,798	76,671	543
	6	405	2,295	94
	Total	5,203	78,966	551
2007	5	4,729	100,934	623
	6	863	7,477	169
	Total	5,592	108,411	645

Method 2				
		Total Mortalities		
Year	Area	Estimate	Variance	+/- 95% CI
2003	5	4,130	99,458	618
	6	1,157	9,236	188
	Total	5,288	108,694	646
2004	5	4,051	67,716	510
	6	792	4,566	132
	Total	4,843	72,283	527
2005	5	2,315	32,492	353
	6	523	16,457	251
	Total	2,839	48,948	434
2006	5	4,281	69,255	516
	6	413	2,425	97
	Total	4,693	71,680	525
2007	5	4,174	80,624	557
	6	783	6,866	162
	Total	4,957	87,491	580

Table 24. Estimated mortalities by mark status/size categories of Chinook and 95% confidence intervals based on Method-1 and -2 approaches for the Areas 5 and 6 selective Chinook seasons 2003 through 2007. Note, values displayed are based on apportioned (by test-fishery composition) pooled encounter estimates, less retained Chinook estimates (i.e., Method-1 estimates of apportioned unknown salmon and unknown mark-status Chinook have been reclassified and integrated into release estimates accordingly, See Appendix A for details).

Method 1

	Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI
2003	3,364	73,466	531	903	6,828	162	648	12,592	220	1,278	17,992	263
2004	3,667	59,772	479	1,004	10,091	197	549	8,214	178	692	11,429	210
2005	2,023	42,083	402	383	2,426	97	418	3,670	119	396	3,630	118
2006	3,607	65,101	500	619	4,311	129	442	4,064	125	536	5,489	145
2007	3,922	76,744	543	606	9,465	191	669	12,920	223	394	9,281	189

Method 2

	Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked		
	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI	Mortalities	Variance	+/- 95% CI
2003	3,192	67,255	508	680	7,410	169	512	11,757	213	905	22,272	293
2004	3,375	50,488	440	636	8,954	185	402	5,153	141	430	7,687	172
2005	1,924	38,747	386	311	3,360	114	320	3,359	114	283	3,481	116
2006	3,443	59,009	476	482	4,699	134	368	3,188	111	400	4,784	136
2007	3,684	64,152	496	433	7,743	172	540	9,438	190	300	6,158	154

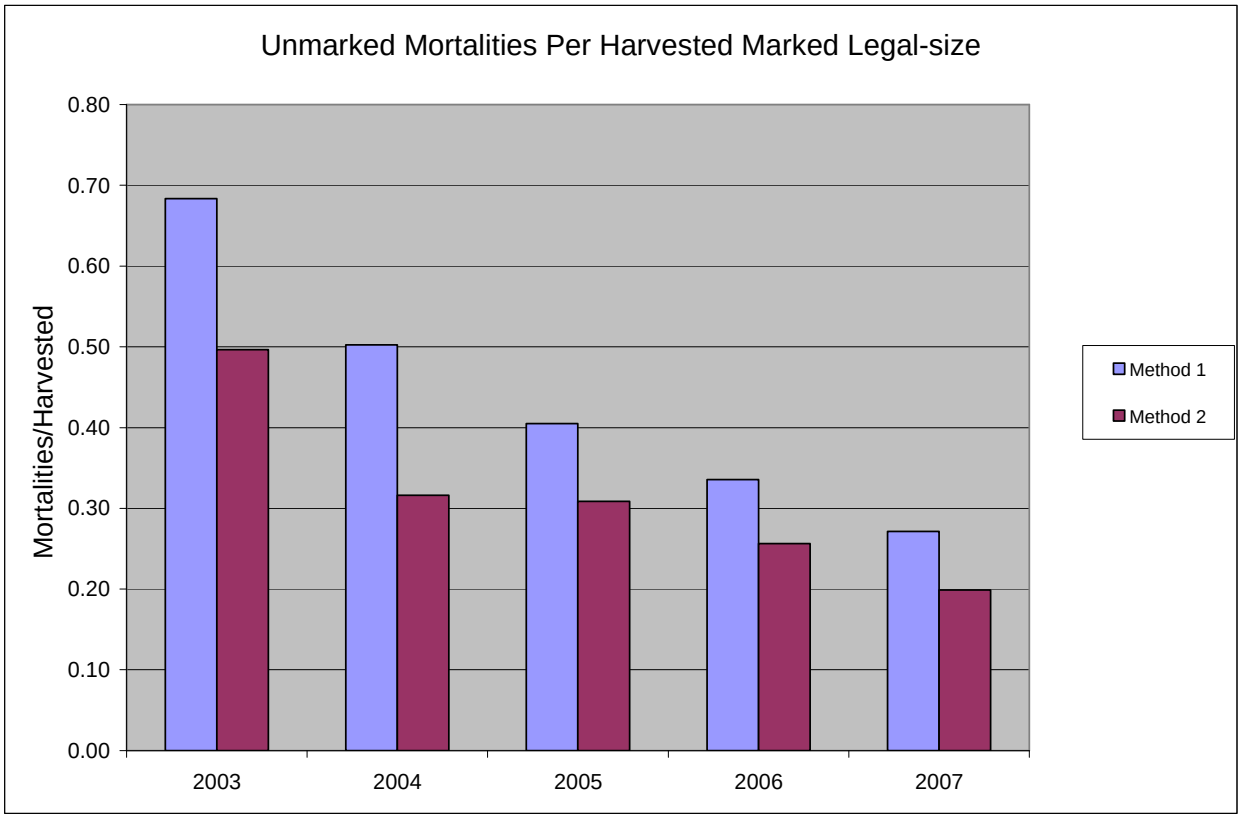


Figure 18. Ratio of unmarked Chinook mortalities per harvested marked legal-size Chinook in the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007. Unmarked mortalities include release mortalities and illegal retention mortalities.

CWT analysis

Over 540 coded wire tags (CWTs) were collected during the Areas 5 and 6 selective Chinook fisheries from 2003 through 2007 (Table 25 and Appendix I). Puget Sound stocks contributed the highest proportion of CWTs in each of the five years (Figure 19), followed by Columbia River stocks. Only five of the recovered CWTs were from stocks originating from rivers on the Washington side of the Strait of Juan de Fuca. The number of Double Index CWT recoveries ranged from 33 to 41 (Table 26 and Appendix J). The estimated number of mortalities that resulted from having this selective fishery versus a non-selective fishery ranged from 11 to 16 (Table 27 and Appendix K).

Table 25. Origin of coded wire tags (CWTs) recovered from Chinook salmon sampled in the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

	Canada	Puget Sound	Strait of Juan de Fuca	Washington Coast	Columbia River	Oregon Coast	California	Total
2003	7	48	0	1	24		3	83
2004	13	53	1	1	47	1	2	118
2005	3	64	1	0	13	0	1	82
2006	1	108	2	1	10	1	3	126
2007	2	118	1	0	14	0	0	135
Total	26	391	5	3	108	2	9	544

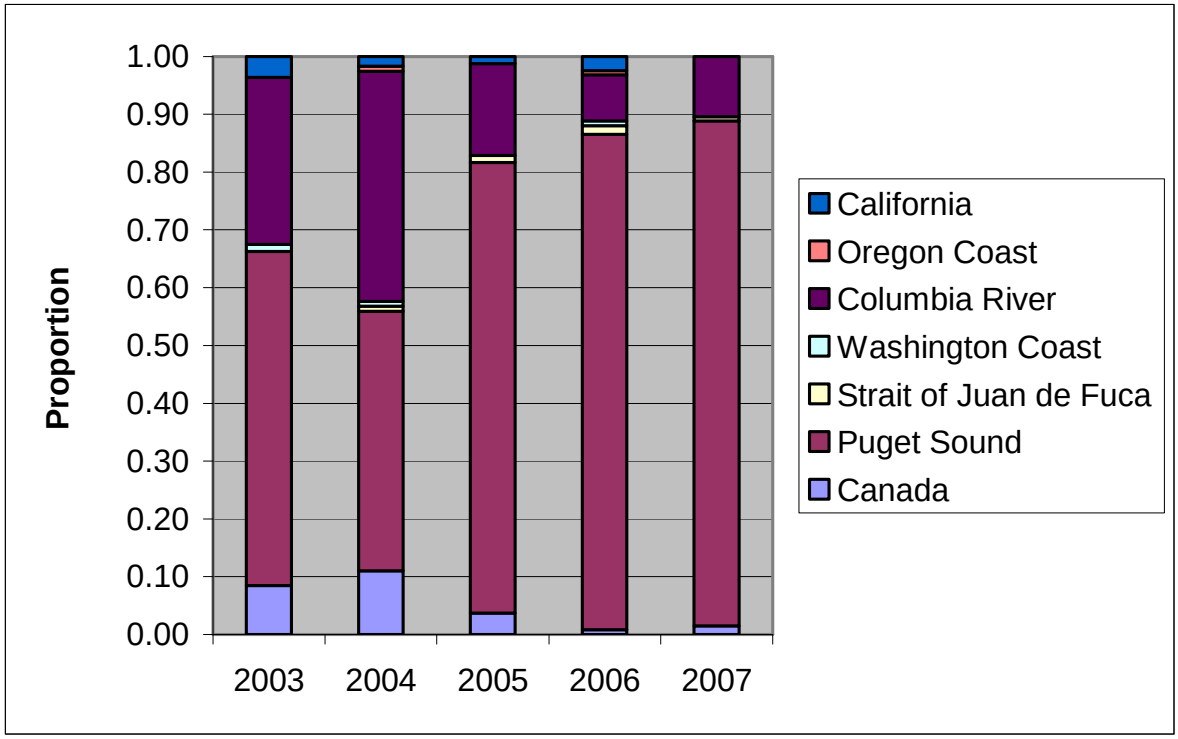


Figure 19. Proportions by origin of coded wire tags (CWTs) recovered from Chinook salmon sampled in the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

Table 26. Number of Chinook salmon Double Index Tag recoveries in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Hatchery	Brood Year	2003	2004	2005	2006	2007
Dungeness	2002			1		
George Adams	2000	3	3			
George Adams	2001		6	3		
George Adams	2002			9	2	
George Adams	2003				5	2
George Adams	2004					5
George Adams	2005					1
Grovers Creek	1999	10				
Grovers Creek	2000	5	6			
Grovers Creek	2001		2	4		
Grovers Creek	2002			2	3	
Grovers Creek	2003				6	3
Grovers Creek	2004					3
Chilliwack	1999	1				
Chilliwack	2000	1				
Chilliwack	2001	1	4			
Chilliwack	2002		1			
Chilliwack	2003				1	
Chilliwack	2005					1
Kendall Creek	2002			1		
Kendall Creek	2003			1	2	
Kendall Creek	2004					1
Marblemount	1999	2				
Marblemount	2000		2			
Marblemount	2002			2		
Marblemount	2004					2
Nisqually	1999	2				
Nisqually - A	2000	2	1			
Nisqually - B	2000	2	3			
Nisqually	2002			1	3	
Nisqually	2003			1	8	4
Nisqually	2004					6
Samish	1999	1				
Samish	2001			2		
Samish	2002			3	3	
Samish	2003				3	1
Samish	2004					1
Samish	2005					1
Soos Creek	1999	5				
Soos Creek	2000	2	4			
Soos Creek	2001			1		
Soos Creek	2002			1	2	
Soos Creek	2003				1	1
Soos Creek	2004					3
Spring Creek	2005					1
Wallace	2000	1	1			
Wallace	2001		1			
Wallace	2002			1		
Wallace	2003				2	
Wallace	2004					1
Total		38	34	33	41	37

Table 27. Estimated number of mortalities of unmarked Double Index Tagged Chinook salmon in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Hatchery	Brood Year	2003	2004	2005	2006	2007
Dungeness	2002			0.2		
George Adams	2000	1.1	0.7			
George Adams	2001		2.1	1.1		
George Adams	2002			2.7	0.6	
George Adams	2003				2.0	0.3
George Adams	2004					1.5
George Adams	2005					0.5
Grovers Creek	1999	3.5				
Grovers Creek	2000	2.0	1.9			
Grovers Creek	2001		0.8	0.8		
Grovers Creek	2002			0.6	1.0	
Grovers Creek	2003				2.3	1.2
Grovers Creek	2004					0.8
Chilliwack	1999	0.4				
Chilliwack	2000	0.4				
Chilliwack	2001	0.4	1.5			
Chilliwack	2002		0.4			
Chilliwack	2003				0.5	
Chilliwack	2005					0.6
Kendall Creek	2002			0.4		
Kendall Creek	2003			0.5	0.9	
Kendall Creek	2004					0.5
Marblemount	1999	0.7				
Marblemount	2000		0.8			
Marblemount	2002			0.7		
Marblemount	2004					0.9
Nisqually	1999	0.7				
Nisqually - A	2000	0.5	0.2			
Nisqually - B	2000	1.0	0.8			
Nisqually	2002			0.7	1.3	
Nisqually	2003			0.4	3.1	1.5
Nisqually	2004					2.0
Samish	1999	0.3				
Samish	2001			0.6		
Samish	2002			0.9	1.1	
Samish	2003				1.0	0.6
Samish	2004					0.5
Samish	2005					0.4
Soos Creek	1999	2.0				
Soos Creek	2000	0.9	1.0			
Soos Creek	2001			0.2		
Soos Creek	2002			0.4	0.9	
Soos Creek	2003				0.5	0.2
Soos Creek	2004					1.1
Spring Creek	2005					0.3
Wallace	2000	0.6	0.6			
Wallace	2001		0.5			
Wallace	2002			0.4		
Wallace	2003				0.7	
Wallace	2004					0.3
Total		14	11	11	16	13

Enforcement

The number of contacts made by enforcement officers ranged from 439 to 846 annually (Table 28). Of those contacts, the proportion cited or warned for sublegal-size Chinook was less than 0.01 for all areas and years. The proportion of contacts cited or warned for unmarked Chinook ranged from 0.00 to 0.03.

Table 28. Number of enforcement contacts and the percent of contacts that were cited or warned for sublegal-size Chinook or unmarked Chinook during the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

Year	Area	Contacts	Number Sublegal	% Sublegal	Number Unmarked	% Unmarked
2003	5	620	--[a]	--[a]	8	0.013
	6	226	--[a]	--[a]	2	0.009
	Total	846	--[a]	--[a]	10	0.012
2004	5	219	0	0.000	0	0.000
	6	220	0	0.000	0	0.000
	Total	439	0	0.000	0	0.000
2005	5	247	2	0.008	7	0.028
	6	228	0	0.000	0	0.000
	Total	475	2	0.004	7	0.015
2006	5	471	2	0.004	3	0.006
	6	315	0	0.000	0	0.000
	Total	786	2	0.003	3	0.004
2007	5	443	2	0.005	1	0.002
	6	143	0	0.000	2	0.014
	Total	586	2	0.003	3	0.005

SECTION I: SUMMARY AND DISCUSSION

Catch and Effort

Since the first few weeks of 2003, the overall Areas 5 and 6 selective Chinook fisheries were clearly driven by catch rate. During years that fishing was good, angler trips were up; during years that fishing was poor, angler trips were down. Surprisingly, the Chinook catch rate does not appear to be the main factor, but rather it appears that the overall salmon catch rate is the main factor responsible for how many angler trips are expended each season. Although we only briefly mention other species in this report, catch per angler of coho was substantially lower in 2005 through 2007 than in 2003 and 2004. The importance of the selective Chinook fishery is very evident in 2006, a non-pink year. Even though angler trips and angler trips/day were low in 2006, we believe effort would have been almost non-existent that year without a sustained Chinook fishery. Clearly, the selective Chinook fishery will have a greater effect on angler trips during even, non-pink years, than it will during odd, pink years. Effort levels in 2007 were surprisingly low given the good catch rates of both Chinook and pink salmon. We speculate that higher fuel prices may be affecting angler's willingness to travel to destination fishing locations such as Sekiu. Fuel prices will likely be a factor in future effort levels at Sekiu.

After seven years of summer-time Chinook closures, non-selective Chinook quota fisheries were implemented in Area 5 during 2001 and 2002 to harvest a small number of these fish. These fisheries utilized the quota in 10 days during 2001 and in 5 days during 2002. We examined the difference in effort occurring in Area 5 during these non-selective quota years versus effort during the selective fisheries years (Tables 29 through 34). For 2003 through 2005, the selective fisheries effort was higher than either 2001 or 2002 during comparable seasons. For 2006 and 2007, the selective fisheries effort in Area 5 was lower than the effort in 2001 and was higher than the effort in 2002. Tremendous coho catches were observed in Area 5 during 2001 and effort was likely bolstered by good coho fishing during that year.

We also examined effort levels estimated from Catch Record Cards from 1984 through 2006 for each area. Effort in Area 5 clearly shows an increase over the 1994 through 2000 period, when no Chinook retention was allowed and coho fishing was closed in certain years (Figure 20). However, the effort level was considerably below the levels observed from 1984 through 1993 even though the number of days open approached the historical level. Surprisingly, effort in Area 6 does not show an increase compared to the 1994 through 2000 period (Figure 21). Similar to Area 5, the Chinook selective fisheries effort is considerably below the levels observed from 1984 through 1993. These data suggest that the combination of both selective coho and selective Chinook fishing will result in effort levels lower than historical. Despite the lower effort levels observed in Area 5 during 2006 and 2007 relative to 2001, results of this study suggest that given the low catch rate of coho in 2003 through 2007, the addition of the selective Chinook fishery increased effort (angler trips) in each year of the fishery relative to what effort would have been without the selective Chinook fishery.

Prior to implementation of the 2003 selective Chinook fishery, fisheries managers and anglers were unsure about what level of angler effort would be expended in a marine selective Chinook

fishery and how long the quota would last. Historically, Area 5 was one of the highest effort areas in Puget Sound. For example from 1984 through 1993, anglers made an average of nearly 50,000 angler trips per month during July, August, and September. When the 2003 fishery was announced, it created substantial excitement among the recreational fishing community, with many anglers believing that fishing would be similar to the "good old days". As we observed, effort during the initial weeks of the 2003 fishery was relatively high given the catch rate. However, for many folks the reality soon set in that selective Chinook fisheries were not the "good old days". During the first year of the fishery, some anglers were disappointed when they were unable to catch any marked Chinook to retain and had to release a number of unmarked Chinook. It took a season for some anglers to understand that harvest opportunities were lower in selective fisheries than in non-selective fisheries. But it also became apparent that the quota was going to last much longer than the 10 and 5 day 2,000 fish non-selective Chinook fisheries in 2001 and 2002. Anglers did not need to rush out and fish in the first week of the fishery to ensure an opportunity to participate as they did during the 2001 and 2002 non-selective fisheries. As such, the initial rush of anglers declined quite rapidly after the first few weeks of 2003 and effort appears to have stabilized between 20,000 and 30,000 angler trips per year during this fishery. Based on our results, opening of a selective Chinook fishery does not necessarily lead to effort levels that are near or substantially higher than historical levels and in fact, in the Area 5 and 6 selective Chinook fisheries, effort was well below historical levels.

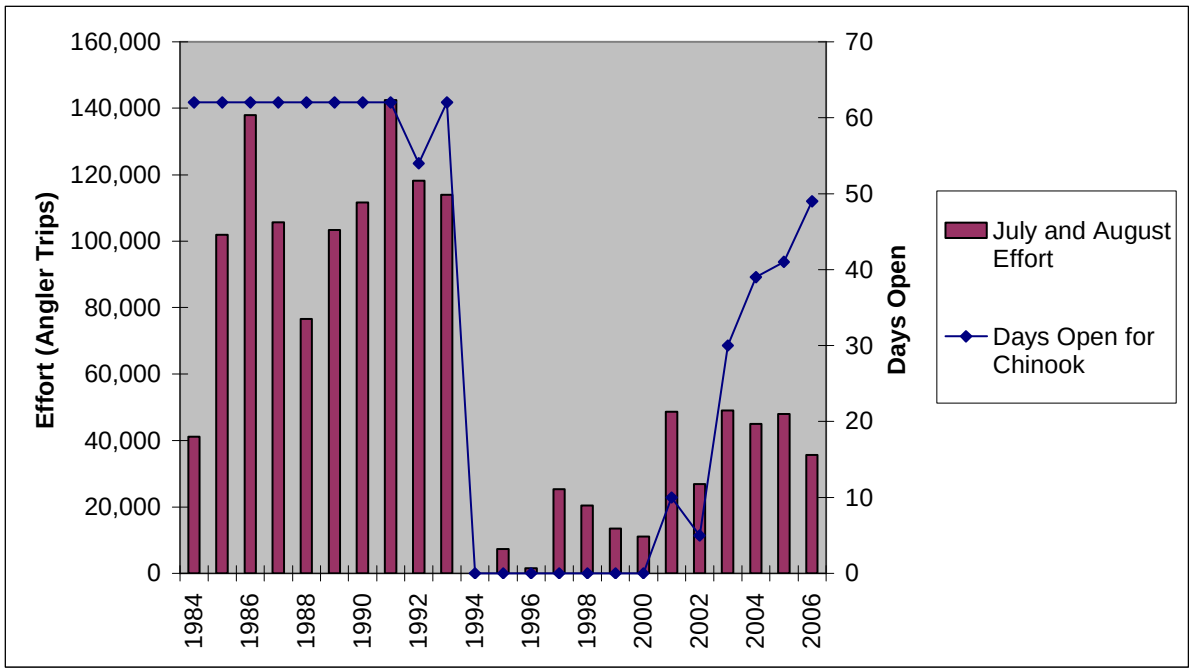


Figure 20. Comparison of days open for Chinook retention and angler effort (trips) measured by baseline sampling and Catch Record Cards in Marine Area 5, 1984 through 2006. Data after March 2002 are still preliminary.

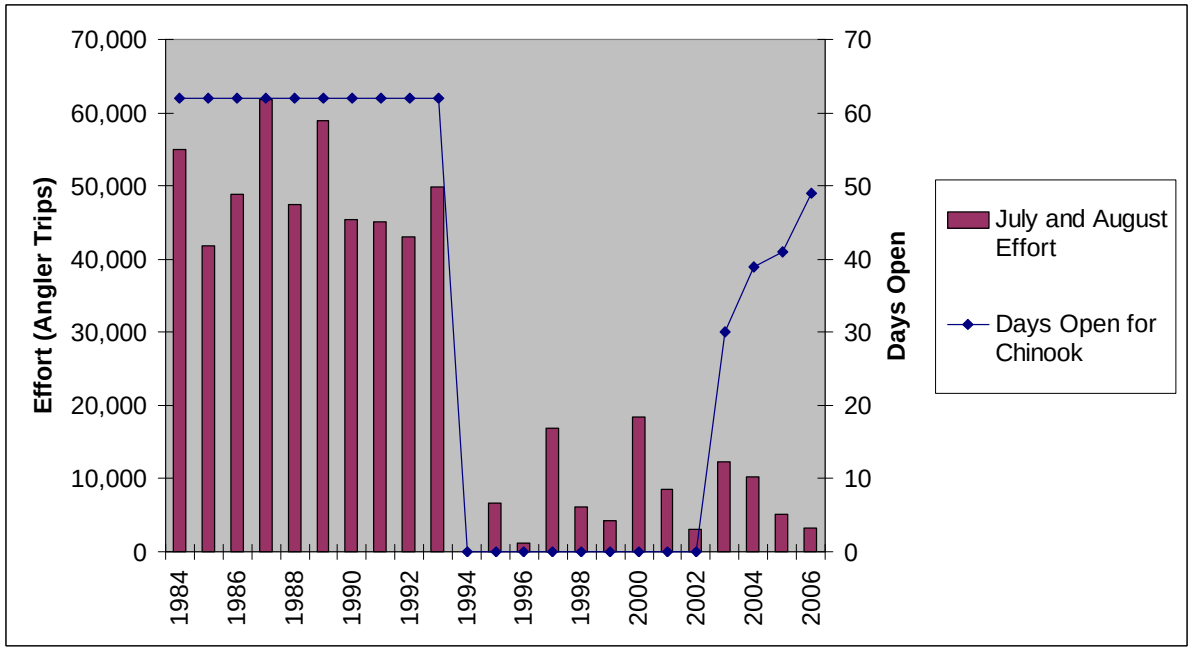


Figure 21. Comparison of days open for Chinook retention and angler effort (trips) measured by baseline sampling and Catch Record Cards in Marine Area 6, 1984 through 2006. Data after March 2002 are still preliminary.

Table 29. Estimated effort and harvest in the 2001 and 2002 non-selective Chinook fisheries in Area 5 compared to the 2003 Area 5 Chinook Mark-Selective Fishery, July 5 through August 3, 2003.

Year	Quota	Days Open for Chinook	Date of Comparison	Chinook Daily Limit (≥ 22")	Angler Trips	Chinook Harvested[a]
2001	2,000	6[b]	July 5 – August 3	Any 1	15,832	954
2002	2,000	5	July 5 – August 3	Any 1	9,973	1,782
2003	3,500[c]	30	July 5 – August 3	2 Marked	19,398	2,529

a. Does not include any illegal harvest during days that Chinook retention was not allowed.
b. Chinook retention was also allowed July 1 – July 4, for a total of 10 days open.
c. The quota applied to Area 5 and the western portion of Area 6.

Table 30. Estimated effort and harvest in the 2001 and 2002 non-selective Chinook fisheries in Area 5 compared to the 2004 Area 5 Chinook Mark-Selective Fishery, July 1 through August 8, 2004.

Year	Quota	Days Open for Chinook	Date of Comparison	Chinook Daily Limit (≥ 22")	Angler Trips	Chinook Harvested[a]
2001	2,000	10	July 1 – August 8	Any 1	23,809	1,800
2002	2,000	5	July 1 – August 8	Any 1	11,711	1,782
2004	3,500[b]	39	July 1 – August 8	2 Marked	25,174	2,900

a. Does not include any illegal harvest during days that Chinook retention was not allowed.
b. The quota applied to Area 5 and the western portion of Area 6.

Table 31. Estimated effort and harvest in the 2001 and 2002 non-selective Chinook fisheries in Area 5 compared to the 2005 Area 5 Chinook Mark-Selective Fishery, July 1 through August 8, 2005.

Year	Quota	Days Open for Chinook	Date of Comparison	Chinook Daily Limit (≥ 22")	Angler Trips	Chinook Harvested[a]
2001	2,000	10	July 1 – August 10	Any 1	24,882	1,800
2002	2,000	5	July 1 – August 10	Any 1	13,186	1,782
2005	3,500[b]	40	July 1 – August 10	2 Marked	30,115	1,669

a. Does not include any illegal harvest during days that Chinook retention was not allowed.
b. The quota applied to Area 5 and the western portion of Area 6.

Table 32. Estimated effort and harvest in the 2001 and 2002 non-selective Chinook fisheries in Area 5 compared to the 2006 Area 5 Chinook Mark-Selective Fishery, July 1 through August 14 and August 18 - 21, 2006.

Year	Quota	Days Open for Chinook	Date of Comparison	Chinook Daily Limit (≥ 22")	Angler Trips	Chinook Harvested[a]
2001	2,000	10	July 1 – August 14 & August 18 - 21	Any 1	29,910	1,800
2002	2,000	5	July 1 – August 14 & August 18 - 21	Any 1	16,738	1,782
2006	3,500[b]	49	July 1 – August 14 & August 18 - 21	2 Marked	23,177	3,318

a. Does not include any illegal harvest during days that Chinook retention was not allowed.
b. The quota applied to Area 5 and the western portion of Area 6.

Table 33. Estimated effort and harvest in the 2001 and 2002 non-selective Chinook fisheries in Area 5 compared to the 2007 Area 5 Chinook Mark-Selective Fishery, July 1 through August 4 and August 9, 2007.

Year	Quota	Days Open for Chinook	Date of Comparison	Chinook Daily Limit (≥ 22")	Angler Trips	Chinook Harvested[a]
2001	2,000	10	July 1 – August 4 & August 9	Any 1	22,738	1,800
2002	2,000	5	July 1 – August 4 & August 9	Any 1	11,194	1,782
2007	4,000[b]	36	July 1 – August 4 & August 9	2 Marked	18,830	3,367

a. Does not include any illegal harvest during days that Chinook retention was not allowed.
b. The quota applied to Area 5 and the western portion of Area 6.

Another concern of fishery managers and anglers prior to implementation of this fishery was the mark rate that would be observed on Chinook. When mark rates during selective coho fisheries fall below about 33%, numerous emails, telephone calls and letters are received by WDFW voicing concern about the fisheries. The mark rate on legal-size Chinook has been very good in this fishery and has been on an increasing trend over time. Anglers have been able to retain about 1 out of every 2 legal-size Chinook they have caught. Although we have not collected data on angler issues directed to WDFW, as opposed to selective coho fisheries during years of low mark rates, very few concerns have been raised about the mark rate on Chinook in this fishery. Virtually all concerns identified by anglers and received by WDFW regarding the Areas 5 and 6 selective Chinook fisheries are questions about the method of estimating harvest and disbelief that the quota has been reached. As the proportion of hatchery Chinook that are marked continues to increase in Puget Sound, the mark rate observed in this fishery should also continue to increase.

The number of Chinook harvested per day in this fishery has ranged from approximately 50 to 115 per day. For future fisheries planning, assuming 100 Chinook harvested per day would be a good conservative estimate. Assuming 100 fish harvested per day for a thirty day fishery would equate to 3,000 Chinook. For comparison, if the actual number harvested was 116 per day (the highest value observed), the harvest would be 3,480 or 16% over the predicted value.

Test Boats and VTRs

Given that the two Areas are adjacent to each other, the difference in the size composition of Chinook available to anglers is remarkable. Whichever method is used to evaluate encounters, creel surveys, VTRs, or test fishing, it is abundantly clear that the Area 5 fishery has a higher proportion of sublegal-size Chinook than Area 6. Sublegal-size Chinook have been almost non-existent in Area 6 during the five years this fishery has occurred.

CWT Analyses

Based on CWT recoveries, the Area 5 and 6 selective Chinook fishery is impacting mostly Puget Sound and Columbia River stocks. Recoveries of Strait of Juan de Fuca stocks have been surprising low. While a complete cohort based CWT analysis has not yet been completed, based on our estimates of marked and unmarked DIT tagged Chinook, the overall bias introduced to the CWT program due to this fishery is extremely low. Hagen-Breaux (2007) analyzed lambda at release versus lambda at recovery for Puget Sound DIT Chinook stocks and determined that there was no detectable difference due to selective Chinook fisheries conducted to date.

Although not intended to capture the complete impacts of these selective fisheries on local stocks, we examined the number of recovered CWTs from 1999 through 2002 brood year Chinook originating from the Washington State side of the Strait of Juan de Fuca as reported in the Regional Mark Information System (RMIS) in order to gain a relative measure of the effects of these fisheries. From 2001 through 2006, 1,027 Strait of Juan de Fuca CWTs were recovered

in fisheries, broodstock collection, or on the spawning grounds (Table 34). Only seven were recovered from recreational fisheries in Washington State, including the three recovered during the Areas 5 and 6 selective Chinook fisheries. These tags represent less than 1 percent of all recoveries (Table 35). Nearly 29 percent of the recoveries occurred in fisheries in Canada and Alaska.

Table 34. Recoveries of Washington State Strait of Juan de Fuca origin coded wire tags (CWTs) from 1999 through 2002 brood year Chinook salmon in fisheries or escapement from 2001 through 2006 as reported in RMIS.

Reporting Agency	Troll	Treaty Troll	Seine	Sport	Hatchery	Broodstock	Escapement
ADFG	125	0	2	16	0	0	0
CDFO	127	0	0	27	0	0	0
USFWS	0	0	0	0	3	0	0
NWIFC	0	0	0	0	0	394	239
WDFW	0	6	0	7	1	0	80

Table 35. Proportion of recoveries of Washington State Strait of Juan de Fuca origin coded wire tags (CWTs) from 1999 through 2002 brood year Chinook salmon in fisheries or escapement from 2001 through 2006 as reported in RMIS.

Reporting Agency	Troll	Treaty Troll	Seine	Sport	Hatchery	Broodstock	Escapement
ADFG	12.2	0.0	0.2	1.6	0.0	0.0	0.0
CDFO	12.4	0.0	0.0	2.6	0.0	0.0	0.0
USFWS	0.0	0.0	0.0	0.0	0.3	0.0	0.0
NWIFC	0.0	0.0	0.0	0.0	0.0	38.4	23.3
WDFW	0.0	0.6	0.0	0.7	0.1	0.0	7.8

Enforcement Compliance Compared to Creel Compliance

Our enforcement reports are not intended to be an unbiased estimate of angler compliance. However, they are a relative index of compliance that can be contrasted with creel survey results. For most areas and years, the estimated encounters from the creel survey (Appendix G) noted a higher proportion of either unmarked or sublegal-size Chinook than the enforcement encounters (Table 36). Both creel survey and enforcement data suggest a very high rate of compliance, with overall compliance for both areas combined at 90% or better for each of the five years.

Table 36. Comparison of enforcement percent of contacts that had sublegal-size Chinook or unmarked Chinook and percent of each from estimated landed catch (see Appendix G) during the Area 5 and 6 selective Chinook fisheries, 2003 through 2007.

Year	Area	Creel % Sublegal	Enforcement % Sublegal	Creel % Unmarked	Enforcement % Unmarked
2003	5	0.089	--[a]	0.021	0.013
	6	0.000	--[a]	0.023	0.009
	Total	0.064	--[a]	0.022	0.012
2004	5	0.067	0.000	0.000	0.000
	6	0.004	0.000	0.007	0.000
	Total	0.055	0.000	0.001	0.000
2005	5	0.076	0.008	0.029	0.028
	6	0.010	0.000	0.010	0.000
	Total	0.063	0.004	0.026	0.015
2006	5	0.061	0.004	0.005	0.006
	6	0.031	0.000	0.024	0.000
	Total	0.058	0.003	0.007	0.004
2007	5	0.111	0.005	0.035	0.002
	6	0.010	0.000	0.010	0.014
	Total	0.093	0.003	0.030	0.005

SECTION II: ASSESSMENT OF THE SELECTIVE FISHERY SAMPLING PROGRAM AND ANALYSIS METHODS

Sampling intensity-related questions:

The Puget Sound Sampling Program Operational Plan lists the following objective for the Areas 5 and 6 (and Elliott Bay) fisheries with in-season catch estimates:

- Sampling size will be established based on previously tested designs for Terminal Area Fisheries and will be sufficient to provide total estimates of harvest and effort to be within 15% of the point estimate at a 95% confidence level.

The Plan further lists the following objectives for Selective Fisheries:

- For creel sampling, sample size is set at 100 encounters (observed retained plus reported released fish) per area and week for coho and per area and month for Chinook.
- At least 10% of the fishery will be sampled for coded wire tags (CWTs) with a goal of 20% for any Chinook selective fisheries.
- For the test fishery, the sampling goal is set at a minimum of 100 salmon encounters per stratum (management regime).

Harvest estimate precision ranged from 0.1295 to 0.1930 during the five years of the fisheries and met the 0.15 precision objective four out of the five years (Table 37). The only year that the objective was not met was during 2005, when fishing was very poor and the quota was not achieved. Effort estimate precision ranged from 0.0660 to 0.1546 during the five years of the fisheries and therefore met the 0.15 precision objective each year (Table 37).

Baseline sample-size objectives were met for most statistical months and areas (Table 39). The objective was not met in Area 6 during August in 2005, 2006 and 2007. Not meeting the objectives in 2005 and 2006 was primarily due to low effort and the fishery being open for only part of the month (10 days in 2005 and 19 days in 2006), and in 2007 due to the fishery only being open for one day in statistical month August. Sample size objectives likely would have been met if the fisheries were open for the entire statistical month of August.

Weekly sample rates (*n* fish examined / estimated harvest) ranged from 0.154 to 0.544 in Area 5 (Table 40) and from 0.162 to 0.777 in Area 6 (Table 41). Overall fishery sample rates ranged from 0.227 to 0.276 in Area 5 and from 0.326 to 0.558 in Area 6. The overall fishery sample rate objective (for CWT recoveries) of 20% was met each year in each area.

Test fishery encounters ranged from 80 to 335 in Area 5 and from 10 to 148 in Area 6 (Table 42). The test fishery encounter objective was met in Area 5 each year except in 2007, while in Area 6 the objective was not met in 3 of the 5 years.

Table 37. Precision of harvest estimates for the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

Year	Harvest Estimate	+/- 95% CI	Precision	Precision Objective	Objective Met
2003	3,493	526	0.1506	0.15	yes
2004	3,576	463	0.1295	0.15	yes
2005	2,078	401	0.1930	0.15	no
2006	3,666	502	0.1369	0.15	yes
2007	4,096	538	0.1313	0.15	yes

Table 38. Precision of effort estimates for the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

Year	Effort Estimate	+/- 95% CI	Precision	Precision Objective	Objective Met
2003	24,594	3,803	0.1546	0.15	yes
2004	29,425	3,162	0.1075	0.15	yes
2005	34,086	2,251	0.0660	0.15	yes
2006	26,253	2,342	0.0892	0.15	yes
2007	22,051	1,839	0.0834	0.15	yes

Table 39. Number of Chinook encounters (harvested and released) sampled by creel survey samplers in each area by statistical month during the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

	Area 5			Area 6		
Year	July	August	Objective Met	July	August	Objective Met
2003	3,732	n/a[a]	yes	1,085	n/a[a]	yes
2004	3,361	354	yes	726	238	yes
2005	1,973	140	yes	278	60	no
2006	1,015	2,229	yes	209	93	no
2007	2,559[b]	117	yes	681[c]	58	no

a. The fishery did not continue into statistical month August.
b. Does not include an additional 115 encounters in Area 5 during July 1 which is considered statistical month June.
c. Does not include an additional 50 encounters in Area 6 during July 1 which is considered statistical month June.

Table 40. Weekly sample rates (*n* fish examined / estimated harvest) for the Area 5 selective Chinook fisheries, 2003 through 2007.

	Week										
Year	26	27	28	29	30	31	32	33	34	35	Total
2003		0.268	0.175	0.229	0.246	0.239					0.227
2004		0.184	0.294	0.260	0.244	0.267	0.202				0.239
2005		0.399	0.209	0.274	0.186	0.412	0.353				0.276
2006		0.262	0.206	0.262	0.314	0.248	0.235	0.304	0.235	0.344	0.249
2007	0.544	0.297	0.184	0.183	0.313	0.264	0.154				0.248

Table 41. Weekly sample rates (*n* fish examined / estimated harvest) for the Area 6 selective Chinook fisheries, 2003 through 2007.

	Week										
Year	26	27	28	29	30	31	32	33	34	35	Total
2003		0.539	0.520	0.404	0.334	0.323					0.378
2004		0.582	0.372	0.429	0.470	0.373	0.495				0.453
2005		0.504	0.596	0.681	0.545	0.162	0.455	0.392			0.326
2006		0.777	0.444	0.538	0.431	0.391	0.375	0.295	0.701	--[a]	0.445
2007	0.656	0.399	0.629	0.585	0.574	0.591	0.396				0.558

a. No fish were sampled and the estimated harvest was zero.

Table 42. Test boat catches for the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

	Area 5			Area 6		
Year	Number Caught	Objective	Objective Met	Number Caught	Objective	Objective Met
2003	335	100	yes	148	100	yes
2004	169	100	yes	148	100	yes
2005	137	100	yes	17	100	no
2006	210	100	yes	10	100	no
2007	80	100	no	76	100	no

Comparing Private Fleet, TF, and VTR data

A key assumption of both methods of calculating mortalities is that the test-fishery and private-fleet encounter composition (i.e., frequency by mark-status/size categories) is identical (Assumption 6, Appendix C). To evaluate this assumption, we compared mark rates, size, and proportions of fish caught by the fleet as a whole through creel surveys, fish caught and reported on VTRs by anglers, and fish caught by test fishing.

In Area 5, test boats caught more Chinook than anglers recording their catch on VTRs in all years except 2007 (Table 43). In Area 6, anglers reporting their catch on VTRs caught more Chinook than the test boats did in 2005 and 2006. During years of poor fishing (2005 and 2006), very low samples sizes were reported for both VTRs and test boats.

Size

Due to concerns about the accuracy of the measurements in the VTR data, we did not compare lengths of Chinook from VTRs with creel survey or test boat data. Although test boat sample sizes in Area 6 were low in 2005 and 2006, length frequency distributions suggest that mean length and length distributions were similar between test fishing and angler caught Chinook measured during creel surveys for each Area (Figures 22 and 23). The length frequency distributions are remarkable in the similarity of the size distributions in each individual area for each year, and in their differences between the Areas. Mean length and distribution of lengths were not statistically compared for Area 6 in 2006 because of small sample sizes. Mean lengths and distribution of lengths were not significantly different between test fishing and creel surveys for all comparisons made, except for Area 5 in 2007 (Table 44). Thus both test fishing and creel surveys clearly demonstrate the similarities within sections annually and demonstrate the difference in size distribution of Chinook between Area 5 and Area 6.

Mark Rate

Overall mark rate varied between the three methods in both areas, but also showed differences between areas (Figure 24). Mark rate was more variable between methods in Area 5 than in Area 6. In Area 5, mark rates reported by anglers during creel surveys were always the lowest rate of the three methods. The highest mark rate was reported for VTRs in 3 of the 5 years. In Area 6, VTRs always had an intermediate mark rate between test boats and creel surveys. The highest mark rate was reported by test boats for 3 of the 5 years. For legal-size fish in Area 5, mark rate was between 43 and 57% for test boats and between 20 and 74% for VTRs (Figure 25). For legal-size fish in Area 6, mark rate was between 40 and 67% for test boats and between 30 and 100% for VTRs (Figure 25). Legal-size mark rate in Area 6 was relatively similar between test fishing and VTRs for all years except 2005.

We tested for differences in overall mark rates (i.e., total marked encounters / total encounters) between test-fishery, VTR, and dockside sampling methods and legal-size mark rates (i.e., legal-marked encounters / total legal encounters) between test-fishery VTR observations using χ^2 proportion tests (with Yates continuity correction). For Area 5 overall mark rate, highly

significant differences in mark rates were noted for all five years except 2006 (Table 45). In 2003 and 2007, the creel survey and VTR comparison and the test fishery and creel survey comparisons were significantly different, while the test fishery and VTR comparison was not significantly different. In 2004 and 2005, the test fishery and VTR comparison and the test fishery and creel survey comparisons were significantly different, while the creel survey and VTR comparison was not significantly different. For Area 6, a significant difference in overall mark rates was observed only for 2004. In that year, the entire difference was due to a highly significant difference between the test fishery and creel survey. Although the difference in legal-size marked rate was quite large in some years (Table 46), a significant difference was observed only for Area 5 in 2005, with 2004 in Area 5 also close to being significantly different (ρ = 0.082).

Table 43. Number of Chinook caught by test boats and recorded by anglers on Voluntary Trip Reports (VTRs) in the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

Year	Area	VTRs	Test Boat
2003	5	179	335
	6	80	148
2004	5	35	169
	6	112	148
2005	5	63	135
	6	40	17
2006	5	35	210
	6	15	10
2007	5	128	78
	6	36	76

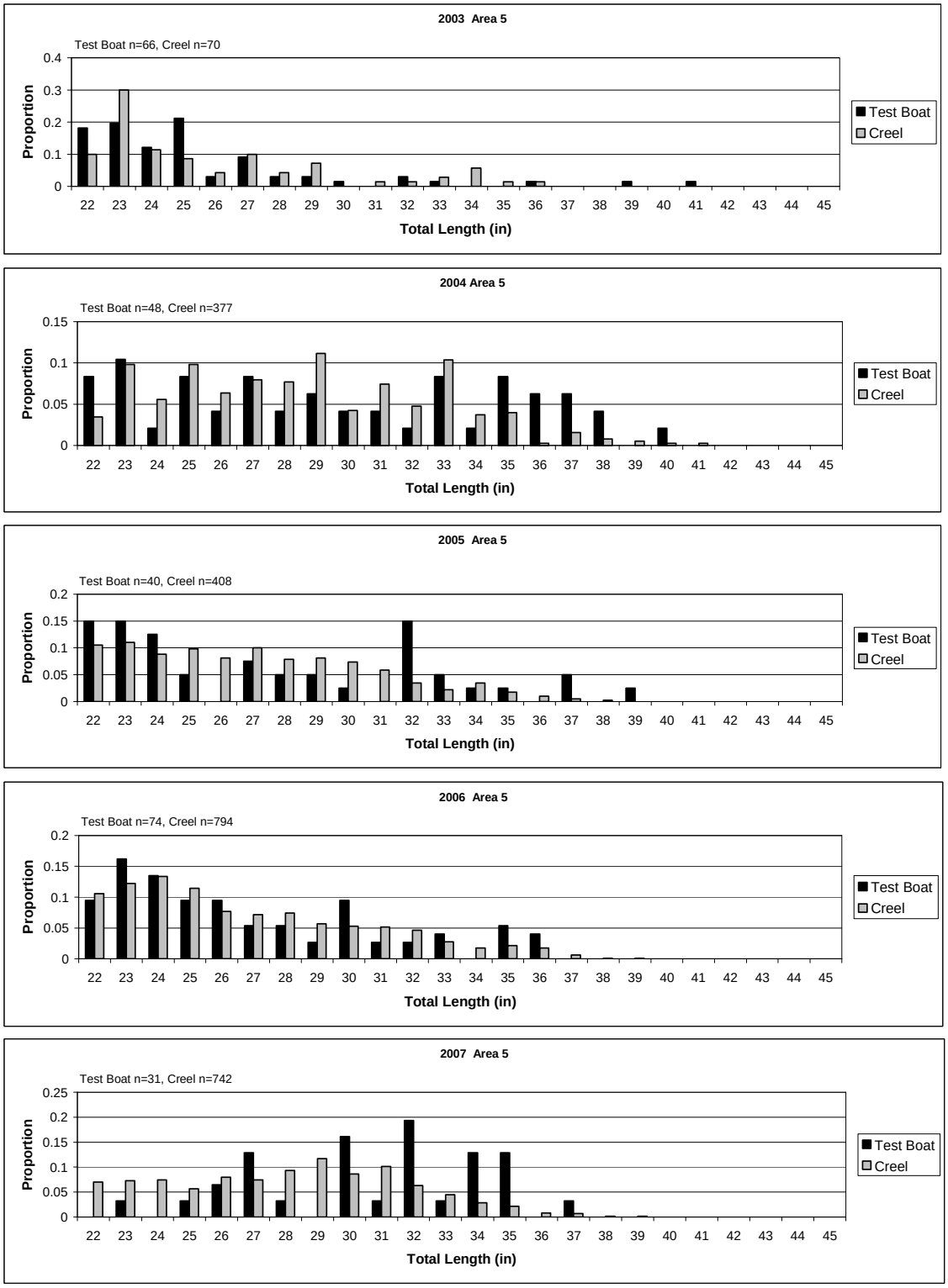


Figure 22. Length frequency histograms for legal-size marked Chinook caught on test boats compared to dockside creel survey interviews in Area 5 during selective Chinook fisheries, 2003 through 2007.

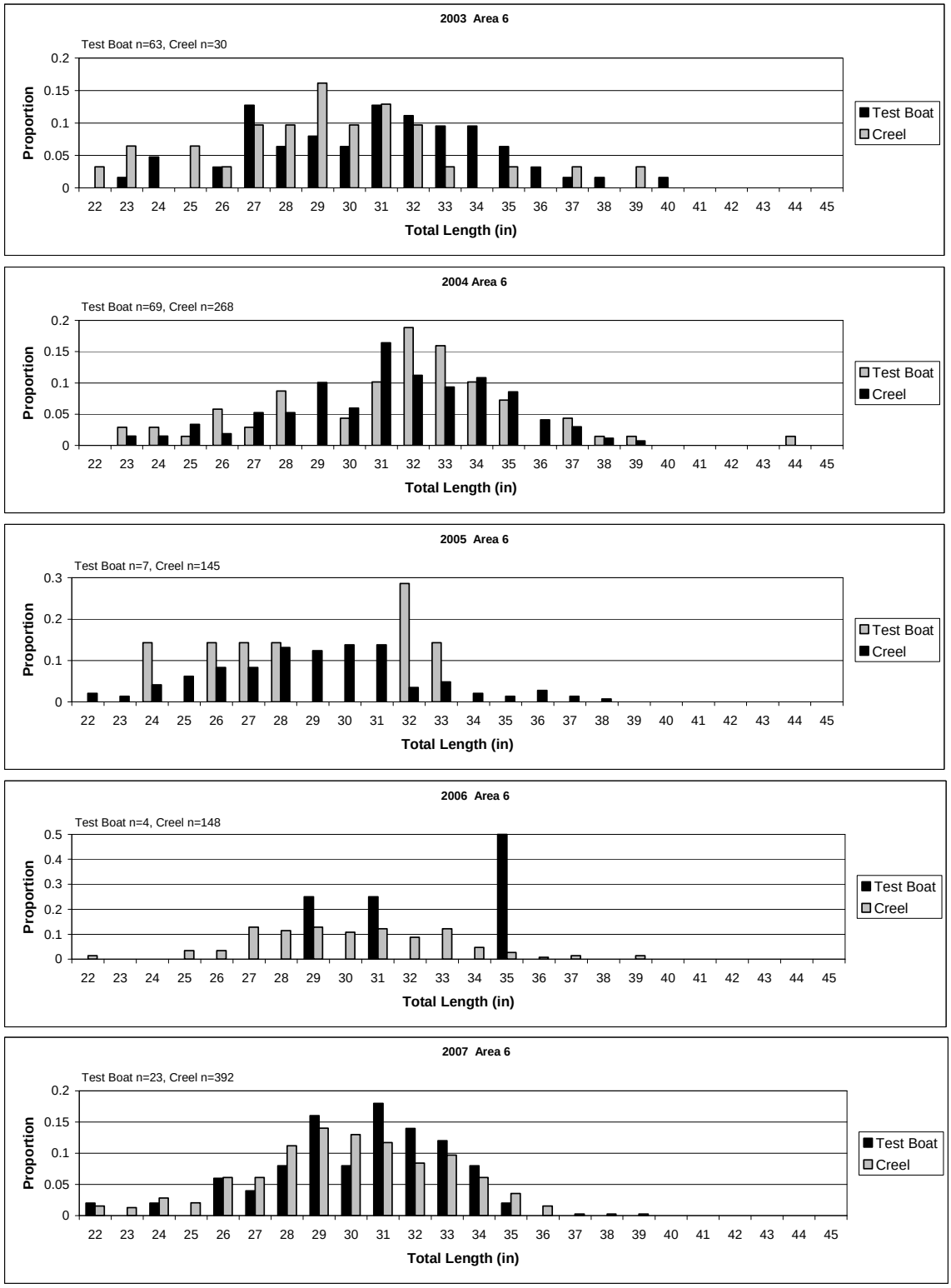
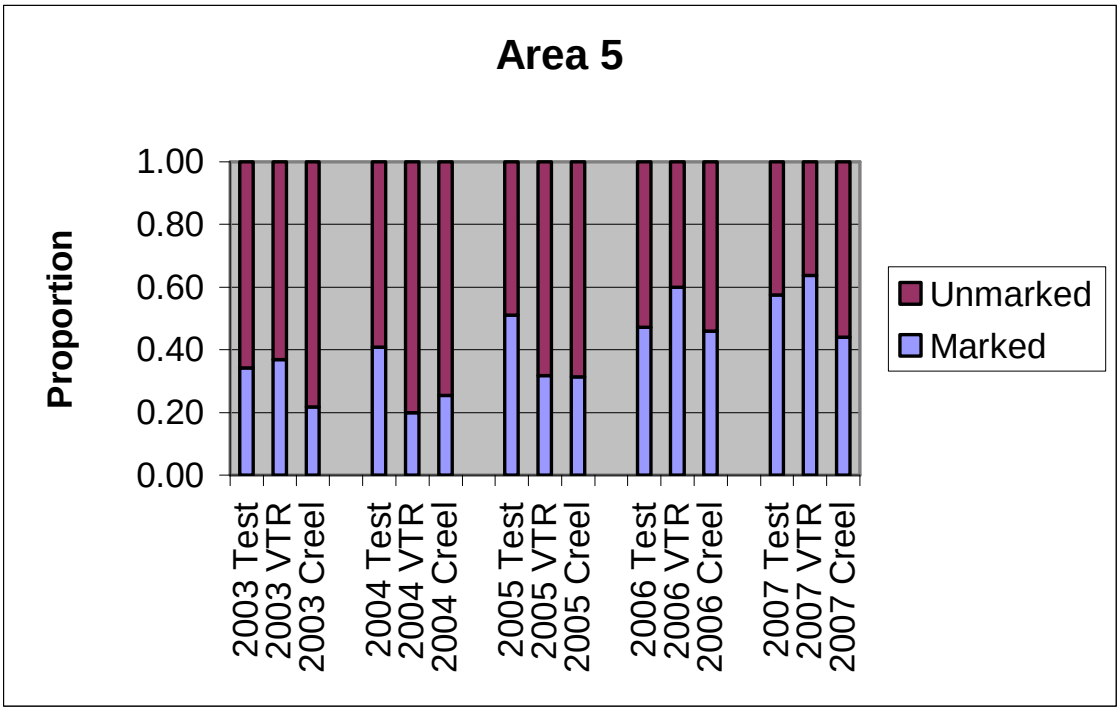


Figure 23. Length frequency histograms for legal-size marked Chinook caught on test boats compared to dockside creel survey interviews in Area 6 during selective Chinook fisheries, 2003 through 2007.

Table 44. Mean lengths of legal-size marked Chinook caught by test boats and anglers in the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007; and results of statistical analysis comparing size and distribution of lengths. Non-significant differences are denoted NS while significant differences at the $\alpha = 0.05$ level are denoted * and significant differences at the $\alpha = 0.01$ level are denoted **.

		Test		Creel		Statistical Comparison	
Year	Area	Samples	Mean Length (mm)	Samples	Mean Length (mm)	T Test	Smirnov Test
2003	5	66	660	71	667	NS	NS
	6	63	794	32	763	NS	NS
2004	5	48	765	377	738	NS	NS
	6	69	813	268	809	NS	NS
2005	5	40	713	408	699	NS	NS
	6	7	748	145	751	NS	NS
2006	5	74	695	794	692	NS	NS
	6	4	841	149	775	Not Tested	Not Tested
2007	5	31	795	767	722	** $\rho < 0.01$	* $\rho < 0.05$
	6	50	787	392	772	NS	NS



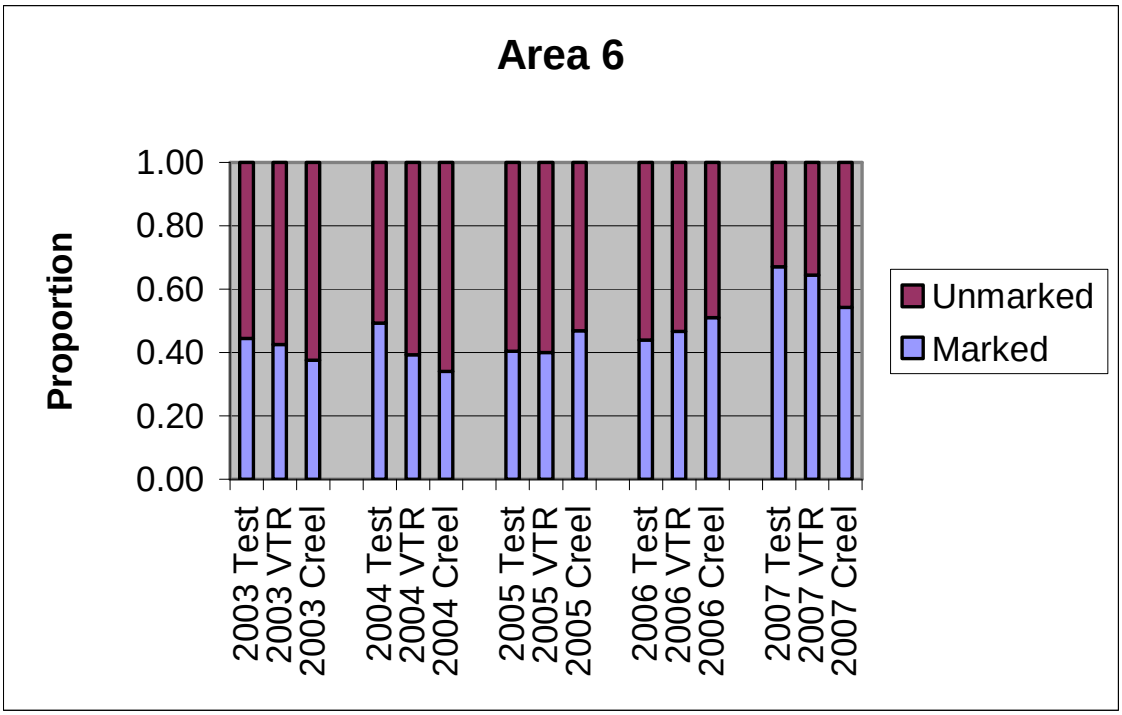


Figure 24. Proportions of marked and unmarked Chinook caught by test fishing boats, reported caught by anglers on Voluntary Trip Reports (VTR), and observed in creels surveys during the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Table 45. Results of statistical analysis comparing mark rates of Chinook caught by test boats, anglers reporting their catch on Voluntary Trip Reports (VTRs), and dockside creel surveys in the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007. Non-significant differences are denoted NS while significant differences at the $\alpha = 0.05$ level are denoted * and significant differences at the $\alpha = 0.01$ level are denoted **.

Year	Area	Test, VTR & Creel	Test and VTR	Creel and VTR	Test and Creel
2003	5	** $\rho < 0.01$	NS	** $\rho < 0.01$	** $\rho < 0.01$
	6	NS	n/a	n/a	n/a
2004	5	** $\rho < 0.01$	* $\rho = 0.04$	NS	** $\rho < 0.01$
	6	** $\rho < 0.01$	NS	NS	** $\rho < 0.01$
2005	5	** $\rho < 0.01$	* $\rho = 0.02$	NS	** $\rho < 0.01$
	6	NS	n/a	n/a	n/a
2006	5	NS	n/a	n/a	n/a
	6	NS	n/a	n/a	n/a
2007	5	** $\rho < 0.01$	NS	** $\rho < 0.01$	* $\rho = 0.03$
	6	NS	n/a	n/a	n/a

Table 46. Results of statistical analysis comparing mark rates of marked legal-size Chinook caught by test boats and anglers reporting their catch on Voluntary Trip Reports (VTRs) in the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007. Non-significant differences are denoted NS while significant differences at the $\alpha = 0.05$ level are denoted * and significant differences at the $\alpha = 0.01$ level are denoted **.

		Mark Rate			
Year	Area	Test Fishing	VTRs	χ^2	Statistical Comparison
2003	5	0.426	0.423	0.00	NS
	6	0.453	0.433	0.02	NS
2004	5	0.436	0.200	3.02	NS
	6	0.483	0.404	1.20	NS
2005	5	0.548	0.310	3.79	* $\rho = 0.05$
	6	0.412	0.351	0.02	NS
2006	5	0.532	0.476	0.06	NS
	6	0.400	0.467	0.00	NS
2007	5	0.574	0.737	1.91	NS
	6	0.667	0.634	0.02	NS

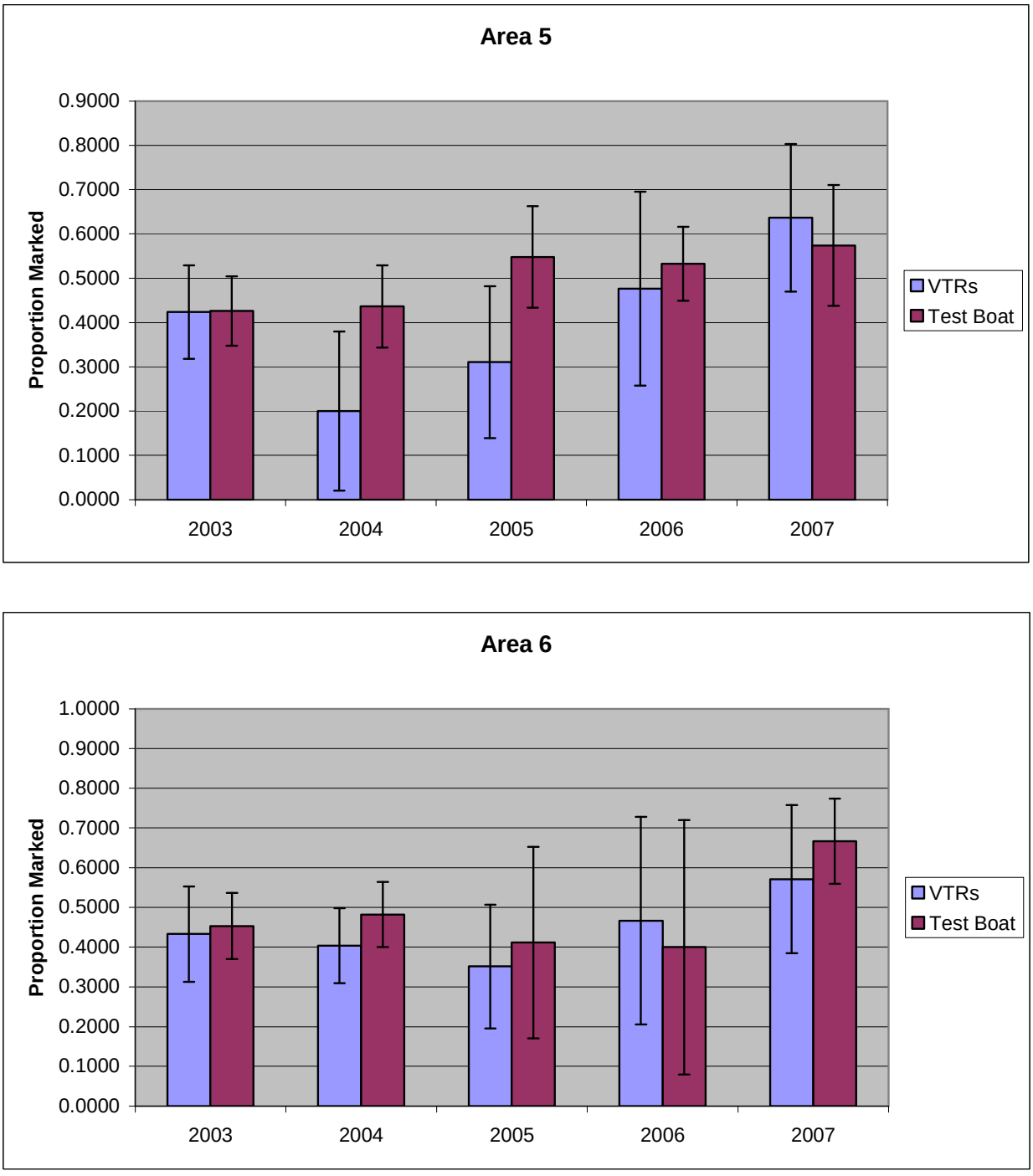


Figure 25. Proportions that were marked, and 95% confidence intervals, of legal-size Chinook caught by test fishing boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Size and mark status categories

Creel data were not collected with enough detail on mark and size status of released salmon to compare with test fishing and VTRs for proportions of Chinook in each of the four size and mark status categories. Proportions in each the mark-status/size categories were not significantly different in most comparisons (Figure 26 and Table 47). Significant differences were observed in Area 5 in 2006 and 2007 and in Area 6 in 2007 (Table 47). The 2007 Area 5 differences might be a result of a biased VTR sample as most of the VTR data was collected from 1 boat during a 6-day period. The proportion of legal-size marked Chinook in Area 5 was always lower for VTR data than test boat data, except in 2003 when they were essentially equal. In Area 6, test fishing and VTR data showed very similar proportions of the four mark status/size categories for each year except 2007 when anglers reported more sublegal-size fish than the test boats. The proportion of legal-size marked Chinook in Area 6 was always lower for VTR data than test boat data, except in 2006.

In Area 5, confidence intervals around proportion estimates were almost always smaller for test fishing estimates versus VTR estimates (Figures 27 and 28). In Area 6, confidence intervals were smaller for test fishing in 2003, 2004 and 2007, but were larger in 2004 and 2005 when sample sizes were extremely low (Figures 29 and 30).

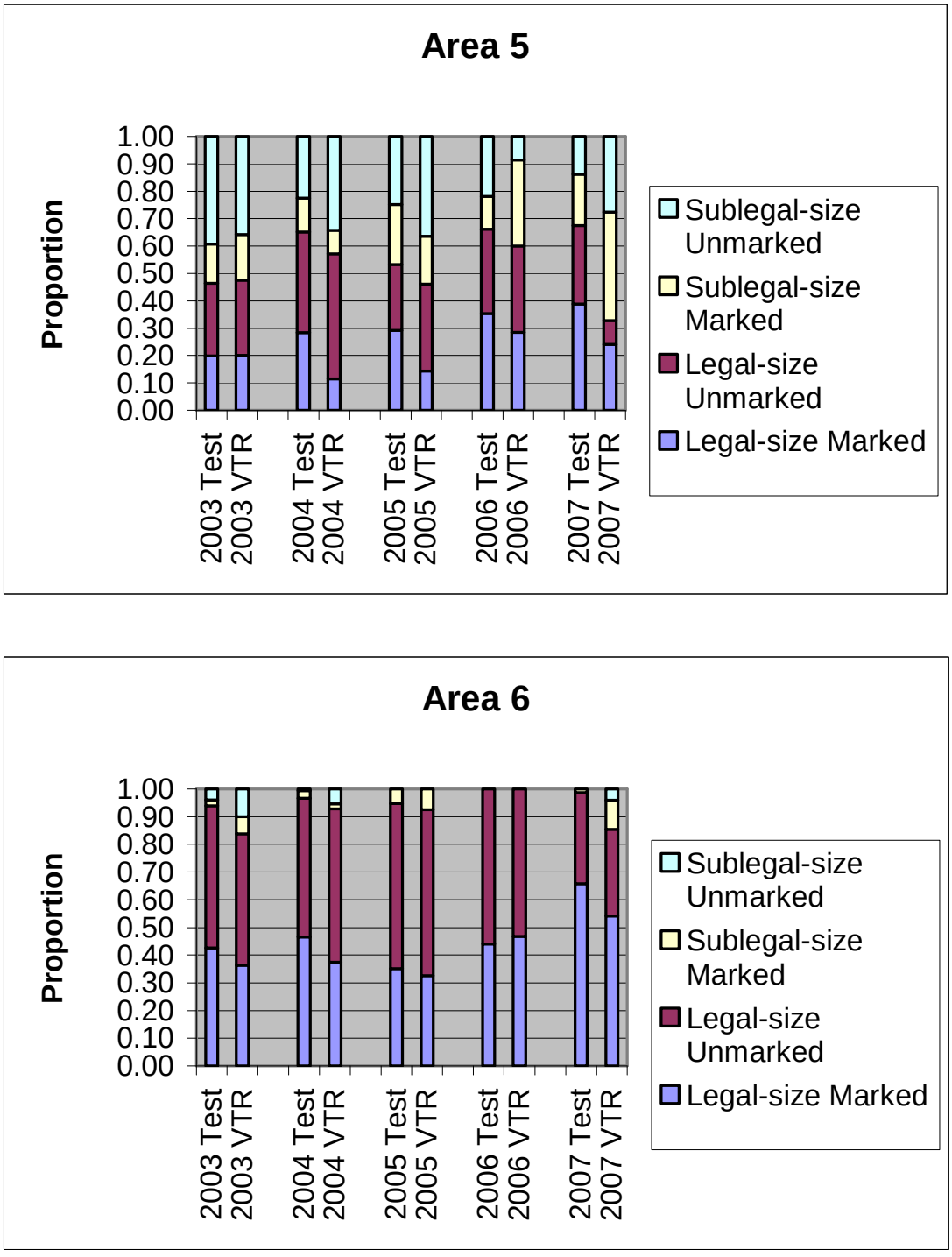


Figure 26. Proportions in four size/mark status groups of Chinook caught by test boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Table 47. Sample numbers in four mark status/size categories used to compute Chi-squared analysis and Chi Square test results for Chinook caught by test fishing and anglers reporting their catch on Voluntary Trip Reports (VTRs) during the Areas 5 and 6 selective Chinook fisheries, 2003 through 2007.

Area	Year	Method	Legal-size Marked	Legal-size Unmarked	Sublegal-size Marked	Sublegal-size Unmarked	χ^2	Probability
5	2003	Test Boat	66	89	48	132	0.89	$0.75<\rho<0.90$
		VTRs	36	49	30	64		
	2004	Test Boat	48	62	21	38	2.63	$0.25<\rho<0.50$
		VTRs	4	16	3	12		
	2005	Test Boat	40	33	30	34	3.44	$0.25<\rho<0.50$
		VTRs	9	20	11	23		
	2006	Test Boat	74	65	25	46	10.45**	$0.01<\rho<0.025$
		VTRs	10	11	11	3		
	2007	Test Boat	31	23	15	11	22.17**	$\rho<0.001$
		VTRs	28	10	46	32		
6	2003	Test Boat	63	76	3	6	5.78	$0.10<\rho<0.25$
		VTRs	29	38	5	8		
	2004	Test Boat	69	74	4	1	5.77	$0.10<\rho<0.25$
		VTRs	42	62	2	6		
	2005	Test Boat	7	10	0	0	1.28	$0.50<\rho<0.75$
		VTRs	13	24	3	0		
	2006	Test Boat	4	6	0	0	0.05	$0.75<\rho<0.90$
		VTRs	7	8	0	0		
	2007	Test Boat	50	25	1	0	8.23*	$0.025<\rho<0.05$
		VTRs	26	15	5	2		

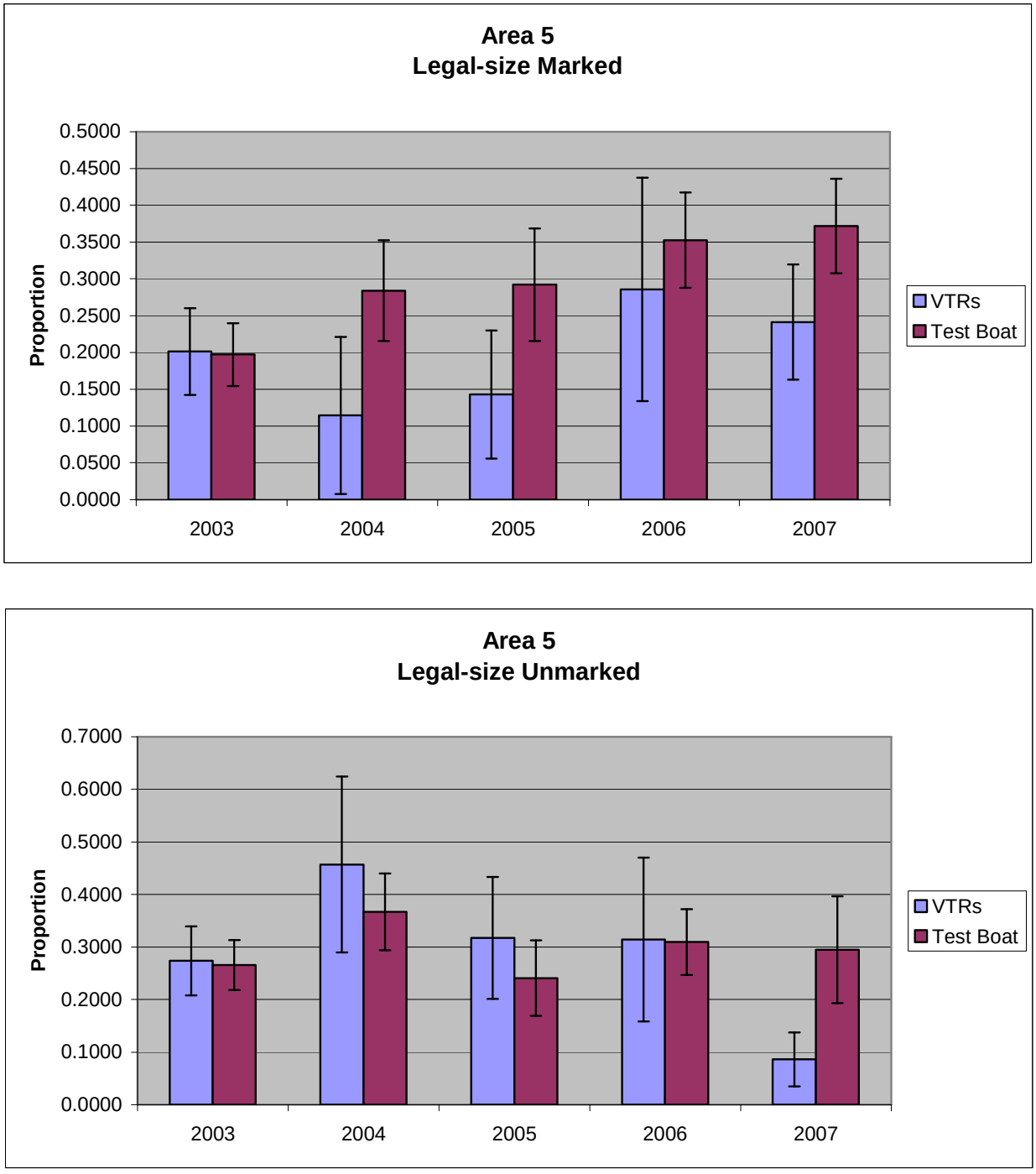
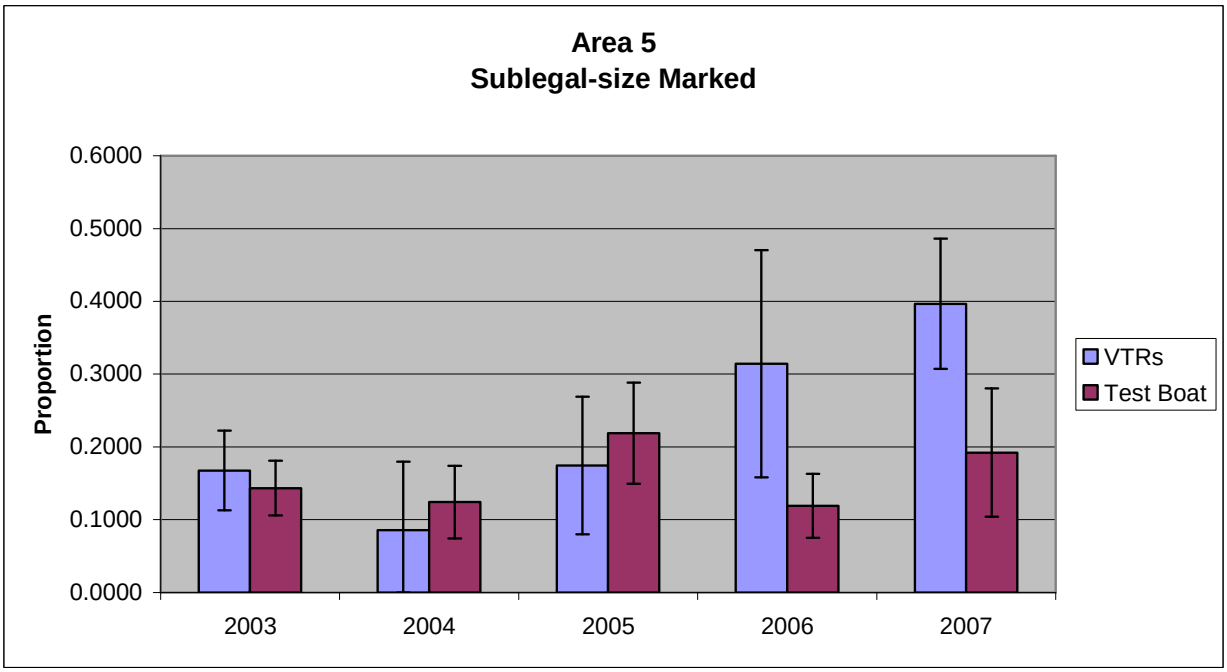


Figure 27. Proportions and 95% confidence intervals of marked and unmarked legal-size Chinook caught by test boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 5 selective Chinook fishery, 2003 through 2007.



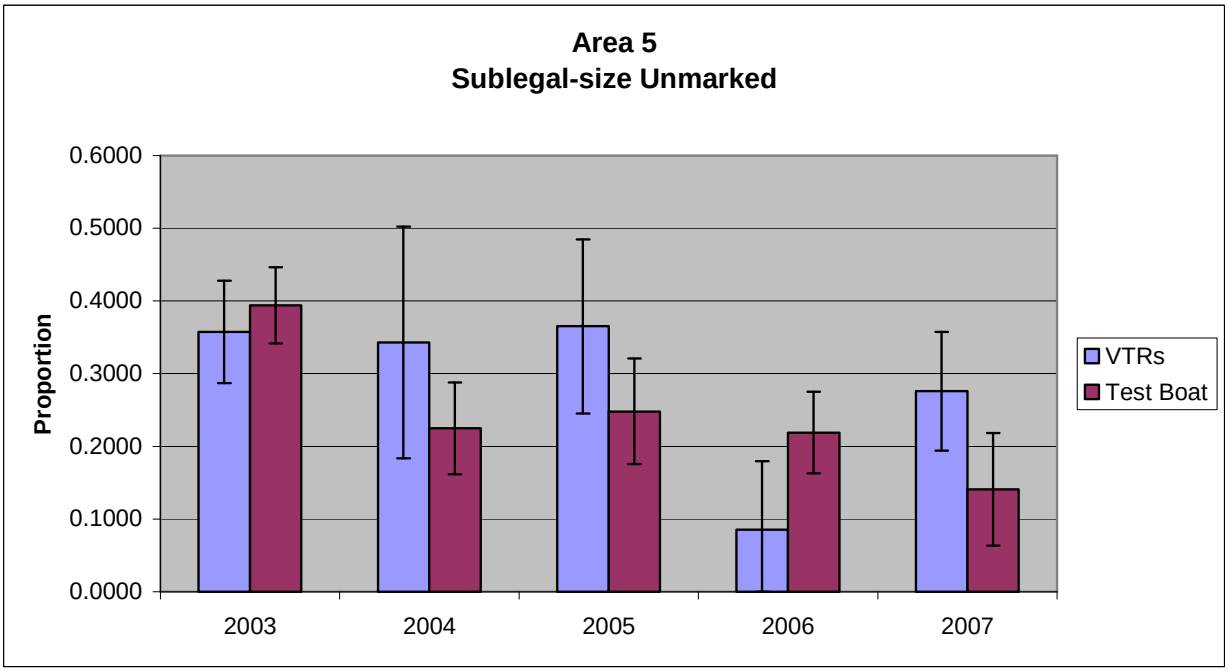
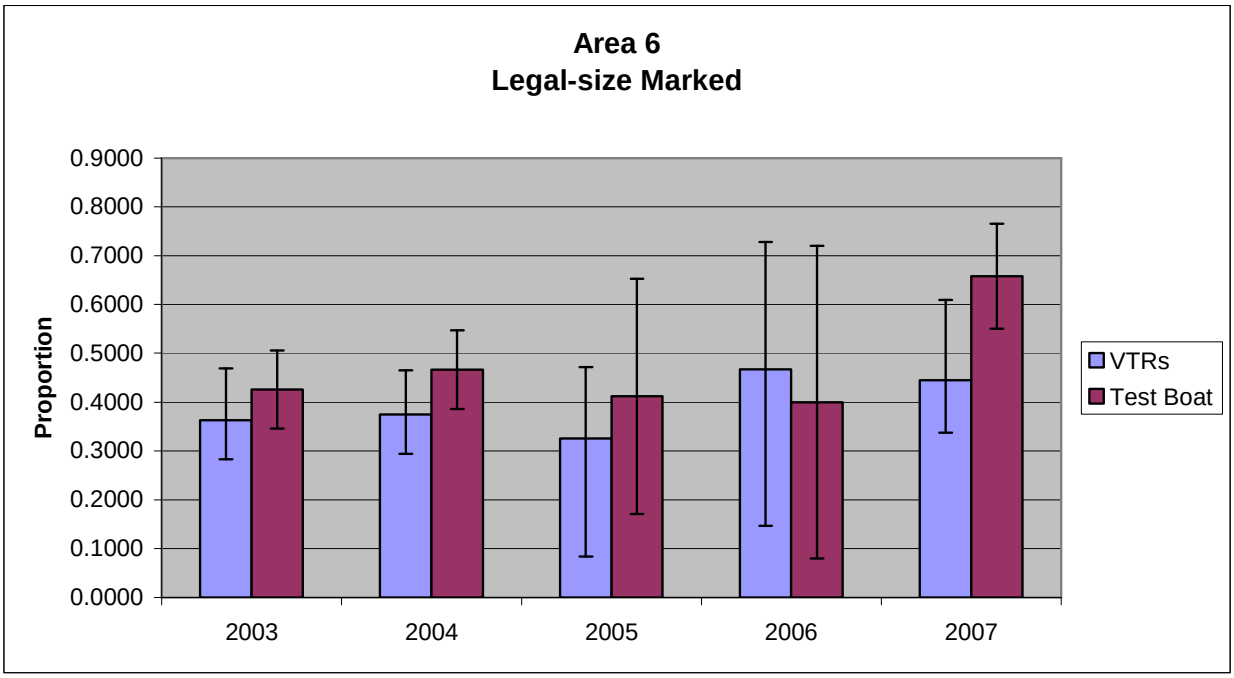


Figure 28. Proportions and 95% confidence intervals of marked and unmarked sublegal-size Chinook caught by test boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 5 selective Chinook fishery, 2003 through 2007.



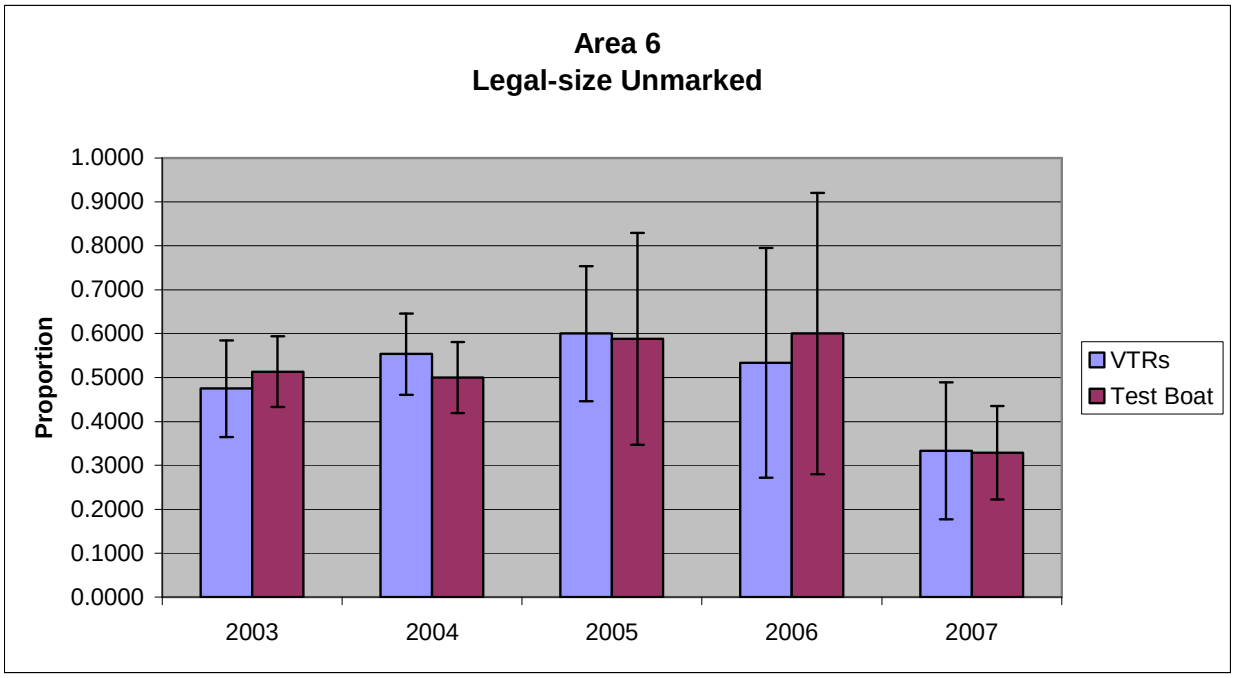
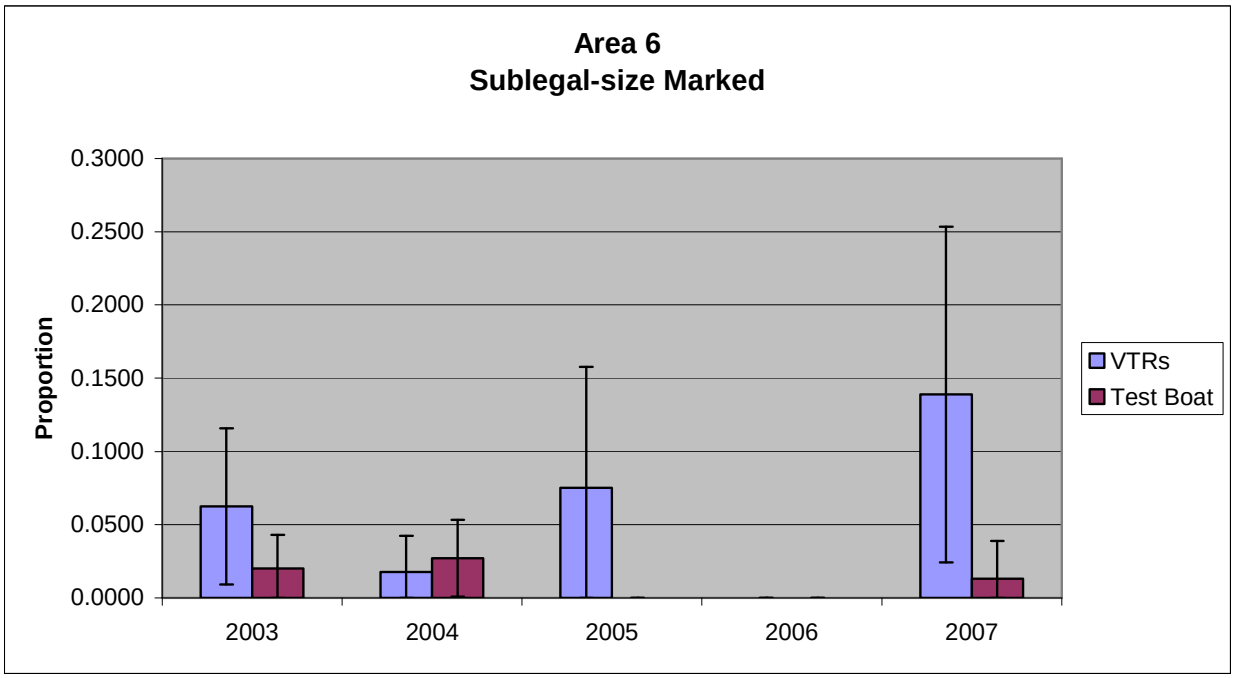


Figure 29. Proportions and 95% confidence intervals of marked and unmarked legal-size Chinook caught by test boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 6 selective Chinook fishery, 2003 through 2007.



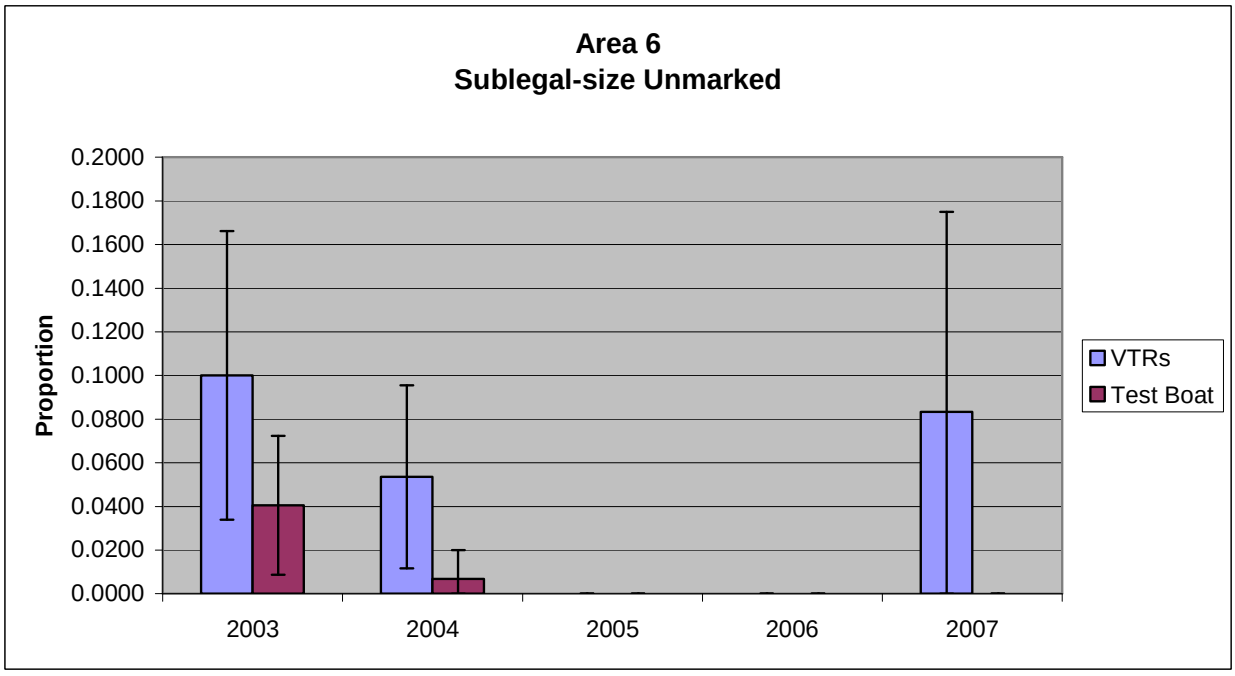


Figure 30. Proportions and 95% confidence intervals of marked and unmarked sublegal-size Chinook caught by test boats and reported caught by anglers on Voluntary Trip Reports (VTR) during the Area 6 selective Chinook fishery, 2003 through 2007.

Estimation of Total Encounters, Method 1 versus Method 2

In previous post-season selective fishery reports (e.g., WDFW 2007b, 2007c) and in Section I of the present document, WDFW has noted that Method-1 (M1) and Method-2 (M2) estimates of total Chinook encounters (and quantities that are estimated from total encounters; see Appendix A for details) sometimes differ substantially. In particular, M1 estimates of Chinook releases (and associated mortality) have been on average 50% higher (range: 11% lower to 238% higher) than M2 estimates over the suite of selective seasons monitored to date (i.e., 2003-2007 in Areas 5 and 6, 2004-5 and 2006-7 in 8-1 and 8-2, and 2007 in Areas 9, 10, and 11; Figure 31). While M2 was originally added to the creel estimation process with sound justification (i.e., because angler-reported releases were perceived as inaccurate at times), the simultaneous reporting of two estimates introduces ambiguity to the fishery-evaluation process. In particular, it can be difficult to draw precise, quantitative post-season conclusions about the success of fisheries relative to pre-season objectives (e.g., FRAM-predicted vs. observed impact comparisons, Section II) when multiple impact estimates are available for consideration.

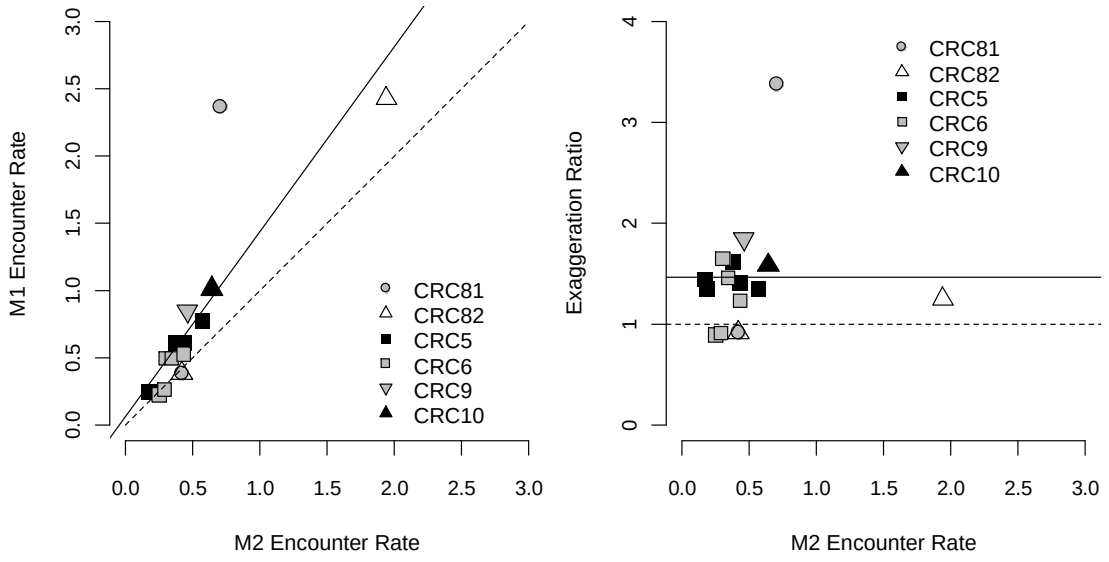


Figure 31. (A) (left) Season-wide Method-1 (M1) vs. Method-2 (M2) encounter rates (total encounters / total angler trips) for all Puget Sound/Strait of Juan de Fuca selective fisheries monitored using the Murthy design, 2003-2007. The dashed line reflects a 1:1 relationship; the solid line is the fitted relationship. (B) (right) The ratio of M1 to M2 total encounter estimates ("Exaggeration Ratio") as a function of M2 encounter rates for all selective fisheries monitored using the Murthy design with test fishing, 2003-2007. The dashed horizontal line represents the line of estimator equality whereas the solid horizontal line reflects the overall mean for fisheries and seasons considered.

For these reasons and with the encouragement of tribal technical staff, we sought to resolve which estimation scheme (M1 and M2) is most appropriate for selective fishery evaluation. Our specific goal was to discern which approach is most likely to yield unbiased estimates of fishery impacts relative to actual (*unknown*) impacts. To do this, we evaluated: *i*) M1 and M2 estimators and their associated assumptions, *ii*) the sensitivity of estimators to assumption violations, and *iii*) the validity assumptions based on indirect evaluations using empirical data. Based on these efforts, we propose and recommend alternatives for data collection and parameter estimation in selective Chinook fisheries monitored using our standard Murthy design.

Method 1 and Method 2 Estimators: Assumptions and Sensitivity Analysis

Though M1 and M2 estimators (and their variances) are detailed in Section I and Appendix A, we review them briefly here to set the stage for the present evaluation. M1 and M2 rely on the same information for the harvested Chinook component (dockside-based Murthy total estimates) but differ computationally and in terms of the data inputs needed for released Chinook (and therefore total encounters) estimation. M1 Chinook encounters (E_{TOT}) are obtained by summing dockside-based total estimates (N) of retained and released Chinook encounters for six estimation categories [subscripts: marked-kept (MK), unmarked-kept (UK), marked-released (MR), unmarked-released (UR), unknown mark status-released (unkR), and apportioned unidentified salmon (AUS)]:

(1) $$E_{TOT} = N_{MK} + N_{UK} + N_{MR} + N_{UR} + N_{unkR} + N_{AUS}$$

Given its reliance on creel data, the validity of M1 release estimates (relative to M2) hinges on the ability and/or willingness of anglers to accurately recall and/or report released Chinook encounters during the interview process (i.e., Assumption 3 from Section I; Appendix B).

Accepting the potential for Assumption-3 violation, M2 approaches encounters estimation by combining sampler observations on landed fish only (i.e., Murthy estimates for legal-marked Chinook in particular), assumptions about angler behavior (i.e., they harvest all legal-marked Chinook encountered), and auxiliary information (collected via test fishing) about the size/mark-status composition of the at-large "fishable" (i.e., vulnerable to encounter with hook-and-line angling gear) Chinook population. Using a simple Peterson estimator, M2 encounters are estimated as:

(2) $$E_{TOT} = K_{LM} / p_{LM}$$

where K_{LM} is the dockside estimate of legal-marked Chinook retention (apportioned Murthy estimate based on size composition of dockside samples) and p_{LM} is the proportion of test-fishery encounters that were legal-sized and marked. Thus, the accuracy of M2 estimates is unaffected by the reliability of angler-reported releases and instead depends on whether or not anglers report all legal-marked Chinook encountered (Assumption 5, Appendix B) and the extent to which the size/mark-status composition of test-fishery encounters mirrors that seen by private anglers (Assumption 6, Appendix B).

To understand which estimator (M1 or M2) is most appropriate for estimating total encounters in selective Chinook fisheries with accuracy, the plausibility of Assumptions 3, 5, and 6 and the sensitivity of estimators to departures from their perfect attainment must be considered. While the latter portion of this section addresses the validity of Assumptions 3, 5, and 6, we briefly evaluate the effects of hypothetical assumption violations on the accuracy of estimates here.

We evaluated bias in total encounter estimates ($E_{TOT\text{-}est}$) generated by M1 and M2 estimators under known harvest, release, and size/mark-status (p_{LM} in particular) conditions given a range of proportional departures from perfect assumption attainment for each one (3, 5, and 6) independently. We considered an "average" case where 3,500 Chinook were encountered in total ($E_{TOT\text{-}true}$) of which 10% were legal in size and marked ($p_{LM\text{-}true}$) and thus available for harvest (i.e., $E_{LM\text{-}true} = 350$; this analysis assumes only LM Chinook are harvested). The sensitivity [assessed in terms of relative bias, i.e., *Relative Bias* = $(E_{TOT\text{-}est} - E_{TOT\text{-}true}) / E_{TOT\text{-}true}$] of the M1 estimator to departures from Assumption 3 (i.e., accurate release reporting occurs) was assessed using the encounters estimates:

$$E_{TOT\text{-}est} = N_K + N_R{*}D, \text{ and}$$
$$E_{TOT\text{-}true} = N_K + N_R,$$

where $N_R{*}D$ is the release value observed through sampling and D is the modeled departure between reality and assumptions (i.e., the misreporting rate for released fish in the case of Assumption 3); D was assessed from 0.05 to 1.95 [i.e., +/- 95% deviations from Assumption 3 being perfectly met ($D = 1$)]. N_K was assumed to be 350 (all legal-marked fish were harvested) and N_R – the number of fish released – was taken as the remainder (3,150 fish).

The sensitivity (~*Relative Bias*) of M2 estimates to Assumptions 5 (all legal-marked Chinook are retained) and 6 (test fishery and fleet encounters are the same) departures was similarly quantified. However, for assumption 5, $E_{TOT\text{-}est}$ and $E_{TOT\text{-}true}$ were estimated as:

(4)
$$E_{TOT\text{-}est} = [E_{LM\text{-}true}{*}(1-D)] / p_{LM\text{-}true}$$
$$E_{TOT\text{-}true} = E_{LM\text{-}true} / p_{LM\text{-}true},$$

where the quantity $E_{LM\text{-}true}{*}(1-D)$ is what is observed through dockside sampling and D represents the legal-marked release rate, which was evaluated for a range of 0-0.95 (i.e., it is bound to the range 0 and 1). For Assumption-6 sensitivity, $E_{TOT\text{-}est}$ and $E_{TOT\text{-}act}$ were estimated as:

(5)
$$E_{TOT\text{-}est} = E_{LM\text{-}true} / (p_{LM\text{-}true}{*}D)$$
$$E_{TOT\text{-}true} = E_{LM\text{-}true} / p_{LM\text{-}true},$$

where $p_{LM\text{-}true}{*}D$ yields the value that is observed in test fishery samples and D is the degree of departure between test fishery legal-marked and actual fleet legal-marked encounters (D values from 0.05 to 1.95 were assessed).

Based on this cursory sensitivity analysis, four issues about the effects of assumption violations on the reliability of M1 and M2 estimates became apparent. First, for Assumptions 3 and 5, discrepancies of similar magnitude affect the accuracy of estimates to a similar extent (on an ~1:1 basis; Figure 32). Incremental under- and over-reporting of actual releases (i.e., Assumption 3) leads to proportional negative and positive biases in M1 estimates; the relative bias in M2 estimates varies inversely and proportionally with the rate at which legal-marked Chinook encounters are released by anglers (i.e., Assumption 5). Second, M2 bias varies non-linearly (via a hyperbolic function) with the degree of departure between test-fishery and fleet legal-marked encounters; thus, estimates are more (and positively) biased if test fishers have fewer legal-marked encounters than the private fleet than if the opposite scenario is true [e.g., a 20% discrepancy towards test-fishers having fewer legal-marked encounters leads to a 25% relative bias (overestimate) in encounters whereas the opposite (i.e., test fishers having more legal-marked encounters) yields only a 17% bias (underestimate)]. Third, although we did not evaluate estimator sensitivity to simultaneous assumption violations, it is clear that M2 could yield accurate estimates of total encounters if both Assumption 5 and 6 are not well met. For example, compensation might occur if anglers released legal-marked Chinook encounters (leading to negative bias) and fewer legal-marked Chinook were caught by test fishing than private-fleet anglers (leading to positive bias). Finally, while estimators were equally sensitive to the three different assumption violations on average, departures in Assumption 6 (test-fishery assumption) yielded the maximum level of bias across all levels considered.

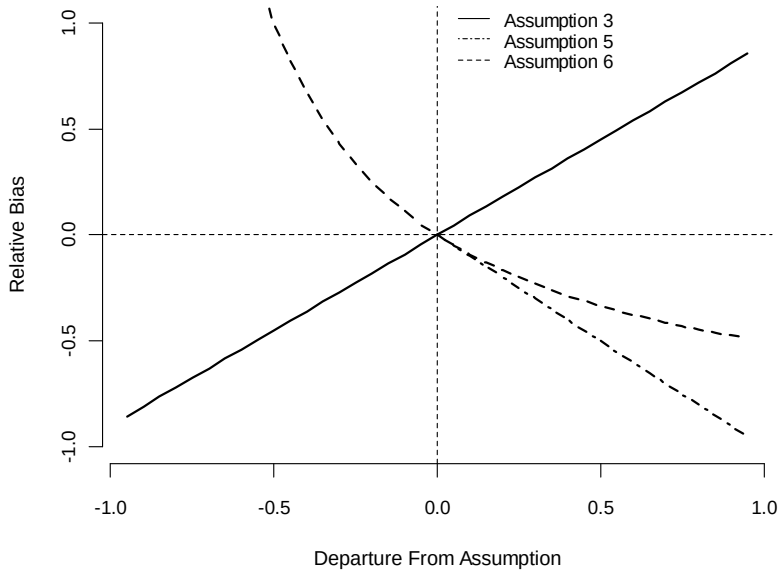


Figure 32. Relationship between relative bias in total encounter estimates [i.e., (estimate – actual) / actual] and assumption violations of proportionally varying degrees (D) for Assumptions 3 (anglers accurately report all released fish), 5 (anglers keep all legal-marked Chinook encountered), and 6 (the test fishery and fleet encounter Chinook in the same size/mark-status composition).

Evaluating the Validity of Estimator Assumptions

Assumption 3: *Do anglers accurately report caught-and-released Chinook salmon?*

To gauge the plausibility of Assumption 3, we conducted a brief literature review, considered patterns in empirical estimates, and inspected raw interview data (i.e., release–frequency distributions). From this, we concluded that Assumption 3 is unlikely to be perfectly met and that in general anglers probably over-report released encounters. While the rate at which anglers over-report released encounters is unknown, original 8-1/8-2 data and previous studies suggest that it could be anywhere between 20-200%.

In Washington (Noviello 1998) and elsewhere (e.g., NRC 2006; Bailey 2007), interview-based catch information (inclusive of harvested and released components) is generally accepted as being vulnerable to several forms of response error. Whether due to innate human tendencies towards recalling/reporting catch in prototype quantities (i.e., digit bias, where even numbered and multiples-of-five responses are favored; e.g., Beaman et al. 2005), intentional over-reporting of catch for status purposes (i.e., prestige bias), or other reasons, the misreporting of encounters occurs often and can significantly bias interview-based estimates of catch (Malvestuto 1996; Pollock et al. 1994). For example, in a comparison of angler-based and "true" total catch estimates for Alberta walleye fisheries, Sullivan (2003) found that anglers reported sublegal releases at a rate 2.2 times the release level which actually occurred. Applying Sullivan's methodology (i.e., he based "true" encounters on an M2-like estimator, i.e., with landed catch expanded by test-fishery proportions) to Washington's selective fisheries suggests an over-reporting rate of similar magnitude (i.e., M1 is 1.5 times M2 on average; e.g. Figure 32).

Specific to marine recreational salmon fisheries, Noviello (1998) demonstrated that anglers do over-report the released component of their catch in some fisheries. In this study, the overall (i.e., across 7 season-area strata) angler-reported release proportion was +18% [range: -19% (Area 4 pink salmon) to +353% (Area 10 all salmon)] biased compared to the actual value documented via on-the-water observation methods. By inspecting release–frequency distributions, Noviello (1998) also showed that anglers tend to report releases in prototype quantities (e.g., 10, 12, 15, 20) and therefore suggested a role of digit bias in the over-reporting process. Similar reporting tendencies were reported by WDFW (2008) in the Areas 8-1 and 8-2 selective winter blackmouth fisheries; evidence suggesting digit bias was especially pronounced for high-encounter periods (e.g., October in the 06-07 season; Figure 33). Although digit bias is likely the result of complex cognitive processes that are beyond the scope of selective fisheries monitoring, its presence can be an impediment to the accurate estimation of population parameters from interview data (Huttenlocher et al. 1990; Beaman et al. 2005).

In combination, these observations lead us to speculate that: *i*) anglers misreport actual releases by recalling/reporting in prototypical bins, *ii*) misreporting likely involves erring towards over-estimation, and *iii*) Assumption 3 is poorly met in some cases (e.g., during periods of high encounters).

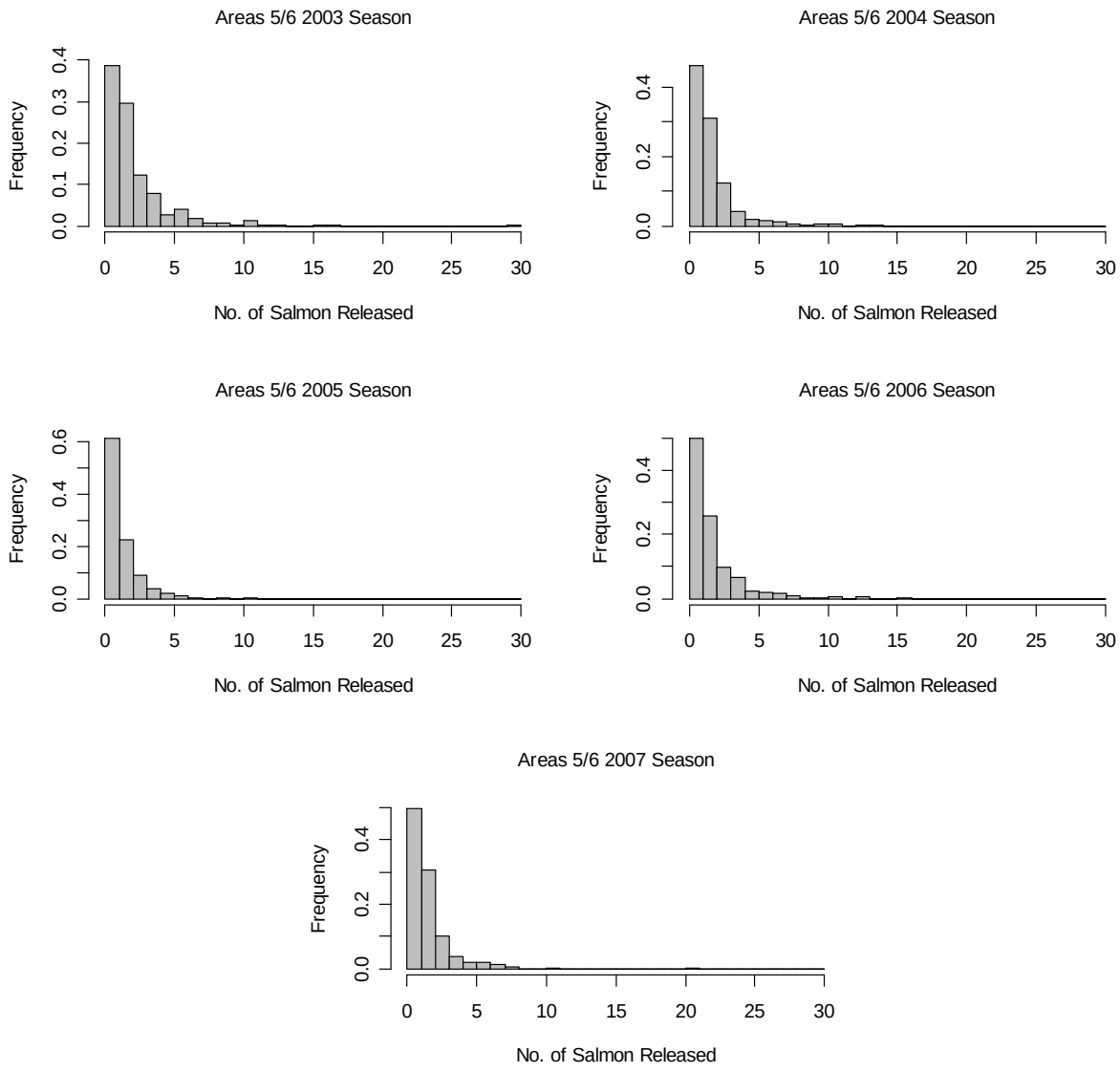


Figure 33. Histograms of reported salmon releases (all species) from pooled Areas 5 & 6 interviews, 2003-07. The plotted frequency is the proportion of anglers interviewed that successfully encountered and released Chinook salmon. In sequential order (2003-2007), the season-total samples size (no. parties interviewed) represented by each plot are *n* = 858, 1,392, 751, 827, and 730 and n = 1,917, respectively.

<u>*Assumption 5*</u>: *Do anglers keep all of the legal-marked Chinook they encounter?*
Though the data needed to rigorously evaluate Assumption 5 are limited, available information suggests that it is likely violated but only to a minor extent. To arrive at this conclusion, we considered all available direct [empirical estimates of legal-marked release rates from voluntary trip reports, VTRs] and indirect evidence relating to its occurrence.

The availability of empirical data for evaluating the plausibility of Assumption 5 is limited for multiple reasons. Foremost, to discourage the over-handling of fish in protected size/mark-status classes (marked or unmarked), WDFW has historically avoided asking anglers about the size of released individuals; thus, legal-marked release rate estimates cannot be obtained for the private recreational fleet. Second, even if interviews included questions about the release of legal-marked fish, however, an unknown (and non-estimable) proportion of the legal-marked Chinook release that occurs in a fishery could be due to misidentification (i.e., mark-status determination, length measurement, or both). Third, VTRs – our only direct means for estimating legal-marked release rates in a fishery – are the result of a self-selected sample coming from a more skilled segment of the angling population (see Section I for justification); legal-marked release rates estimated from VTRs are therefore potentially biased (and most likely in the positive direction).

Given appropriate caveats about the potential for bias in VTR-based samples, data collected and returned by private and charter anglers fishing in Areas 5 and 6 yield a legal-marked release rate estimate of approximately 0 to 14% (overall estimate, 5%) for the combination of seasons and areas (Table 19). We found VTR estimates of legal-marked release rates to be similarly low and consistent for season-area-source combinations where sufficient legal-marked encounters were reported.

Overall, VTR observations and test-boat vs. fleet comparisons of legal-marked Chinook size suggest that Assumption 5 is unlikely to be met in the 5 and 6 fishery. However, VTRs provide a starting point for adjusting M2 estimates so that they may more accurately reflect reality (i.e., by expanding legal-marked Chinook retention by ~10% prior to using this value in the M2 estimator). If a more defensible estimate of the private fleet legal-marked release rate could be obtained (e.g., based on reported intentional legal-marked release activity supplied during interview, Assumption-3 issues notwithstanding), this could also be used in modifying future estimates.

Assumption 6: *Is the size/mark-status composition of test fishery encounters the same as that seen by the private recreational fleet?*

In the previous subsection of the present report, we addressed this assumption in detail both in terms of how test fishing proceeds in implementation (i.e., do test-boat anglers perfectly mimic the fleet?) and based on comparisons of parameter estimates that could be obtained from both the test-boat and the private-fleet datasets (i.e., overall mark rates and size/age composition for legal-marked Chinook). Several lines of evidence suggest that this assumption is correct. We refer the reader to the previous subsection for more on our consideration of this assumption.

FRAM Performance in Selective Fishery Planning

Predictions of encounters, landed catch and mortalities by FRAM were relatively accurate for the Area 5 and 6 selective Chinook fishery. In general, actual estimated encounters, landed catch and mortalities of marked fish were occasionally higher than FRAM predictions, and actual estimated encounters, landed catch and mortalities of unmarked fish were almost always less than FRAM predictions.

Estimates of actual landed catch exceeded FRAM predictions every year except 2005 for marked legal-size fish, and every year for marked sublegal-size fish (Table 48). Estimates of actual landed catch of unmarked legal-size fish never exceeded FRAM predictions, while in 2005, 2006 and 2007, estimated actual landed catch of unmarked sublegal-size fish exceeded the FRAM predictions of zero. Estimates of total unmarked landed catch were from less than 1 percent to 26 percent of the FRAM predictions.

Using Method 1 estimates of encounters, actual estimates exceed FRAM predictions every year except 2005 for marked legal-size fish, and for unmarked sublegal-size fish in 2003 (Table 49). **However, even under this most conservative estimate (highest estimate) of encounters, estimated actual total encounters of unmarked Chinook were less than FRAM predictions for all five years of the fishery** (Figure 34). Using Method 2 estimates of encounters, actual estimates exceed FRAM predictions in 2003, 2004 and 2006 for marked legal-size fish, and for unmarked sublegal-size fish in 2003 (Table 50). Using Method 2 estimates, total encounters of unmarked Chinook never exceeded the FRAM predictions.

Using Method 1 estimates of mortalities (including both kept and released fish), actual estimates exceed FRAM predictions every year except 2005 for marked legal-size fish and total marked fish, in 2004 for marked sublegal-size fish, and for unmarked sublegal-size fish in 2003 (Table 51). **However, even under this most conservative estimate (highest estimate) of mortalities, the estimated actual total fishing mortality of unmarked Chinook was less than the FRAM prediction for all five years of the fishery** (Figure 35). Using Method 2 estimates of mortalities, actual estimates exceed FRAM predictions in 2003, 2004 and 2006 for marked legal-size fish, and for unmarked sublegal-size fish in 2003 (Table 52). Using Method 2 estimates, total mortalities of unmarked Chinook never exceeded the FRAM predictions.

Table 48. Pre-season FRAM predicted landed catch (harvest) compared to actual estimated landed catch, and 95% confidence intervals, for the combined Areas 5 and 6 selective Chinook fishery, 2003 through 2007.

Year	Size Class	FRAM Predicted Marked	Estimated Marked Landed	+/- 95% CI	FRAM Predicted Unmarked	Estimated Unmarked Landed	+/- 95% CI
2003	Legal	2,862	3,192	508	638	76	36
	Sublegal	0	225	165	0	0	0
	All	2,862	3,417	535	638	76	36
2004	Legal	2,861	3,375	440	639	5	6
	Sublegal	0	196	77	0	0	0
	All	2,861	3,571	447	639	5	6
2005	Legal	2,887	1,924	386	613	23	19
	Sublegal	0	100	42	0	30	21
	All	2,887	2,025	388	613	53	28
2006	Legal	3,044	3,443	476	456	10	9
	Sublegal	0	198	60	0	15	14
	All	3,044	3,641	480	456	25	17
2007	Legal	3,532	3,684	496	468	30	26
	Sublegal	0	287	77	0	94	51
	All	3,532	3,972	502	468	124	57

Table 49. Pre-season FRAM predicted encounters compared to actual estimated encounters using Method 1, and 95% confidence intervals, for the combined Areas 5 and 6 selective Chinook fishery compared, 2003 through 2007.

Year	Size Class	FRAM Predicted Marked	Estimated Marked Encounters	+/- 95% CI	FRAM Predicted Unmarked	Estimated Unmarked Encounters	+/- 95% CI
2003	Legal	3,045	4,341	1,148	7,976	5,595	1,053
	Sublegal	2,815	2,338	744	4,585	6,388	1,315
	All	5,860	6,680	1,368	12,561	11,983	1,684
2004	Legal	3,043	5,324	1,334	7,993	6,665	1,312
	Sublegal	2,690	1,961	805	4,935	3,460	1,048
	All	5,733	7,285	1,558	12,928	10,125	1,679
2005	Legal	3,071	2,586	848	7,664	2,423	631
	Sublegal	2,615	1,691	558	4,875	1,858	582
	All	5,686	4,277	1,015	12,539	4,282	859
2006	Legal	3,238	4,535	1,126	5,699	4,068	856
	Sublegal	3,625	1,420	551	3,570	2,617	723
	All	6,863	5,954	1,253	9,269	6,685	1,120
2007	Legal	3,757	5,269	1,548	5,850	3,868	1,260
	Sublegal	3,805	2,198	1,048	3,625	1,596	911
	All	7,562	7,467	1,870	9,475	5,464	1,554

Table 50. Pre-season FRAM predicted encounters compared to actual estimated encounters using Method 2, and 95% confidence intervals, for the combined Areas 5 and 6 selective Chinook fishery compared, 2003 through 2007.

Year	Size Class	FRAM Predicted Marked	Estimated Marked Encounters	+/- 95% CI	FRAM Predicted Unmarked	Estimated Unmarked Encounters	+/- 95% CI
2003	Legal	3,045	3,192	508	7,976	4,103	1,099
	Sublegal	2,815	1,658	688	4,585	4,523	1,463
	All	5,860	4,850	855	12,561	8,627	1,830
2004	Legal	3,043	3,375	440	7,993	4,213	1,236
	Sublegal	2,690	1,223	595	4,935	2,152	859
	All	5,733	4,598	740	12,928	6,365	1,505
2005	Legal	3,071	1,924	386	7,664	1,941	747
	Sublegal	2,615	1,201	530	4,875	1,296	569
	All	5,686	3,125	656	12,539	3,237	939
2006	Legal	3,238	3,443	476	5,699	3,157	894
	Sublegal	3,625	1,051	468	3,570	1,938	674
	All	6,863	4,494	668	9,269	5,095	1,120
2007	Legal	3,757	3,684	496	5,850	2,713	1,137
	Sublegal	3,805	1,550	875	3,625	1,126	728
	All	7,562	5,235	1,006	9,475	3,839	1,350

Table 51. Pre-season FRAM predicted mortalities compared to actual estimated mortalities using Method 1, and 95% confidence intervals, for the combined Areas 5 and 6 selective Chinook fishery compared, 2003 through 2007.

Year	Size Class	FRAM Predicted Marked	Estimated Marked Mortalities	+/- 95% CI	FRAM Predicted Unmarked	Estimated Unmarked Mortalities	+/- 95% CI
2003	Legal	3,032	3,364	531	1,771	903	162
	Sublegal	563	648	220	917	1,278	263
	All	3,595	4,012	575	2,688	2,181	309
2004	Legal	3,031	3,667	479	1,774	1,004	197
	Sublegal	538	549	178	987	692	210
	All	3,569	4,216	511	2,761	1,696	288
2005	Legal	3,059	2,023	402	1,701	383	97
	Sublegal	523	418	119	975	396	118
	All	3,582	2,442	419	2,676	779	153
2006	Legal	3,225	3,607	500	1,265	619	129
	Sublegal	725	442	125	714	536	145
	All	3,950	4,049	515	1,979	1,155	194
2007	Legal	3,743	3,922	543	1,298	606	191
	Sublegal	761	669	223	725	394	189
	All	4,504	4,592	587	2,023	1,000	268

Table 52. Pre-season FRAM predicted mortalities compared to actual estimated mortalities using Method 2, and 95% confidence intervals, for the combined Areas 5 and 6 selective Chinook fishery compared, 2003 through 2007.

Year	Size Class	FRAM Predicted Marked	Estimated Marked Mortalities	+/- 95% CI	FRAM Predicted Unmarked	Estimated Unmarked Mortalities	+/- 95% CI
2003	Legal	3,032	3,192	508	1,771	680	169
	Sublegal	563	512	213	917	905	293
	All	3,595	3,704	551	2,688	1,584	338
2004	Legal	3,031	3,375	440	1,774	636	185
	Sublegal	538	402	141	987	430	172
	All	3,569	3,776	462	2,761	1,067	253
2005	Legal	3,059	1,924	386	1,701	311	114
	Sublegal	523	320	114	975	283	116
	All	3,582	2,245	402	2,676	594	162
2006	Legal	3,225	3,443	476	1,265	482	134
	Sublegal	725	368	111	714	400	136
	All	3,950	3,811	489	1,979	882	191
2007	Legal	3,743	3,684	496	1,298	433	172
	Sublegal	761	540	190	725	300	154
	All	4,504	4,224	532	2,023	733	231

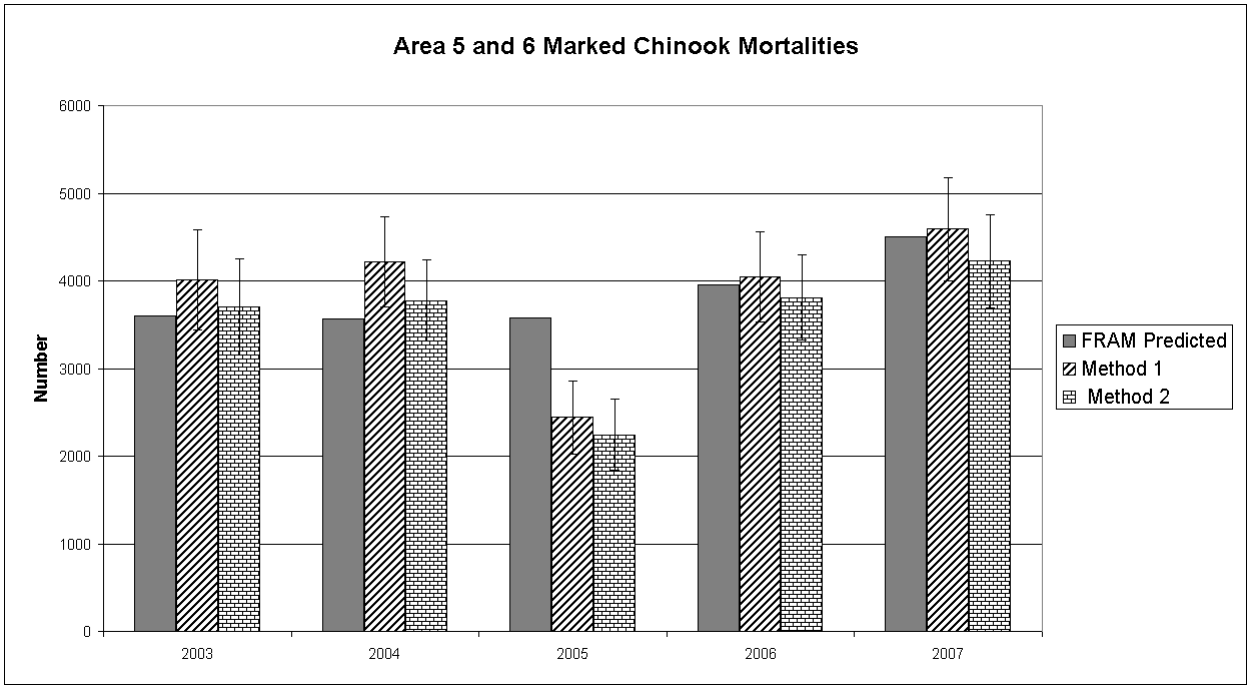


Figure 34. Comparison of FRAM predicted mortalities of marked Chinook (based on Method 1 and Method 2 estimates of encounters) and actual mortality estimates from the Areas 5 and 6 selective Chinook fisheries, 2003 through 2006.

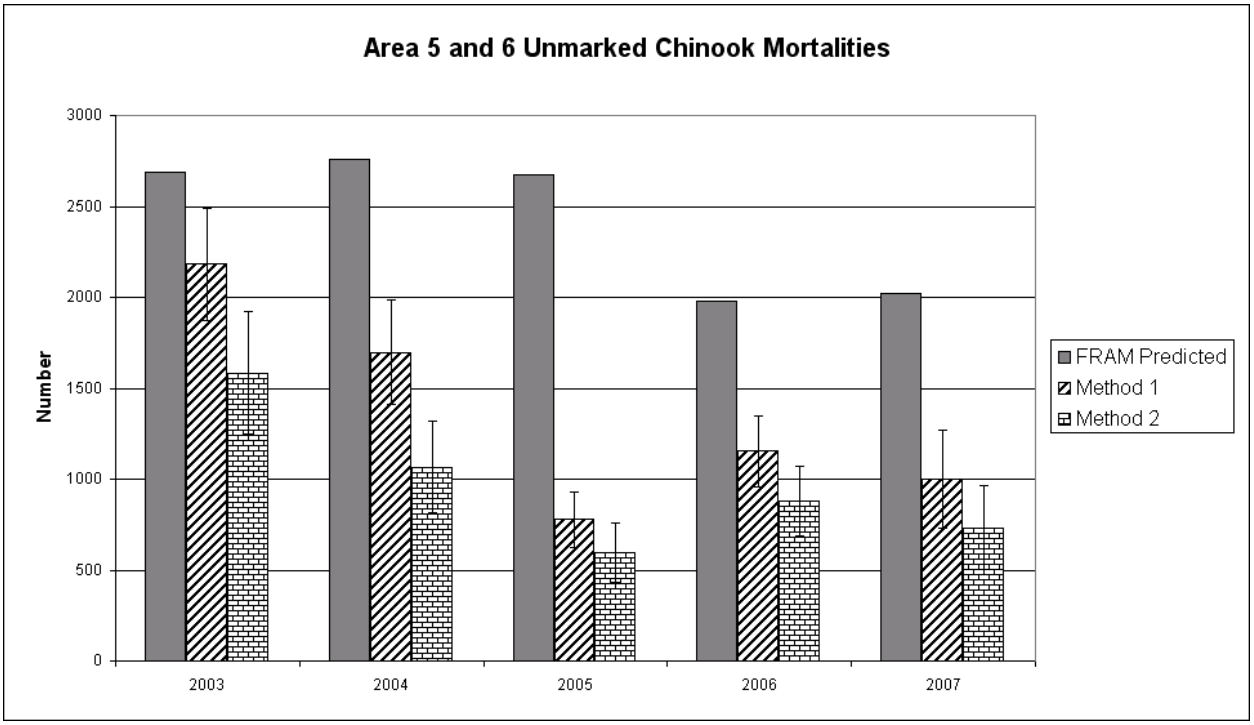


Figure 35. Comparison of FRAM predicted mortalities of unmarked Chinook (based on Method 1 and Method 2 estimates of encounters) and actual mortality estimates from the Areas 5 and 6 selective Chinook fisheries, 2003 through 2006.

Unmarked retention error ranged from less than 1 percent to just under 2 percent (Table 53), well below the FRAM value of 8 percent. Using Method 1 estimates, marked release error ranged from 24 to 37 percent, many times greater than the FRAM value of 6 percent. Unmarked sublegal-size retention error and marked sublegal-size retention error are modeled as zero in FRAM. Unmarked sublegal-size retention error ranged from 0 to 8 percent, while marked sublegal-size retention error ranged from 6 to 19 percent. Marked sublegal-size retention error increased over the five years of the fisheries.

Table 53. Comparison of FRAM input parameters and estimated values from the combined Areas 5 and 6 selective Chinook fishery, 2003 through 2007.

Year	Selective Fishery Parameter	FRAM Value	Method 1	Method 2
2003	Unmarked Retention Error	0.080	0.013	0.018
	Marked Release Error	0.060	0.265	0.000
	Unmarked Sublegal Retention Error	0.000[b]	0.000	0.000
	Marked Sublegal Retention Error	0.000[b]	0.096	0.136
2004	Unmarked Retention Error	0.080	0.001	0.001
	Marked Release Error	0.060	0.366	0.000
	Unmarked Sublegal Retention Error	0.000[b]	0.000	0.000
	Marked Sublegal Retention Error	0.000[b]	0.100	0.160
2005	Unmarked Retention Error	0.080	0.010	0.012
	Marked Release Error	0.060	0.256	0.000
	Unmarked Sublegal Retention Error	0.000[b]	0.016	0.023
	Marked Sublegal Retention Error	0.000[b]	0.059	0.084
2006	Unmarked Retention Error	0.080	0.003	0.003
	Marked Release Error	0.060	0.241	0.000
	Unmarked Sublegal Retention Error	0.000[b]	0.006	0.008
	Marked Sublegal Retention Error	0.000[b]	0.139	0.188
2007	Unmarked Retention Error	0.080	0.008	0.011
	Marked Release Error	0.060	0.301	0.000
	Unmarked Sublegal Retention Error	0.000[b]	0.059	0.083
	Marked Sublegal Retention Error	0.000[b]	0.131	0.185

SECTION II: SUMMARY AND DISCUSSION

Sampling Intensity

These monitoring and sampling programs were designed to collect and provide data to estimate the following parameters, as listed in the State-Tribal agreement documents (Northwest Treaty Tribes and the Washington Department of Fish and Wildlife 2007). For the most part, the monitoring program used for the Area 5 and 6 selective Chinook fisheries from 2003 through 2007 has been very effective at achieving the goals and objectives as outlined in those agreements.

Our estimates of harvest were within the 15% precision objective during all years that the quota was achieved and effort estimates achieved the objective each year. Even in 2005 when the quota was not harvested, our precision was within 20%. Although better precision is desirable for all years, the precision achieved in 2005 was such that even if we added the upper end of the confidence interval to the harvest estimate, we still did not exceed our conservation objectives. Sample size objectives were met when the fishery encompassed the entire statistical month. We still met our precision estimate in 2 of the 3 years when the August sample size objective was not met. Sampling rate for CWTs was met each year of the fishery. Based on the precision and sample rates achieved, we believe that the dockside-sampling program for summer selective Chinook fisheries with quotas should remain unchanged.

Test fishery encounters met objectives in Area 5 in all years except 2007. The number of hours expended test fishing was down in 2007 versus previous years. Future test fisheries must ensure the desired sample is reached. In Area 6, the test fishing objective was met only twice. The stated objective of 100 fish caught is probably unrealistic given the entire estimated encounters for Area 6 ranged from 683 to 1,614 during the years the objective was not met. An objective of 100 fish would represent between 6 and 14% of the angler encounters. An alternative test fishing objective for short duration, low catch rate fisheries should be investigated. Despite the deficiencies in test fishing sample size in Area 6, the test fishing data still matched well with creel data and clearly showed the difference in the size of fish being caught in Area 6 versus Area 5.

Evaluation of Mark Rates and Mark Status/Size Category Proportions

Based on results presented in Section II, we conclude that test boat catches are representative of angler catches for the following reasons:

- Mean length of legal-size marked fish caught by test fishing was not significantly different from angler caught fish measured in dockside creel surveys for eight out of nine area/year comparisons.
- Length frequency distributions were not significantly different for legal-size marked fish caught by test fishing and anglers.

- Mean length of fish caught by test fishing showed significant differences between areas all years and therefore clearly captured the differences in the available pool of fish between the two areas.
- Test fishing mark rate was more similar to VTR mark rate than it was to the creel survey mark rate.
- Test fishing mark rate was significantly different from creel in 5 out of 10 year/area comparisons. Since angler catches are subject to recall bias, this is an expected result.
- Mark rate of legal-size fish caught by test fishing was not significantly different from mark rate of fish reported on VTRs in 9 out of 10 year/area comparisons.
- Test fishing mark rate was not consistently higher or lower than mark rates of VTRs and creel surveys suggesting that it is not uniformly biased either high or low.
- VTR data is subject to clumped and/or patchy distribution throughout the season whereas test fishing data is collected throughout the season and responds to catch rate.
- Confidence intervals for proportions in the four mark-status/size categories were tighter for test fishing versus VTRs.
- Proportions in the four mark-status/size categories were not significantly different from VTR proportions in 7 out of 10 year/area comparisons.

FRAM

FRAM predicted too few marked fish encounters and mortalities and too many unmarked encounters and mortalities for this fishery. FRAM input parameters unmarked retention error was too high and marked release error is too low. FRAM assumes no sublegal-size fish are retained, when clearly there is unmarked sublegal-size retention error and marked sublegal-size retention.

CONCLUSIONS

State and Tribal Objectives

Prior to implementation of the 2003 selective Chinook fishery, fisheries managers identified a number of questions about the magnitude and impacts of selective fisheries that needed to be addressed by a monitoring and evaluation program. Although additional questions were identified, this monitoring and evaluation program was not intended to address those additional questions. Questions that are addressed include:

Sampling Intensity

Can the sampling program adequately measure effort and harvest?

The use of the Murthy type estimator for quota management worked well with no changes needed.

How would we measure mark rate?

We measured mark rate by creel survey, Voluntary Trip Reports and test fishing. Test fishing provided the most reliable unbiased method of determining both mark rate and sublegal-size to legal-size proportions. Creel surveys are subject to substantial error and bias and were the least desirable method. Voluntary Trip Reports can provide information on mark rate and sublegal to legal ratios in lieu of test fishing, although the data is likely to have errors and biases, especially at low sample size. Use of VTRs in a destination area like Sekiu requires additional effort to successfully collect good data.

Fishery Description

What level of effort would occur?

Opening of this selective Chinook fishery did not lead to effort levels that are substantially higher than historical levels and in fact, in the Area 5 and 6 selective Chinook fisheries, effort was well below historical levels.

What would be the mark rate?

The mark rate during this fishery ranged from about 40 to 60 percent, and for legal-size fish from about 35 to 65 percent, increasing over time.

How many sublegal-size fish would be caught and released?

The proportion of sublegal-size fish in Area 5 dropped from 0.54 in 2003 to 0.33 in 2007. Few sublegal-size Chinook were caught in Area 6, never exceeding 0.06 of the catch.

How many unmarked fish would be released for every fish landed?

For both areas combined, the number of fish released per landed dropped during the five years of fisheries from 4.2 to 2.0.

How many mortalities would occur in this fishery?

Total fishing related Chinook mortalities ranged from 2,839 to 6,193.

What stocks of fish would be caught?

Puget Sound and Columbia River origin stocks comprise the bulk of the fishery. Very few Strait of Juan de Fuca origin stocks are caught in this fishery.

What would be the impact to the coded wire tag program?

Very few DIT fish are caught in this fishery and the effect on the DIT mark rates appears undetectable.

What would angler compliance be?

Angler compliance exceeded 90% at all times. Sublegal-size retention was high in 2007 and additional resources should be directed to ensure continued compliance with the minimum size regulation.

Use of FRAM to Predict Selective Fishery Impacts

Encounters/Landed Catch

Since the Area 5 and 6 Chinook fishery is modeled as a quota, deviations of FRAM predicted encounters and catches from creel encounters and catches are not due to inaccurate fisheries scalars. Rather, FRAM inputs of mark release error, unmarked retention error, as well as stock and age specific abundances are responsible for the differences. Mark release error and unmarked retention error are addressed below. Stock and age specific abundances of unmarked and marked Chinook are developed outside of the FRAM model. Unmarked and marked stock composition for FRAM can be compared to DNA stock composition after DNA samples have been analyzed.

Excluding 2005 since the quota was not achieved, FRAM total encounter estimates were generally higher than creel total encounter estimates using either method 1 or 2. They were on average 16% higher than method 1 estimates and 64% higher than method 2 estimates. Compared to method 1, FRAM tends to slightly underestimate marked encounters and significantly overestimate unmarked encounters.

FRAM estimates of landed catch should exactly match creel estimates, because the fishery is modeled as a quota. Due to management inaccuracies the FRAM estimate of landed catch is slightly lower than the creel estimate (2% average). Similar to total encounters, FRAM tends to underestimate marked catch and overestimate unmarked catch.

FRAM is not designed to estimate sublegal landed catch. Although this parameter is not estimated in FRAM, sublegal retained catch is accounted for in the quota as retained catch and ultimately leads to the fishery ending sooner.

Unmarked Retention Error (legal-unmarked kept/legal-unmarked encountered):

FRAM uses a rate of 8% to calculate the predicted number of unmarked legal-size Chinook that are retained in a selective fishery. This rate is applied to the number of unmarked legal fish encountered. The calculation of unmarked retention error in the creel survey varies depending on whether method 1 or method 2 is used to estimate Chinook encounters. The average method 1 and method 2 estimates of unmarked retention error are 0.7% and 0.9% respectively, with no single year/method exceeding 2%. The FRAM value of 8% is significantly higher than the creel values. It was originally selected to provide a generous estimate of this parameter until more data could be collected to substantiate this value.

Mark Release Error (legal-marked released/legal-marked encountered):

FRAM uses a value of 6% as the estimate of Chinook legal-marked release error in selective fisheries. Creel estimates of legal-marked release error are produced only via the method 1 approach, because method 2 assumes that anglers retain all legal-marked Chinook encountered. Method 1 estimates of the legal marked release error range from 24% to 37%, with an average value of 28%. VTR estimates for this parameter average 5%.

Test Fishing Encounters

FRAM models 150 encounters per test fishing boat and month. The average number of actual test fishing encounters per area and month was 157 in Area 5 and 71 in Area 6.

State Objectives

How would anglers respond to the fishery and would they be satisfied with the mark rate?

Effort levels were generally higher than for years of short-duration, quota managed, non-selective fisheries. Anglers appear satisfied with the mark rate of legal-size fish.

Other Questions and Issues

Method 1 versus Method 2

Though it is impossible to know with certainty the true number of Chinook salmon encountered in a particular fishery, preceding considerations suggest that both Method 1 and Method 2 have the potential to yield biased estimates of this important fishery parameter. For this reason, it may be more productive to define the set of conditions under which one method is expected to yield better (i.e., less biased) estimates than the other and/or determine defensible means for adjusting for measurable biases when they occur.

Length and Duration of Monitoring

Monitoring and evaluation of this fishery occurred for five years. Very little additional knowledge was gained after the first three years. The range of effort and harvest was established by the first 3 years, with 2003 representing a good fishing year and 2005 representing a poor fishing year. The ability of the sampling program to estimate effort, harvest and releases within required precision levels was demonstrated with the first year of monitoring. The ability of test fishing to effectively mimic the fleet was demonstrated with the first year of sampling, and again in the second year after changes were made in an attempt to better mimic the fleet. While the ratio of released fish to harvested fish continued to drop throughout the duration of the fisheries, even in 2003, the first year of the fishery, the observed impacts to unmarked Chinook were less than predicted by FRAM. That is, conservation objectives for this fishery were met during the first year of the fishery and every year thereafter. Catch per unit effort is clearly a representative measure of the quality of fishing in Areas 5 and 6. Since C/f can be computed from baseline sampling, it could be used to monitor gross changes in the fishery in lieu of the intensive sampling that has occurred to date. Major effort changes are also picked up in a relative scale during baseline sampling. If significant changes in C/f and effort are noted during baseline sampling, managers can then decide if additional intensive monitoring is required to investigate if the fishery is no longer within predicted FRAM impacts.

Conservation Objectives

Finally, it is important to highlight that despite questions that might remain about selective fishery mortality rates, multi-year impacts, effects on the coded wire tag program, etc. this fishery consistently met the pre-season conservation objectives for unmarked Chinook, i.e. **the estimated mortalities of unmarked Chinook were less than predicted in FRAM models used during the pre-season planning process for every year of the fishery.**

RECOMMENDATIONS

- With the existing sampling program and Methods 1 and 2 as starting points, WDFW and tribal co-managers should work towards a mutually agreeable encounters and mortalities estimation framework.

- The dockside interview process should be modified to quantify the extent of intentional legal-marked Chinook release activity for the entire recreational fleet. This assessment will yield additional insight on the utility of the Method-2 estimator and may provide a representative means for adjusting M2 estimates for release-related bias. A caveat to this approach is that it adds a new assumption to the M2 approach (i.e., that angler-reported legal-marked Chinook releases are accurate; as legal-marked Chinook release is a low frequency but memorable event, this may be of minor consequence).

- In areas with sufficient test boat samples, VTRs add relatively little additional information. Resources directed at the VTR program are probably better utilized elsewhere (e.g. test fishing) when test fishing samples are adequate. In contrast, when test fishing samples are low and fishing catch rate is high, VTRs can be a significant source of supplemental information. Successful implementation of a VTR program in a "destination" area such as Sekiu is problematic. We recommend relaxing standards of training for participants of the VTR program in these locations, providing VTR instructions and data sheets to anglers in the morning prior to their trip, and utilizing data from any anglers returning forms. Given the aforementioned caveats, VTRs can provide useful information on mark rate and sublegal-size to legal-size ratios when test fishing is not conducted.

- Mean lengths of fish caught by test fishing and anglers were not significantly different even though the proportion of fish caught while using downriggers during test fishing was higher than the proportion of Chinook encountered while using using downriggers by the fleet. This suggests that the method of fishing was not biasing the size of fish encountered by test fishing. Therefore we recommend utilizing the most efficient method of catching fish on test boats in order to boost sample size and increase precision rather than attempting to prevent bias by adjusting methods to match anglers.

- With the high mark rate of legal-size Chinook observed in Area 6 (40-60%) and low rate of sublegal encounters, this is perhaps the lowest bycatch recreational selective fishery in

the state. As no local stock CWTs have been observed in the Area 6 fishery and the number of fish released per harvested in very low, this fishery would be a very good choice for expanded angler opportunity.

- Very little additional information was gained relative to evaluating the magnitude of the Areas 5 and 6 selective Chinook fisheries nor the effectiveness the monitoring program after the third year of implementation. Therefore we recommend a maximum of 3 years of monitoring for short-duration (less than 3 months) selective fisheries unless inter-year variation suggests additional years of monitoring are necessary. Additional intensive monitoring should occur if significant changes are observed in C/f, effort, or release estimates as measured by baseline sampling.

- Adjust the FRAM input parameter for unmarked retention error to a value of 2% to calculate the predicted number of unmarked legal-size Chinook that are retained in a selective fishery.

- Defer a decision on a new value for mark release error pending resolution on methodology. We expect the range for this parameter to be between 5% (VTR) and 28% (creel method 1).

- Continue to model 150 Chinook encounters per test fishing boat and month.

- Since the changes necessary to model sublegal retained catch in FRAM require a major programming effort and since sublegal catch is accounted for in the quota, no FRAM change to model sublegal retention is proposed.

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APPENDICES

Appendix A. Estimating season-wide mark-selective fishery impacts

List A1. Variable definitions and equations associated with Figure A1.

Below are definitions and equations for all quantities used in estimating total mark-selective fishery impacts under "Method 1". The sequence in the list builds from estimators (and variances) of encounters-by-class (i.e., size/mark-status groups) for each marine area (spatial strata) to season-wide fishery-impact estimates. Where appropriate, estimation differences leading to "Method-2" estimates of fishery impacts are identified and are denoted by ‡‡. *Regarding notation*: i) symbols follow those in Figure A1; ii) estimated quantities appear in *italics*; and iii) constants (with an assumed variance of zero) are depicted in ***bold-faced, italicized*** font.

A. Total and class-specific encounters estimation:

The first step towards quantifying mark-selective fishery impacts by size/mark-status class is the apportioning of Murthy-based estimates of total Chinook encounters (the sum of retained and released fish; *Encounters*) in a given stratum *i* to the appropriate group using encounter-composition data collected in the WDFW test fishery (*Test-fishery Encounter Composition*).

Encounters

E_i = Estimated total Chinook encounters for stratum *i*, inclusive of retained and released individuals from all mark-status groups (N_{MKi} = marked-retained, N_{UKi} = unmarked-retained, N_{MRi} = marked-released, and N_{URi} = unmarked-released), released Chinook of unknown mark status (N_{unkRi}), and apportioned unidentified salmon [N_{AUSi}, i.e., unidentified (to species) released salmonids that may have been Chinook; apportioned by identified-released proportions] derived using the Murthy estimator. E_i and its variance are estimated as:

(1) $E_i = N_{MKi} + N_{UKi} + N_{MRi} + N_{URi} + N_{unkRi} + N_{AUSi}$

(2) $var(E_i) = var(N_{MKi}) + var(N_{UKi}) + var(N_{MRi}) + var(N_{URi}) + var(N_{unkRi}) + var(N_{AUSi})$[1]

‡‡ For Method-2, the total encounter estimate, E_i, is obtained by: 1) combining the marked-legal retention estimate (K_{LMi}) and the test-fishery-based estimate of the proportion of at-large Chinook that are marked and of legal size (p_{LMi}; defined in 3 and 9 below) and 2) assuming that anglers retain all legal-size, marked Chinook [i.e., $E_i = K_{LMi} / p_{LMi}$, with $var(E_i) = (K_{LMi}^2 / p_{LMi}^2)*(var(K_{LMi}) / K_{LMi}^2 + var(p_{LMi}) / p_{LMi}^2)$]. This estimate is used in all subsequent Method-2 computations in a manner identical to Method-1 E_is unless specified otherwise.

[1] Variances for all quantities contributing to E_i under Method-1 are defined in the Methods section of the main body of the report.

Test-fishery Encounter Composition

p_{LMi} = the test-fishery estimate of Chinook catch proportion comprised of legal (L), marked (M) individuals in stratum *i*

p_{LUi} = the test-fishery estimate of Chinook catch proportion comprised of legal (L), unmarked (U) individuals in stratum *i*

p_{SMi} = the test-fishery estimate of Chinook catch proportion comprised of sublegal (S), marked (M) individuals in stratum *i*

p_{SUi} = the test-fishery estimate of Chinook catch proportion comprised of sublegal (S), unmarked (U) individuals in stratum *i*

For each *XY* combination (*X* = L and S and *Y* = M or U), test-fishery p_{XYi}s and their variances are estimated as:

(3) $p_{XYi} = N_{XYi} / \Sigma N_{XYi}$, and

(4) $var(p_{XYi}) = [p_{XYi}*(1- p_{XYi})] / (n_i-1)$,

where n_i = the total number of fish encountered by test boats in stratum *i*.

Encounters by Size/Mark-status Class

E_{LMi} = estimated legal (L), marked (M) encounters in stratum *i*

E_{LUi} = estimated legal (L), unmarked (U) encounters in stratum *i*

E_{SMi} = estimated sublegal (S), marked (M) encounters in stratum *i*

E_{SUi} = estimated sublegal (S), marked (U) encounters in stratum *i*

For each *XY* combination (*X* = L and S and *Y* = M or U), apportioned encounters E_{XYi} and a conservative estimate of its variance (*assuming* p_{XYi} *and* E_{XYi} *are independent estimates*) are obtained from:

(5) $E_{XYi} = E_i*p_{XYi}$

(6) $var(E_{XYi}) = var(E_i)* p_{XYi}^2 + E_i^2*var(p_{XYi})$

‡‡ $var(E_{XYi})$ (i.e., equation 6) includes an additional covariance component [i.e., $var(E_i)*var(p_{XYi})$] for Method-2 estimates of apportioned encounters given that E_i is derived from test-fishery data.

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

Before mortality can be estimated for each class, the number of fish retained and released must be estimated. Class-specific retention estimates are obtained by apportioning Murthy estimates of marked and unmarked Chinook retained in each stratum *i* to size classes (*Apportioned Estimates of Retention to Size Classes*); this is achieved using proportions estimated during dockside creel surveys (*Dockside Observations for Apportioning Retained Catch to Class*).

Releases are then estimated as the difference between class-specific total encounters and retention (*Estimating Release Numbers by Class*).

Dockside Observations for Apportioning Retained Catch to Class

d_{LMK} = the estimated proportion of retained (kept, K), marked (M) Chinook salmon that were legal (L); based on *season-wide* dockside observations of marked Chinook (as is d_{SMK})

d_{SMK} = the estimated proportion of retained (kept, K), marked (M) Chinook salmon that were sublegal (S)

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

(7) $d_{XMK} = n_{XMK} / \Sigma\, n_{XMK}$

(8) $var(d_{XMK}) = [d_{XMK}*(1- d_{XMK})] / (\Sigma n_{XMK}-1)$,

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

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 p_{SUK})

d_{SUK} = the estimated proportion of retained (kept, K), unmarked (U) Chinook salmon that are sublegal (S)

The proportions of retained, unmarked fish belonging to legal and sublegal size classes are estimated as above (7 and 8) but using *season-wide* dockside observations on unmarked (U), not marked Chinook salmon.

Apportioned Estimates of Retention to Size Classes

K_{LMi} = estimated number of legal (L), marked (M) Chinook kept in stratum i

K_{LUi} = estimated number of legal (L), unmarked (U) Chinook kept in stratum i

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

(9) $K_{XMi} = d_{XMK}*N_{MKi}$

(10) $var(K_{XMi}) = var(N_{MKi})* d_{XMK}^{\,2} + N_{KMi}^{\,2}*var(d_{XMK}) - var(N_{MKi})* var(d_{XMK})$

where d_{XMK} and its variance are from 7 and 8 above and N_{MKi} is the Murthy estimate of retained marked fish for stratum i defined for 1 above.

K_{SMi} = estimated number of sublegal (S), marked (M) Chinook kept in stratum i

K_{SUi} = estimated number of sublegal (S), unmarked (U) Chinook kept in stratum i

The number of retained, unmarked fish belonging to legal and sublegal size classes is estimated as above (9 and 10) using unmarked fish proportions and season-wide Murthy-based retention estimates (and variances).

Estimating Release Numbers by Class

R_{LMi} = estimated number of legal (L), marked (M) Chinook released in stratum *i*
R_{LUi} = estimated number of legal (L), unmarked (U) Chinook released in stratum *i*
R_{SMi} = estimated number of sublegal (S), marked (M) Chinook released in stratum *i*
R_{SUi} = estimated number of sublegal (S), unmarked (U) Chinook released in stratum *i*

For each size/mark-status class *XY* combination (*X* = L and S and *Y* = M or U), the number fish encountered and released is estimated as the difference of total size/mark-status class encounters (E_{XYi}) and retention (K_{XYi}) in stratum *i*. The estimator and its variance are:

(11) $R_{XYi} = E_{XYi} - K_{XYi}$
(12) $var(R_{XYi}) = var(E_{XYi}) + var(K_{XYi})$

‡‡ For Method-2, R_{LMi} is assumed to be zero with zero variance (i.e., anglers retain all legal-size, marked fish); all other R_{XYi}s are estimated using equations 11 and 12, but with Method-2-specific E_{XYi}s.

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

The final step towards quantifying mark-selective fishery impacts is the application of assumed mortality rates (*Assumed Mortality Rates for Retained and Released Chinook*) to class-specific retention and release estimates.

Assumed Mortality Rates for Retained and Released Chinook

$\boldsymbol{m_K}$ = retention mortality rate, 100% for all retained Chinook
$\boldsymbol{sfm_L}$ = release mortality rate for legal (L) Chinook, assumed to be a constant 15%
$\boldsymbol{sfm_S}$ = release mortality rate for sublegal (S) Chinook, assumed to be a constant 20%

Retention-mortality Estimates

M_{LMKi} = estimated number of mortalities due to direct harvest of legal (*L*), marked (*M*) Chinook in stratum *i*; the point estimate and variance are equivalent to K_{LMi} given that $m_K = 1.00$ (i.e., $M_{LMKi} = K_{LMi} * \boldsymbol{m_K}$).

M_{LUKi} = estimated number of mortalities due to direct harvest of legal (*L*), unmarked (*U*) Chinook in stratum *i*; the point estimate and variance are equivalent to K_{LUi} given that $m_K = 1.00$ (i.e., $M_{LUKi} = K_{LUi} * \boldsymbol{m_K}$).

M_{SMKi} = estimated number of mortalities due to direct harvest of sublegal (*S*), marked (*M*) Chinook in stratum *i*; the point estimate and variance are equivalent to K_{SMi} given that $m_K = 1.00$ (i.e., $M_{SMKi} = K_{SMi} * \boldsymbol{m_K}$).

M_{SUKi} = estimated number of mortalities due to direct harvest of sublegal (*S*), unmarked (*U*) Chinook in stratum *i*; the point estimate and variance are equivalent to K_{SUi} given that m_K = 1.00 (i.e., $M_{SUKi} = K_{SUi}$*$\boldsymbol{m_K}$).

Release-mortality Estimates

M_{LMRi} = estimated number of post-release, fishery-related mortalities of encountered legal (*L*), marked (*M*) Chinook in stratum *i*

M_{LURi} = estimated number of post-release, fishery-related mortalities of encountered legal (*L*), unmarked (*U*) Chinook in stratum *i*

M_{SMRi} = estimated number of post-release, fishery-related mortalities of encountered sublegal (*S*), marked (*M*) Chinook in stratum *i*

M_{SURi} = estimated number of post-release, fishery-related mortalities of encountered sublegal (*S*), unmarked (*U*) Chinook in stratum *i*

An estimate of release mortality for size/mark-status class *XY* (*X* = L or S, *Y* = M or U) in stratum *i* and its variance is obtained from:

(13) $M_{XYRi} = R_{XYi}$*$\boldsymbol{sfm_Y}$

(14) $var(M_{XYRi}) = \text{var}(R_{XYi})$*$\boldsymbol{sfm_Y}^2$

Season-wide Total and Class-specific Mortality Estimation

M_{total} = season-wide Chinook mortality due to the selective fishery; this parameter and its variance [$var(M_{total})$] are computed as the sum of all retention (M_{XYKi}) and release mortality (M_{XYRi}) estimates and variances, respectively, for the *XY* (*X* = L or S, *Y* = M or U) size/mark-status groups.

The standard error (SE), coefficient of variation (CV), and 95% confidence interval about M_{total} (and all other parameters θ defined herein) are obtained from:

(15) $\text{SE}(\theta) = (\theta)^{1/2}$

(16) $\text{CV}(\theta) = [\text{SE}(\theta) / \theta] * 100$

(17) 95% CI = $\theta \pm 1.96 * \text{SE}(\theta)$

Figure A1 (Next Page). Graphical representation of the estimation approach used to quantify season-wide encounters and mortalities by size/mark-status category for the Areas 5/6 mark-selective Chinook fishery. Boxes depict abundance estimates (encounters, mortalities) whereas the mathematical operations depicted on intermediate connector lines are estimator formulae for subsequent boxes (moving from left to right). Gray ovals represent points in the total encounter and mortality estimation sequence where Methods 1 and 2 diverge. Variable and parameter names, complete formulae, and variances (where appropriate) are defined in List A1. Bold-faced, italicized symbols are constants, all others are estimated quantities. Total stratum mortality is the sum of M_{Ki} and M_{Ri}; total fishery (combined 5/6) mortality is simply the sum all M_{Ki} and M_{Ri}s.

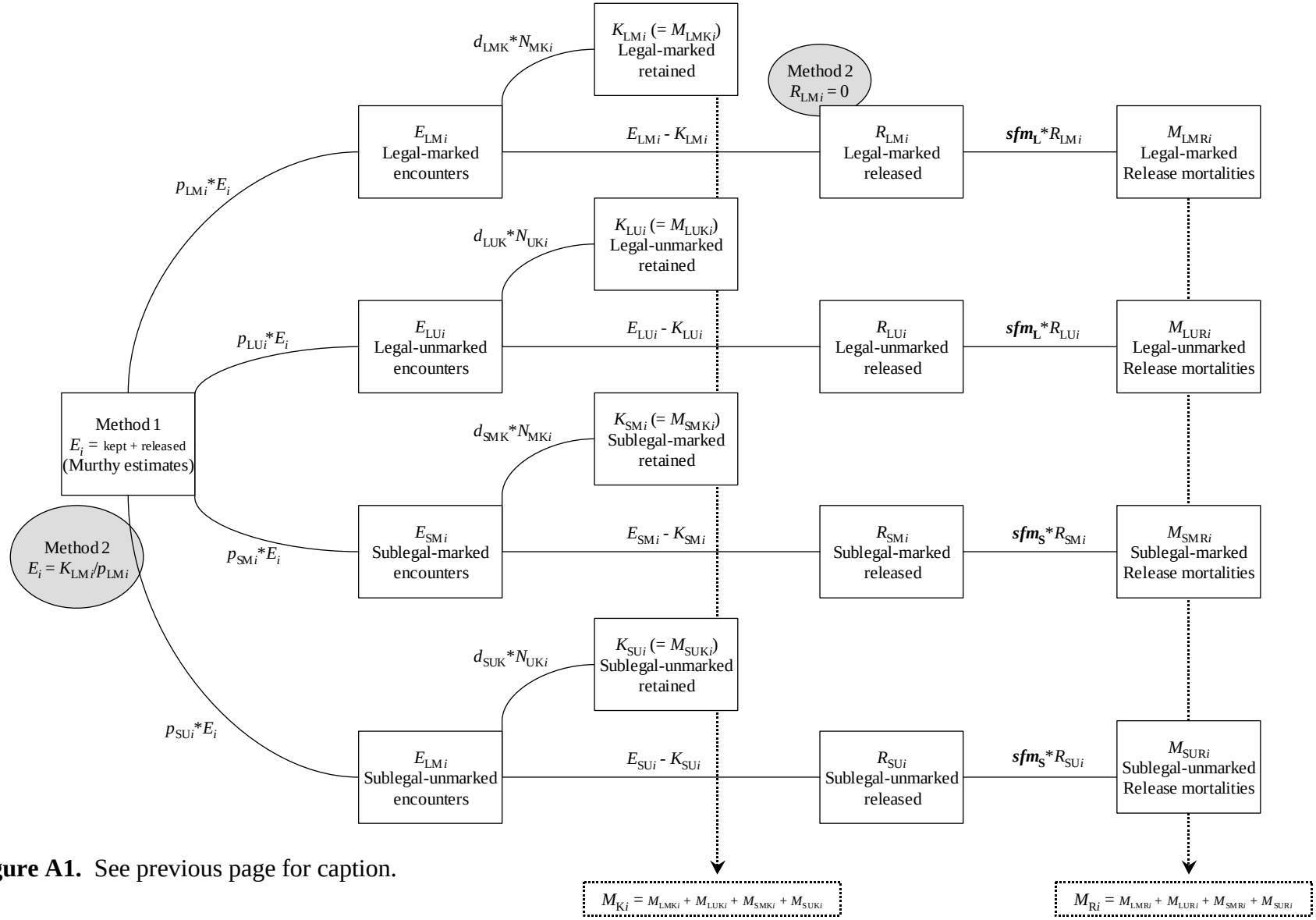


Figure A1. See previous page for caption.

Appendix B. Discussion of weighting methods

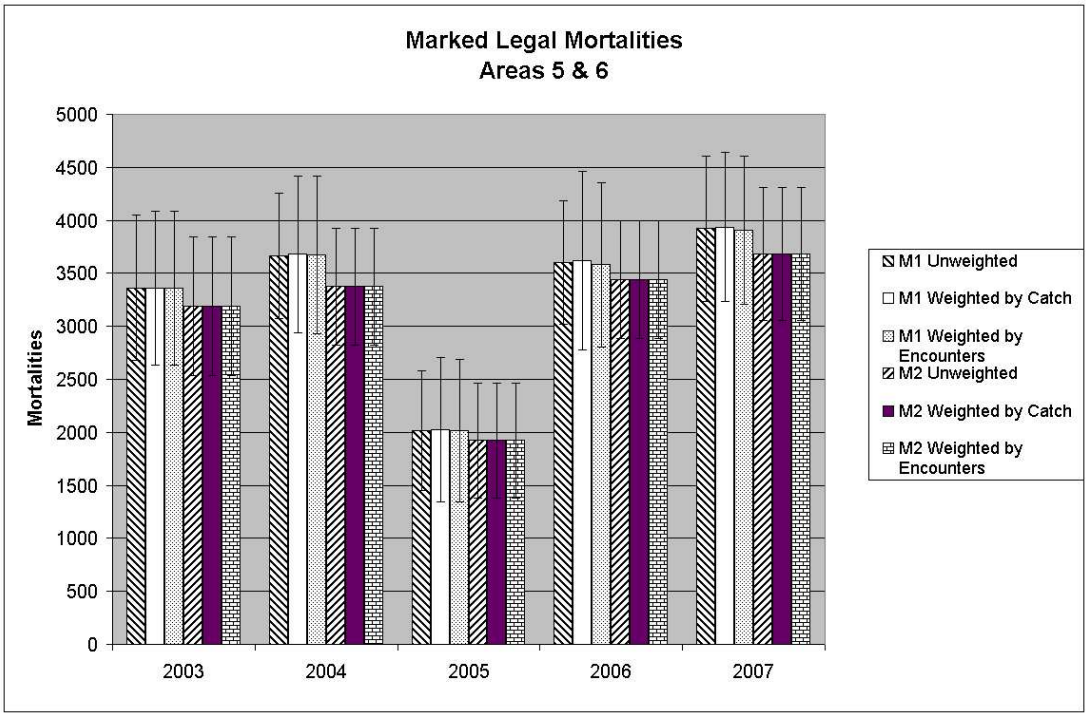
During the five years of the fishery, we have used two methods to calculate proportions of Chinook caught by test fishing that were in the four mark status/size categories (legal-size marked, legal-size unmarked, sublegal-size marked and sublegal-size unmarked). We initially calculated unweighted proportions, i.e. season-long proportions. Based on comments received on draft reports, we started weighting the proportions weekly by the percent of catch occurring each week, and calculating weighted proportions. These weighted proportions were used in all previous reports, despite issues that have arose with their use. For this report, we have recalculated unweighted, season-long proportions for each year after examining mortality estimates generated using unweighted proportions, proportions weighted by catch, and proportions weighted by encounters. Our reasons for using unweighted proportions are as follows:

1. The use of season-long proportions shores-up the information on stock composition in weeks of with limited or no data. The underlying assumption of this method is that stock compositon with regard to size and mark status is constant across the season. This assumption is difficult to test in practice for the same reason that we propose using season-wide stock compostion estimates; the data are limited for portions of the season.

2. During some years, test boat (or combination test boat and VTR) catches have been zero for one or more weeks. To remedy this problem, we have had to truncate the weighted catches to only those weeks with actual data, thereby adding error and bias to the weighted proportions.

3. Confidence limits for unweighted mortality estimates encompassed the estimates weighted by catch and estimates weighted by encounters for all years and each of the four mark status/size categories (Figures A2 and A3).

4. Weighted estimates are less precise than the un-weighted counterparts (Figures A2 and A3) and the differences between weighted and unweighted estimates were small. Although, weighed estimates may be less biased than unweighted estimates, the mean squared error of unweighted estimates is smaller. Further, the differences between weighting methods is less than the difference between whether Method 1 or Method 2 is used to estimate total encounters (Figures A2 and A3).



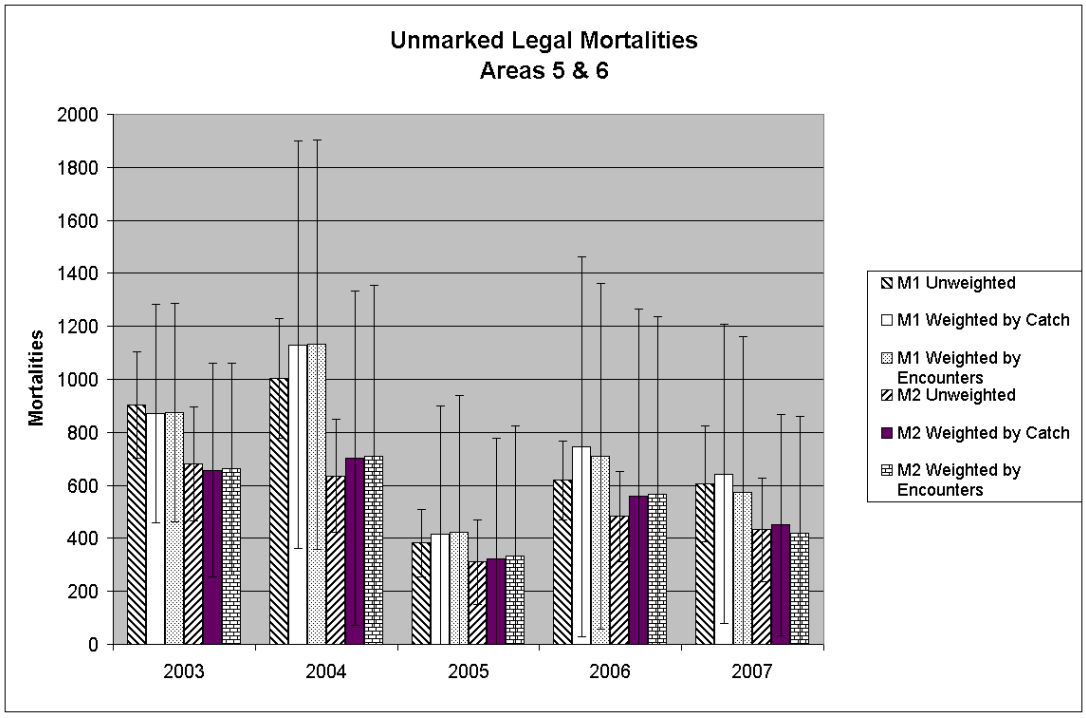
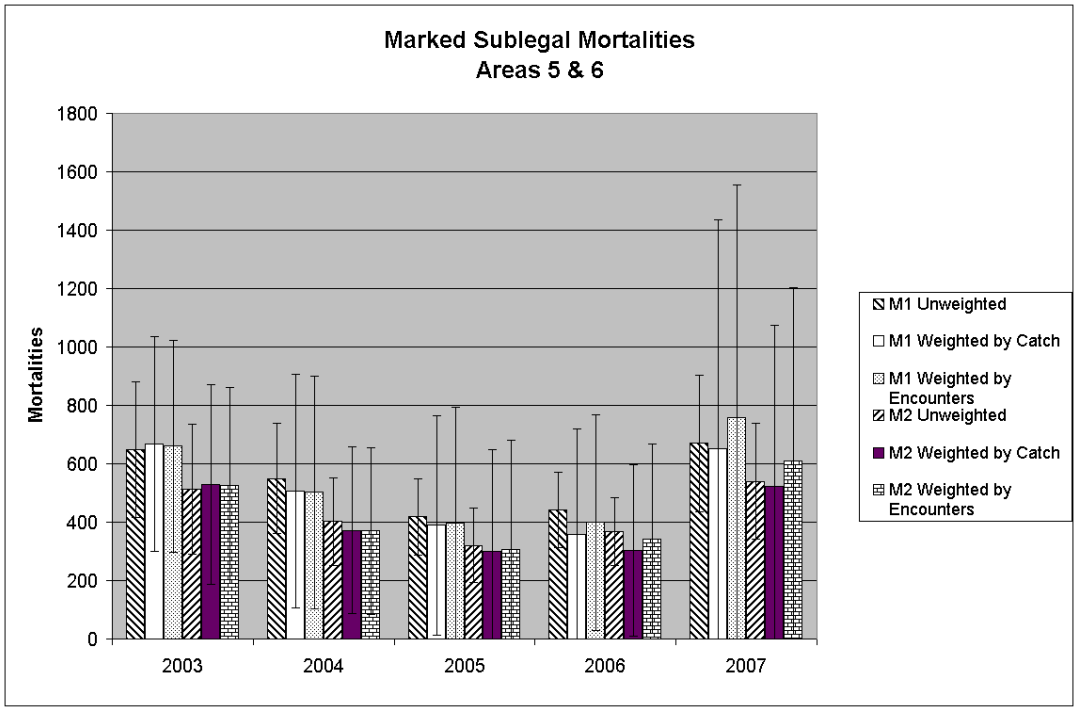


Figure A2. Comparison of legal-size Chinook mortalities in the Area 5 and 6 selective Chinook fisheries based on weighting methods and encounter estimation methods (Method 1, M1 and Method 2, M2).



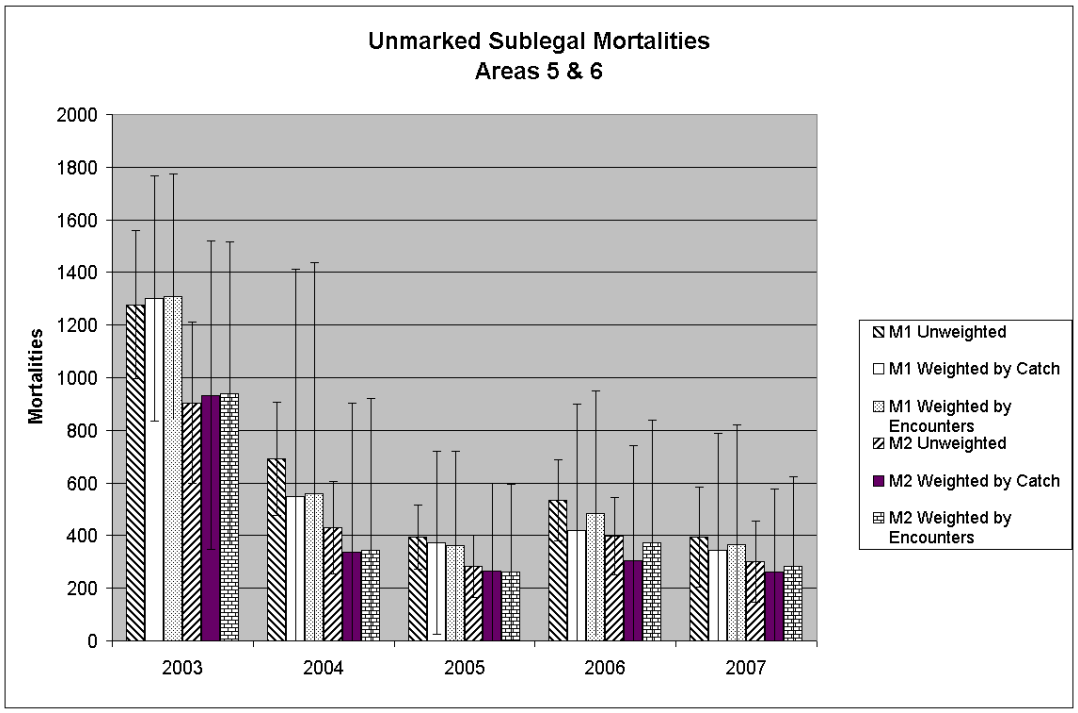


Figure A3. Comparison of sublegal-size Chinook mortalities in the Area 5 and 6 selective Chinook fisheries based on weighting methods and encounter estimation methods (Method 1, M1 and Method 2, M2).

Appendix C. Analytical assumptions

Analytical assumptions required for estimating catch, effort, and mortality for the Areas 5 and 6 selective Chinook fishery under WDFW's selective fishery monitoring approach.

Assumption Number	Description	Tested previously	Likelihood of violation	Likely importance	Comments
Assumption 1	Boat surveys provide unbiased estimates of access-site size measures and out-of-frame effort proportions	N	Low	High	Indirect evaluations suggest the latter aspect of this assumption (i.e., regarding the out-of-frame proportion) is true in a relative sense (WDFW unpublished data).
Assumption 2	Relative angling effort originating from a particular site (i.e., site-size) is proportional to catch landed at that site	Y	Low	Moderate	Simulations by Conrad and Alexandersdottir (1993) demonstrate that mis-specification of size measures leads to precision but not bias issues.
Assumption 3	All anglers exiting the fishery are interviewed and accurately report their catch (missed boats are dealt with analytically assuming average values)	N	Moderate	High	The accuracy of angler-reported encounters, particularly releases during high-encounter periods, is uncertain but important
Assumption 4	C/F does not differ between in-frame and out-of-frame access sites	N	Unknown	Unknown	Likely difficult, if not impossible, to test.
Assumption 5	Anglers retain all legal-marked Chinook encountered	N	High	Low	Empirical estimates for avid anglers suggest intentional legal-marked release rates are ~10%; unintentional legal-marked release is unknown.
Assumption 6	Test-fishery and private-fleet encounter composition (I.e., frequency by size/mark-status class) is identical.	N	Low	High	Preliminary analyses of length-frequency distributions, age-data, and overall mark rates suggest both test fishers and the private fleet are accessing a similar pool of fish.

Appendix D. Detailed FRAM Stock Impacts

2003

Species: CHINOOK Version#:5.14 CMD File: 1603.cmd Date: 11-20-2003
Report : Selective Fishery Report DRV File: chinSelf.DRV Time: 11:21:29
Title : Final 2003 PFMC

Fishery:NT Area 5-6 Sport TimeStep:July-Sept

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
NkSm FF	2	0	0	0	0	7	0	0	0	0	100
NkSm FF	3	18	1	2	1	1	319	300	2	16	18
NkSm FF	4	183	15	17	9	0	473	444	3	24	0
NkSm FF	5	92	7	8	5	0	2	2	0	0	0
SFNK SP	3	4	0	0	0	0	0	0	0	0	0
Skag FF	2	0	0	0	0	12	0	0	0	0	0
Skag FF	3	64	5	6	3	3	1	1	0	0	0
Skag FY	2	0	0	0	0	5	0	0	0	0	0
Skag FY	3	54	4	5	3	1	0	0	0	0	0
Skag FY	4	10	1	1	0	0	0	0	0	0	0
Skag FY	5	23	2	2	1	0	0	0	0	0	0
Skag SY	2	0	0	0	0	3	0	0	0	0	1
Skag SY	3	7	1	1	0	1	7	7	0	0	1
Skag SY	4	4	0	0	0	0	3	3	0	0	0
Snoh FF	2	0	0	0	0	4	0	0	0	0	2
Snoh FF	3	6	0	1	0	1	4	4	0	0	0
Snoh FY	2	0	0	0	0	1	0	0	0	0	2
Snoh FY	3	7	1	1	0	0	21	20	0	1	0
Snoh FY	4	6	0	1	0	0	17	16	0	1	0
Snoh FY	5	7	1	1	0	0	0	0	0	0	0
Stil FF	2	0	0	0	0	1	0	0	0	0	0
Stil FF	3	4	0	0	0	0	0	0	0	0	0
Tula FF	2	0	0	0	0	8	0	0	0	0	1
Tula FF	3	44	4	4	2	2	6	6	0	0	0
Tula FF	4	74	6	7	4	0	8	8	0	0	0
Tula FF	5	23	2	2	1	0	3	3	0	0	0
MiPS FF	2	0	0	0	0	20	0	0	0	0	47
MiPS FF	3	239	19	22	12	13	508	477	3	25	28
MiPS FF	4	307	25	28	15	0	279	262	2	14	0
MiPS FF	5	30	2	3	1	0	3	3	0	0	0
UWAc FF	2	0	0	0	0	0	7	7	0	0	4
UWAc FF	3	0	0	0	0	0	26	25	0	1	0
UWAc FF	4	0	0	0	0	0	9	8	0	0	0
SPSo FF	2	0	0	0	0	33	0	0	0	0	197
SPSo FF	3	0	0	0	0	11	0	0	0	0	40
SPSo FF	4	100	8	9	5	0	441	415	3	22	0
SPSo FF	5	150	12	14	7	0	176	165	1	9	0
SPSo FY	2	0	0	0	0	1	0	0	0	0	9
SPSo FY	3	1	0	0	0	0	18	16	0	1	3
SPSo FY	4	52	4	5	3	0	113	106	1	6	0
Whte SpFi	2	0	0	0	0	1	0	0	0	0	0
HdCl FF	2	0	0	0	0	93	0	0	0	0	4
HdCl FF	3	348	28	32	17	12	12	11	0	1	0
HdCl FF	4	49	4	5	2	0	1	1	0	0	0
HdCl FF	5	105	8	10	5	0	3	3	0	0	0
HdCl FY	2	0	0	0	0	3	0	0	0	0	0
SJDF FF	2	0	0	0	0	9	0	0	0	0	0
SJDF FF	3	3	0	0	0	1	0	0	0	0	0
SJDF FF	4	109	9	10	5	0	12	12	0	1	0
Oreg Tu	2	25	2	2	1	45	0	0	0	0	1
Oreg Tu	3	357	29	33	18	1	3	3	0	0	0
Wash Tu	2	0	0	0	0	10	0	0	0	0	0
Low CR Wi	2	0	0	0	0	1	0	0	0	0	0
Low CR Wi	3	22	2	2	1	0	0	0	0	0	0
BPH Tu	2	466	37	43	23	199	6	5	0	0	2
BPH Tu	3	550	44	51	27	4	7	7	0	0	0
BPH Tu	4	201	16	18	10	0	2	2	0	0	0
Upp CR Br	2	6	0	1	0	128	0	0	0	0	4
Upp CR Br	3	866	69	80	43	3	25	24	0	1	0
Upp CR Br	4	134	11	12	7	0	4	4	0	0	0
Upp CR Br	5	248	20	23	12	0	7	7	0	0	0
Cowl SP	2	0	0	0	0	0	0	0	0	0	1
Cowl SP	3	2	0	0	0	0	22	21	0	1	0
Will SP	2	0	0	0	0	3	0	0	0	0	24
Will SP	3	11	1	1	1	0	96	90	1	5	3

Appendix D. Continued.

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
Ore No Fl	2	8	1	1	0	11	0	0	0	0	0
WCVI Totl	2	0	0	0	0	3	0	0	0	0	0
WCVI Totl	4	12	1	1	1	0	0	0	0	0	0
Fraser Lt	2	0	0	0	0	80	0	0	0	0	2
Fraser Lt	3	930	74	86	47	11	19	18	0	1	0
Fraser Lt	4	130	10	12	6	0	3	2	0	0	0
Fraser Er	2	0	0	0	0	51	0	0	0	0	1
Fraser Er	3	26	2	2	1	0	1	1	0	0	0
Fraser Er	4	787	63	72	39	0	16	15	0	1	0
LwrGeo St	2	39	3	4	2	13	2	2	0	0	1
LwrGeo St	4	99	8	9	5	0	4	4	0	0	0
FRAM Stocks		7048	564	648	352	810	2691	2529	16	135	497
All Stocks		7976	638	734	399	917	3045	2862	18	152	563

2004

Species: CHINOOK Version#:5.18 CMD File: 1604.cmd Date: 05-26-2004
Report : Selective Fishery Report DRV File: chinSelf.DRV Time: 17:06:43
Title : Final 2004 PFMC (NT 89K; T 49K)

Fishery:NT Area 5-6 Sport TimeStep:July-Sept

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
NkSm FF	2	0	0	0	0	11	0	0	0	0	69
NkSm FF	3	16	1	1	1	1	236	222	1	12	13
NkSm FF	4	40	3	4	2	0	448	421	3	22	0
NkSm FF	5	21	2	2	1	0	49	46	0	2	0
SFNK SP	3	4	0	0	0	0	0	0	0	0	0
Skag FF	2	0	0	0	0	7	0	0	0	0	0
Skag FF	3	49	4	5	2	2	2	2	0	0	0
Skag FY	3	42	3	4	2	1	0	0	0	0	0
Skag FY	4	32	3	3	2	0	0	0	0	0	0
Skag FY	5	9	1	1	0	0	0	0	0	0	0
Skag SY	2	0	0	0	0	6	0	0	0	0	10
Skag SY	3	12	1	1	1	1	14	13	0	1	1
Skag SY	4	4	0	0	0	0	3	3	0	0	0
Snoh FF	2	0	0	0	0	7	0	0	0	0	2
Snoh FF	3	16	1	1	1	2	5	5	0	0	1
Snoh FY	2	0	0	0	0	2	0	0	0	0	1
Snoh FY	3	45	4	4	2	1	32	30	0	2	1
Snoh FY	4	17	1	2	1	0	12	11	0	1	0
Snoh FY	5	5	0	0	0	0	3	3	0	0	0
Stil FF	2	0	0	0	0	1	0	0	0	0	0
Stil FF	3	5	0	0	0	1	0	0	0	0	0
Tula FF	2	0	0	0	0	5	0	0	0	0	1
Tula FF	3	69	6	6	3	3	12	11	0	1	0
Tula FF	4	37	3	3	2	0	6	5	0	0	0
Tula FF	5	18	1	2	1	0	2	2	0	0	0
MiPS FF	2	0	0	0	0	13	0	0	0	0	53
MiPS FF	3	264	21	24	13	15	610	573	4	30	34
MiPS FF	4	142	11	13	7	0	281	264	2	14	0
MiPS FF	5	17	1	2	1	0	15	14	0	1	0
UWAc FF	2	3	0	0	0	2	0	0	0	0	0
UWAc FF	3	25	2	2	1	0	0	0	0	0	0
UWAc FF	4	0	0	0	0	0	15	14	0	1	0
SPSo FF	2	0	0	0	0	0	0	0	0	0	186
SPSo FF	3	0	0	0	0	15	0	0	0	0	50
SPSo FF	4	86	7	8	4	0	328	308	2	16	0
SPSo FF	5	49	4	5	2	0	223	210	1	11	0
SPSo FY	2	0	0	0	0	0	0	0	0	0	8
SPSo FY	3	0	0	0	0	0	12	11	0	1	2
SPSo FY	4	41	3	4	2	0	142	134	1	7	0
Whte SpFi	2	0	0	0	0	1	0	0	0	0	0
HdCl FF	2	0	0	0	0	91	0	0	0	0	5
HdCl FF	3	344	28	32	17	12	14	14	0	1	1
HdCl FF	4	48	4	4	2	0	2	2	0	0	0
HdCl FF	5	102	8	9	5	0	4	3	0	0	0
HdCl FY	2	0	0	0	0	2	0	0	0	0	0
SJDF FF	2	0	0	0	0	8	0	0	0	0	1
SJDF FF	3	3	0	0	0	1	0	0	0	0	0

Appendix D. Continued.

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
SJDF FF	4	119	10	11	6	0	1	1	0	0	0
Oreg Tu	2	30	2	3	2	54	0	0	0	0	1
Oreg Tu	3	109	9	10	5	0	1	1	0	0	0
Wash Tu	2	0	0	0	0	6	0	0	0	0	0
Low CR Wi	2	0	0	0	0	1	0	0	0	0	0
Low CR Wi	3	26	2	2	1	0	0	0	0	0	0
BPH Tu	2	748	60	69	37	319	9	9	0	0	4
BPH Tu	3	1005	80	92	50	7	13	12	0	1	0
BPH Tu	4	169	14	16	8	0	1	1	0	0	0
Upp CR Br	2	6	1	1	0	135	0	0	0	0	4
Upp CR Br	3	792	63	73	40	3	23	22	0	1	0
Upp CR Br	4	97	8	9	5	0	3	3	0	0	0
Upp CR Br	5	420	34	39	21	0	12	11	0	1	0
Will SP	2	0	0	0	0	2	0	0	0	0	22
Will SP	3	12	1	1	1	0	110	103	1	5	3
Snk Riv F	5	2	0	0	0	0	3	3	0	0	0
Ore No Fl	2	8	1	1	0	11	0	0	0	0	0
WCVI Totl	2	0	0	0	0	2	0	0	0	0	0
WCVI Totl	4	42	3	4	2	0	1	1	0	0	0
Fraser Lt	2	0	0	0	0	20	0	0	0	0	0
Fraser Lt	3	286	23	26	14	3	6	6	0	0	0
Fraser Lt	4	84	7	8	4	0	2	2	0	0	0
Fraser Er	2	0	0	0	0	90	0	0	0	0	2
Fraser Er	3	47	4	4	2	0	1	1	0	0	0
Fraser Er	4	1402	112	129	70	0	29	27	0	1	0
LwrGeo St	2	15	1	1	1	5	1	1	0	0	0
LwrGeo St	4	78	6	7	4	0	3	3	0	0	0
FRAM Stocks		7064	565	650	353	872	2689	2528	16	134	475
All Stocks		7993	639	735	400	987	3043	2861	18	152	538

2005

Species: CHINOOK Version#:5.22 CMD File: 2705.cmd Date: 04-07-2005
Report : Selective Fishery Report DRV File: chinSelf.DRV Time: 13:00:24
Title : Final April PFMC 86.5K NT; 48K T

Fishery:NT Area 5-6 Sport TimeStep:July-Sept

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
NkSm FF	2	0	0	0	0	3	0	0	0	0	42
NkSm FF	3	10	1	1	1	1	132	124	1	7	7
NkSm FF	4	37	3	3	2	0	230	216	1	11	0
NkSm FF	5	3	0	0	0	0	36	33	0	2	0
SFNK SP	3	4	0	0	0	0	0	0	0	0	0
Skag FF	2	0	0	0	0	4	0	0	0	0	0
Skag FF	3	69	6	6	3	3	3	3	0	0	0
Skag FY	3	54	4	5	3	2	0	0	0	0	0
Skag FY	4	24	2	2	1	0	0	0	0	0	0
Skag FY	5	32	3	3	2	0	0	0	0	0	0
Skag SY	2	0	0	0	0	5	0	0	0	0	5
Skag SY	3	10	1	1	0	1	8	8	0	0	1
Skag SY	4	6	0	1	0	0	4	3	0	0	0
Snoh FF	2	0	0	0	0	10	0	0	0	0	5
Snoh FF	3	14	1	1	1	2	8	7	0	0	1
Snoh FY	2	0	0	0	0	2	0	0	0	0	1
Snoh FY	3	92	7	8	5	2	59	55	0	3	1
Snoh FY	4	23	2	2	1	0	15	14	0	1	0
Snoh FY	5	3	0	0	0	0	2	2	0	0	0
Stil FF	2	0	0	0	0	1	0	0	0	0	0
Stil FF	3	5	0	0	0	0	0	0	0	0	0
Tula FF	2	0	0	0	0	43	0	0	0	0	5
Tula FF	3	107	9	10	5	4	16	15	0	1	1
Tula FF	4	39	3	4	2	0	7	6	0	0	0
Tula FF	5	11	1	1	1	0	2	2	0	0	0
MiPS FF	2	0	0	0	0	13	0	0	0	0	65
MiPS FF	3	169	14	16	8	9	600	564	4	30	33
MiPS FF	4	200	16	18	10	0	397	374	2	20	0
MiPS FF	5	15	1	1	1	0	19	18	0	1	0
UWAc FF	2	0	0	0	0	0	3	3	0	0	2

Appendix D. Continued.

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
UWAc FF	3	0	0	0	0	0	24	23	0	1	0
UWAc FF	4	15	1	1	1	0	0	0	0	0	0
SPSo FF	2	0	0	0	0	22	0	0	0	0	198
SPSo FF	3	0	0	0	0	5	0	0	0	0	36
SPSo FF	4	63	5	6	3	0	475	447	3	24	0
SPSo FF	5	24	2	2	1	0	276	259	2	14	0
SPSo FY	2	0	0	0	0	0	0	0	0	0	10
SPSo FY	3	0	0	0	0	0	19	18	0	1	3
SPSo FY	4	8	1	1	0	0	102	96	1	5	0
Whte SpFi	2	0	0	0	0	1	0	0	0	0	0
HdCl FF	2	0	0	0	0	87	0	0	0	0	5
HdCl FF	3	325	26	30	16	12	14	13	0	1	0
HdCl FF	4	45	4	4	2	0	2	2	0	0	0
HdCl FF	5	97	8	9	5	0	3	3	0	0	0
HdCl FY	2	0	0	0	0	2	0	0	0	0	0
SJDF FF	2	0	0	0	0	8	0	0	0	0	1
SJDF FF	3	3	0	0	0	1	0	0	0	0	0
SJDF FF	4	130	10	12	7	0	21	20	0	1	0
Oreg Tu	2	12	1	1	1	21	0	0	0	0	0
Oreg Tu	3	119	9	11	6	0	1	1	0	0	0
Wash Tu	2	0	0	0	0	8	0	0	0	0	0
Wash Tu	3	0	0	0	0	1	0	0	0	0	0
Low CR Wi	2	0	0	0	0	1	0	0	0	0	0
Low CR Wi	3	15	1	1	1	0	0	0	0	0	0
BPH Tu	2	624	50	57	31	266	8	7	0	0	3
BPH Tu	3	431	34	40	22	3	6	5	0	0	0
BPH Tu	4	282	23	26	14	0	2	2	0	0	0
Upp CR Br	2	8	1	1	0	159	0	0	0	0	5
Upp CR Br	3	867	69	80	43	3	26	24	0	1	0
Upp CR Br	4	236	19	22	12	0	8	7	0	0	0
Upp CR Br	5	229	18	21	11	0	6	6	0	0	0
Cowl SP	3	1	0	0	0	0	16	15	0	1	0
Will SP	2	0	0	0	0	3	0	0	0	0	24
Will SP	3	12	1	1	1	0	112	105	1	6	3
Snk Riv F	5	2	0	0	0	0	3	3	0	0	0
Ore No Fl	2	8	1	1	0	11	0	0	0	0	0
WCVI Totl	2	0	0	0	0	1	0	0	0	0	0
WCVI Totl	4	103	8	9	5	0	2	2	0	0	0
Fraser Lt	2	0	0	0	0	35	0	0	0	0	1
Fraser Lt	3	503	40	46	25	6	11	10	0	1	0
Fraser Lt	4	96	8	9	5	0	2	2	0	0	0
Fraser Er	2	0	0	0	0	92	0	0	0	0	2
Fraser Er	3	48	4	4	2	0	1	1	0	0	0
Fraser Er	4	1440	115	132	72	0	29	28	0	1	0
LwrGeo St	2	15	1	1	1	5	1	1	0	0	0
LwrGeo St	4	83	7	8	4	0	3	3	0	0	0
FRAM Stocks		6773	542	623	339	862	2714	2551	16	136	462
All Stocks		7664	613	705	383	975	3071	2887	18	154	523

2006

Species: CHINOOK Version#:5.24 CMD File: 3006.cmd Date: 04-07-2006
Report : Selective Fishery Report DRV File: chinSelf.DRV Time: 12:06:19
Title : final April PFMC Apr 7 am; NT 65K; T 42.2K

Fishery:NT Area 5-6 Sport TimeStep:July-Sept

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
NkSm FF	2	0	0	0	0	3	0	0	0	0	37
NkSm FF	3	17	1	2	1	1	118	111	1	6	6
NkSm FF	4	17	1	2	1	0	247	232	1	12	0
NkSm FF	5	2	0	0	0	0	33	31	0	2	0
SFNK SP	2	0	0	0	0	1	0	0	0	0	0
SFNK SP	3	6	0	1	0	0	0	0	0	0	0
Skag FF	2	0	0	0	0	10	0	0	0	0	0
Skag FF	3	6	0	1	0	0	0	0	0	0	0
Skag FY	3	6	0	1	0	0	0	0	0	0	0
Skag FY	4	38	3	4	2	0	0	0	0	0	0

Appendix D. Continued.

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
Skag FY	5	31	2	3	2	0	0	0	0	0	0
Skag SY	2	0	0	0	0	4	0	0	0	0	3
Skag SY	3	6	1	1	0	1	5	4	0	0	0
Skag SY	4	5	0	0	0	0	3	2	0	0	0
Snoh FF	2	0	0	0	0	28	0	0	0	0	21
Snoh FF	3	48	4	4	2	3	34	32	0	2	2
Snoh FY	2	0	0	0	0	1	0	0	0	0	1
Snoh FY	3	72	6	7	4	2	61	58	0	3	1
Snoh FY	4	14	1	1	1	0	9	8	0	0	0
Snoh FY	5	2	0	0	0	0	2	2	0	0	0
Stil FF	2	0	0	0	0	4	0	0	0	0	1
Stil FF	3	10	1	1	1	1	2	1	0	0	0
Tula FF	2	0	0	0	0	29	0	0	0	0	67
Tula FF	3	129	10	12	6	6	14	13	0	1	1
Tula FF	4	37	3	3	2	0	5	5	0	0	0
Tula FF	5	11	1	1	1	0	2	2	0	0	0
MiPS FF	2	0	0	0	0	18	0	0	0	0	61
MiPS FF	3	278	22	26	14	14	543	511	3	27	28
MiPS FF	4	287	23	26	14	0	418	393	3	21	0
MiPS FF	5	20	2	2	1	0	24	22	0	1	0
UWAc FF	2	0	0	0	0	0	14	13	0	1	9
UWAc FF	3	0	0	0	0	0	55	52	0	3	1
UWAc FF	4	0	0	0	0	0	12	11	0	1	0
SPSo FF	2	0	0	0	0	22	0	0	0	0	265
SPSo FF	3	0	0	0	0	8	0	0	0	0	49
SPSo FF	4	66	5	6	3	0	499	469	3	25	0
SPSo FF	5	32	3	3	2	0	227	214	1	11	0
SPSo FY	2	0	0	0	0	0	0	0	0	0	10
SPSo FY	3	0	0	0	0	0	20	19	0	1	3
SPSo FY	4	0	0	0	0	0	126	119	1	6	0
Whte SpFi	2	0	0	0	0	1	0	0	0	0	0
HdCl FF	2	0	0	0	0	38	0	0	0	0	37
HdCl FF	3	248	20	23	12	8	107	101	1	5	4
HdCl FF	4	53	4	5	3	0	3	3	0	0	0
HdCl FF	5	108	9	10	5	0	3	3	0	0	0
HdCl FY	2	0	0	0	0	0	0	0	0	0	2
SJDF FF	2	0	0	0	0	7	0	0	0	0	1
SJDF FF	3	17	1	2	1	1	2	1	0	0	0
SJDF FF	4	72	6	7	4	0	8	7	0	0	0
SJDF FF	5	4	0	0	0	0	0	0	0	0	0
Oreg Tu	2	8	1	1	0	13	0	0	0	0	0
Oreg Tu	3	37	3	3	2	0	0	0	0	0	0
Wash Tu	2	0	0	0	0	6	0	0	0	0	0
Low CR Wi	2	0	0	0	0	1	0	0	0	0	0
Low CR Wi	3	13	1	1	1	0	0	0	0	0	0
BPH Tu	2	350	28	32	17	142	4	4	0	0	2
BPH Tu	3	280	22	26	14	2	4	3	0	0	0
BPH Tu	4	111	9	10	6	0	1	1	0	0	0
Upp CR Br	2	7	1	1	0	130	0	0	0	0	4
Upp CR Br	3	546	44	50	27	2	16	15	0	1	0
Upp CR Br	4	132	11	12	7	0	4	4	0	0	0
Upp CR Br	5	290	23	27	15	0	8	8	0	0	0
Cowl SP	3	2	0	0	0	0	35	33	0	2	0
Will SP	2	0	0	0	0	1	0	0	0	0	10
Will SP	3	13	1	1	1	0	120	113	1	6	3
Snk Riv F	5	2	0	0	0	0	3	3	0	0	0
Ore No Fl	2	9	1	1	0	11	0	0	0	0	0
WCVI Totl	2	0	0	0	0	4	0	0	0	0	0
WCVI Totl	4	28	2	3	1	0	1	1	0	0	0
Fraser Lt	2	0	0	0	0	24	0	0	0	0	0
Fraser Lt	3	303	24	28	15	4	6	6	0	0	0
Fraser Lt	4	61	5	6	3	0	1	1	0	0	0
Fraser Er	2	0	0	0	0	61	0	0	0	0	1
Fraser Er	3	23	2	2	1	0	0	0	0	0	0
Fraser Er	4	1021	82	94	51	0	21	20	0	1	0
LwrGeo St	2	25	2	2	1	8	1	1	0	0	0
LwrGeo St	4	70	6	6	3	0	3	3	0	0	0
FRAM Stocks		4971	398	457	249	623	2825	2655	17	141	633
All Stocks		5699	456	524	285	714	3238	3044	19	162	725

Appendix D. Continued.

2007

Species: CHINOOK Version#:5.26 CMD File: 3907.cmd Date: 01-08-2008
Report : Selective Fishery Report DRV File: chinSelf.DRV Time: 12:48:12
Title : Final PFMC Treaty 35K; NT 32.5K;A9 and 10 7K MSF; A9 & 10 & 7 some MSF TS 4; A11MSF Jun-Sep; A13 MSF May-Sep; A 5 4k MSf; T C&S A 9 700 and test fishing

Fishery:NT Area 5-6 Sport TimeStep:July-Sept

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
NkSm FF	2	0	0	0	0	3	0	0	0	0	38
NkSm FF	3	17	1	2	1	1	121	114	1	6	6
NkSm FF	4	18	1	2	1	0	253	238	2	13	0
NkSm FF	5	2	0	0	0	0	34	32	0	2	0
SFNK SP	3	4	0	0	0	0	0	0	0	0	0
Skag FF	2	0	0	0	0	2	0	0	0	0	0
Skag FF	3	50	4	5	3	2	2	2	0	0	0
Skag FY	2	0	0	0	0	1	0	0	0	0	0
Skag FY	3	110	9	10	6	3	0	0	0	0	0
Skag FY	4	11	1	1	1	0	0	0	0	0	0
Skag FY	5	7	1	1	0	0	0	0	0	0	0
Skag SY	2	0	0	0	0	5	0	0	0	0	8
Skag SY	3	9	1	1	0	1	10	9	0	0	1
Skag SY	4	4	0	0	0	0	4	4	0	0	0
Snoh FF	2	0	0	0	0	25	0	0	0	0	15
Snoh FF	3	99	8	9	5	6	36	34	0	2	2
Snoh FY	2	0	0	0	0	1	0	0	0	0	1
Snoh FY	3	153	12	14	8	3	99	94	1	5	2
Snoh FY	4	14	1	1	1	0	12	11	0	1	0
Snoh FY	5	3	0	0	0	0	1	1	0	0	0
Stil FF	2	0	0	0	0	7	0	0	0	0	1
Stil FF	3	14	1	1	1	1	3	3	0	0	0
Tula FF	2	0	0	0	0	11	0	0	0	0	23
Tula FF	3	25	2	2	1	1	57	54	0	3	3
Tula FF	4	44	3	4	2	0	5	4	0	0	0
Tula FF	5	11	1	1	1	0	2	2	0	0	0
MiPS FF	2	0	0	0	0	16	0	0	0	0	55
MiPS FF	3	177	14	16	9	9	560	527	3	28	29
MiPS FF	4	202	16	19	10	0	430	404	3	21	0
MiPS FF	5	18	1	2	1	0	21	20	0	1	0
UWAc FF	2	0	0	0	0	0	14	13	0	1	9
UWAc FF	3	0	0	0	0	0	43	40	0	2	0
UWAc FF	4	0	0	0	0	0	9	8	0	0	0
SPSo FF	2	0	0	0	0	26	0	0	0	0	309
SPSo FF	3	0	0	0	0	9	0	0	0	0	54
SPSo FF	4	77	6	7	4	0	583	548	3	29	0
SPSo FF	5	24	2	2	1	0	279	263	2	14	0
SPSo FY	2	0	0	0	0	0	0	0	0	0	12
SPSo FY	3	0	0	0	0	0	24	22	0	1	3
SPSo FY	4	0	0	0	0	0	148	139	1	7	0
Whte SpFi	2	0	0	0	0	1	0	0	0	0	0
Whte SpFi	3	0	0	0	0	1	0	0	0	0	0
HdCl FF	2	0	0	0	0	58	0	0	0	0	58
HdCl FF	3	300	24	28	15	10	247	232	1	12	8
HdCl FF	4	62	5	6	3	0	24	22	0	1	0
HdCl FF	5	161	13	15	8	0	10	9	0	0	0
HdCl FY	2	0	0	0	0	0	0	0	0	0	2
SJDF FF	2	0	0	0	0	7	0	0	0	0	1
SJDF FF	3	17	1	2	1	1	2	1	0	0	0
SJDF FF	4	74	6	7	4	0	8	7	0	0	0
SJDF FF	5	5	0	0	0	0	0	0	0	0	0
Oreg Tu	2	7	1	1	0	12	0	0	0	0	0
Oreg Tu	3	81	6	7	4	0	1	1	0	0	0
Wash Tu	2	0	0	0	0	6	0	0	0	0	0
Wash Tu	3	0	0	0	0	1	0	0	0	0	0
Low CR Wi	2	0	0	0	0	1	0	0	0	0	0
Low CR Wi	3	10	1	1	1	0	0	0	0	0	0
BPH Tu	2	359	29	33	18	146	4	4	0	0	2
BPH Tu	3	122	10	11	6	1	2	2	0	0	0
BPH Tu	4	41	3	4	2	0	0	0	0	0	0
Upp CR Br	2	7	1	1	0	133	0	0	0	0	4
Upp CR Br	3	912	73	84	46	3	27	25	0	1	0
Upp CR Br	4	91	7	8	5	0	3	3	0	0	0

Appendix D. Continued.

Stock Name	Age	UnMark Handled	UnMark Catch	UnMark NonRete	UnMark Dropoff	UnMark SubLegl	Marked Handled	Marked Catch	Marked NonRete	Marked Dropoff	Marked SubLegl
Upp CR Br	5	180	14	17	9	0	5	5	0	0	0
Cowl SP	3	2	0	0	0	0	36	34	0	2	0
Will SP	2	0	0	0	0	1	0	0	0	0	10
Will SP	3	14	1	1	1	0	123	116	1	6	3
Snk Riv F	5	2	0	0	0	0	3	3	0	0	0
Ore No Fl	2	9	1	1	0	12	0	0	0	0	0
WCVI Totl	2	0	0	0	0	4	0	0	0	0	0
WCVI Totl	4	78	6	7	4	0	2	1	0	0	0
Fraser Lt	2	0	0	0	0	25	0	0	0	0	1
Fraser Lt	3	245	20	22	12	4	5	5	0	0	0
Fraser Lt	4	61	5	6	3	0	1	1	0	0	0
Fraser Er	2	0	0	0	0	62	0	0	0	0	1
Fraser Er	3	23	2	2	1	0	0	0	0	0	0
Fraser Er	4	1048	84	96	52	0	21	20	0	1	0
LwrGeo St	2	25	2	2	1	8	1	1	0	0	0
LwrGeo St	4	72	6	7	4	0	3	3	0	0	0
FRAM Stocks		5103	408	469	255	632	3278	3081	20	164	664
All Stocks		5850	468	538	292	725	3757	3532	23	188	761

Appendix E. Annual angling effort

Annual angling effort (completed boat ['Boats'] and angler ['Anglers'] trips) point estimates, variances, and 95% confidence intervals for the Areas 5 and 6 mark-selective Chinook fisheries..

Area	Year	Boats	Variance	+/- 95% CI	Anglers	Variance	+/- 95% CI
5	2003	8,008	640,918	1,569	19,398	3,618,965	3,729
	2004	10,709	406,265	1,249	25,174	2,507,693	3,104
	2005	11,968	162,261	790	30,115	1,122,927	2,077
	2006	9,779	235,050	950	23,177	1,421,222	2,337
	2007	7,883	126,699	698	18,830	823,923	1,779
6	2003	2,657	42,002	402	5,195	145,389	747
	2004	2,251	28,277	330	4,251	95,506	606
	2005	2,116	56,790	467	3,971	195,793	867
	2006	1,706	6,408	157	3,077	6,408	157
	2007	1,745	23,147	298	3,221	56,185	465
Total	2003	10,665	682,920	1,620	24,594	3,764,354	3,803
	2004	12,960	434,542	1,292	29,425	2,603,199	3,162
	2005	14,084	219,051	917	34,086	1,318,720	2,251
	2006	11,485	241,458	963	26,253	1,427,631	2,342
	2007	9,628	149,846	759	22,051	880,108	1,839

Appendix F. Annual Chinook harvest and release estimates

Annual Chinook harvest and release estimates, variances, and 95% confidence intervals for the Areas 5 and 6 mark-selective Chinook fisheries..

		Harvested			Released		
Area	Year	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
5	2003	2,529	63,566	494	13,118	1,643,007	2,512
	2004	2,900	51,584	445	12,392	778,148	1,729
	2005	1,669	26,930	322	5,772	156,388	775
	2006	3,318	63,671	495	8,482	349,882	1,159
	2007	3,367	68,497	513	7,803	582,997	1,497
6	2003	964	8,423	180	1,723	25,325	312
	2004	676	4,310	129	1,409	16,631	253
	2005	408	14,941	240	636	22,220	292
	2006	349	2,012	88	334	1,348	72
	2007	729	6,831	162	817	9,397	190
Total	2003	3,493	71,988	526	14,841	1,668,332	2,532
	2004	3,576	55,894	463	13,802	795,580	1,748
	2005	2,078	41,871	401	6,408	178,608	828
	2006	3,666	65,683	502	8,816	351,230	1,162
	2007	4,096	75,327	538	8,620	592,394	1,509

Appendix G. Estimated total Chinook encounters

Estimated total Chinook encounters after released unknown salmon were apportioned to species based on their proportion of the known releases.

			2003			2004		
			Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
Kept	5	Marked	2,476	63,330	493	2,900	51,584	445
		Ummarked	53	236	30	0	0	0
	6	Marked	941	8,320	179	671	4,301	129
		Ummarked	22	103	20	5	9	6
	5 and 6	All Kept	3,493	71,988	526	3,576	55,894	463
Released	5	Marked	485	7,643	171	806	18,105	264
		Unmarked	10,572	1,443,225	2,355	10,836	729,671	1,674
		Unknown Mark	2,061	192,139	859	750	31,240	346
		Apportioned Unidentified Species	303	9,989	196	29	80	18
	6	Marked	39	103	20	23	35	12
		Unmarked	1,604	24,380	306	1,337	16,174	249
		Unknown Mark	79	843	57	50	355	37
		Apportioned Unidentified Species	26	82	18	3	2	3
	5 and 6	All Releases	15,170	1,678,403	3,982	13,834	795,663	2,603
Grand Total	5 and 6	All Encounters	18,662	1,750,391	4,507	17,410	851,557	3,066

			2005			2006		
			Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
Kept	5	Marked	1,620	26,662	320	3,301	63,651	494
		Ummarked	49	268	32	17	20	9
	6	Marked	404	14,938	240	340	1,982	87
		Ummarked	4	3	3	8	30	11
	5 and 6	All Kept	2,078	41,871	401	3,666	65,683	502
Released	5	Marked	542	4,526	132	1,661	50,963	442
		Unmarked	4,664	135,221	721	5,823	241,692	964
		Unknown Mark	566	16,642	253	999	57,227	469
		Apportioned Unidentified Species	30	83	18	109	731	53
	6	Marked	85	4,540	132	8	16	8
		Unmarked	549	17,679	261	326	1,331	72
		Unknown Mark	3	1	2	0	0	0
		Apportioned Unidentified Species	1	0	1	0	0	0
	5 and 6	All Releases	6,439	178,692	1,519	8,925	351,961	2,007
Grand Total	5 and 6	All Encounters	8,517	220,563	1,920	12,592	417,644	2,510

Appendix G. Continued.

			2007		
			Estimate	Variance	+/- 95% CI
Kept	5	Marked	3,250	67,614	510
		Ummarked	117	883	58
	6	Marked	722	6,798	162
		Ummarked	7	33	11
	5 and 6	All Kept	4,096	75,327	538
Released	5	Marked	1,130	25,263	312
		Unmarked	5,428	463,948	1,335
		Unknown Mark	1,245	93,786	600
		Apportioned Unidentified Species	148	4,765	135
	6	Marked	52	289	33
		Unmarked	644	8,584	182
		Unknown Mark	121	525	45
		Apportioned Unidentified Species	67	3,336	113
	5 and 6	All Releases	8,835	600,495	2,755
Grand Total	5 and 6	All Encounters	12,931	675,823	3,293

Appendix H. Detailed estimates of encounters

Detailed estimates of encounters in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Method 1		Kept														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Kept		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	2,251	58,935	476	53	236	30	225	7,120	165	0	0	0	2,529	66,291	505
	6	941	8,320	179	22	103	20	0	0	0	0	0	0	964	8,423	180
	Total	3,192	67,255	508	76	338	36	225	7,120	165	0	0	0	3,493	74,714	536
2004	5	2,706	46,213	421	0	0	0	194	1,524	77	0	0	0	2,900	47,736	428
	6	669	4,275	128	5	9	6	2	6	5	0	0	0	676	4,290	128
	Total	3,375	50,488	440	5	9	6	196	1,530	77	0	0	0	3,576	52,027	447
2005	5	1,520	23,810	302	23	92	19	100	449	42	26	108	20	1,669	24,459	307
	6	404	14,938	240	0	0	0	0	0	0	4	3	3	408	14,941	240
	Total	1,924	38,747	386	23	92	19	100	449	42	30	111	21	2,078	39,400	389
2006	5	3,105	57,049	468	10	23	9	196	940	60	7	19	9	3,318	58,031	472
	6	338	1,961	87	0	0	0	2	5	4	8	30	11	349	1,996	88
	Total	3,443	59,009	476	10	23	9	198	945	60	15	49	14	3,666	60,026	480
2007	5	2,969	57,478	470	23	143	23	280	1,522	76	94	673	51	3,367	59,815	479
	6	715	6,675	160	7	33	11	7	14	7	0	0	0	729	6,721	161
	Total	3,684	64,152	496	30	176	26	287	1,535	77	94	673	51	4,096	66,536	506

Method 1		Released														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Released		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	936	249,330	979	4,149	266,888	1,013	2,058	135,798	722	6,278	447,808	1,312	13,421	1,099,825	2,056
	6	213	26,687	320	1,371	21,526	288	55	1,008	62	110	2,002	88	1,749	51,223	444
	Total	1,149	276,017	1,030	5,519	288,414	1,053	2,113	136,806	725	6,388	449,810	1,315	15,170	1,151,047	2,103
2004	5	1,645	397,342	1,235	5,621	436,353	1,295	1,710	166,407	800	3,445	285,545	1,047	12,422	1,285,647	2,222
	6	305	15,272	242	1,039	11,718	212	54	704	52	14	175	26	1,412	27,870	327
	Total	1,950	412,614	1,259	6,660	448,071	1,312	1,764	167,111	801	3,460	285,720	1,048	13,834	1,313,517	2,246
2005	5	661	124,292	691	1,777	85,785	574	1,536	79,440	552	1,828	87,986	581	5,802	377,504	1,204
	6	0	23,959	303	624	17,920	262	55	1,076	64	0	3	3	679	42,958	406
	Total	661	148,251	755	2,400	103,705	631	1,591	80,516	556	1,828	87,989	581	6,481	420,462	1,271
2006	5	1,092	263,367	1,006	3,676	184,743	842	1,222	77,975	547	2,602	135,976	723	8,591	662,061	1,595
	6	0	7,395	169	382	5,837	150	0	5	4	0	30	11	382	13,267	226
	Total	1,092	270,762	1,020	4,058	190,580	856	1,222	77,980	547	2,602	136,006	723	8,973	675,328	1,611
2007	5	1,238	536,690	1,436	3,314	403,060	1,244	1,896	284,148	1,045	1,502	215,212	909	7,951	1,439,110	2,351
	6	347	22,956	297	524	9,812	194	14	468	42	0	0	0	884	33,236	357
	Total	1,585	559,646	1,466	3,838	412,872	1,259	1,910	284,616	1,046	1,502	215,212	909	8,835	1,472,347	2,378

Appendix H. Continued.

Method 2		Kept														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Kept		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	2,251	58,935	476	53	236	30	225	7,120	165	0	0	0	2,529	66,291	505
	6	941	8,320	179	22	103	20	0	0	0	0	0	0	964	8,423	180
	Total	3,192	67,255	508	76	338	36	225	7,120	165	0	0	0	3,493	74,714	536
2004	5	2,706	46,213	421	0	0	0	194	1,524	77	0	0	0	2,900	47,736	428
	6	669	4,275	128	5	9	6	2	6	5	0	0	0	676	4,290	128
	Total	3,375	50,488	440	5	9	6	196	1,530	77	0	0	0	3,576	52,027	447
2005	5	1,520	23,810	302	23	92	19	100	449	42	26	108	20	1,669	24,459	307
	6	404	14,938	240	0	0	0	0	0	0	4	3	3	408	14,941	240
	Total	1,924	38,747	386	23	92	19	100	449	42	30	111	21	2,078	39,400	389
2006	5	3,105	57,049	468	10	23	9	196	940	60	7	19	9	3,318	58,031	472
	6	338	1,961	87	0	0	0	2	5	4	8	30	11	349	1,996	88
	Total	3,443	59,009	476	10	23	9	198	945	60	15	49	14	3,666	60,026	480
2007	5	2,969	57,478	470	23	143	23	280	1,522	76	94	673	51	3,367	59,815	479
	6	715	6,675	160	7	33	11	7	14	7	0	0	0	729	6,721	161
	Total	3,684	64,152	496	30	176	26	287	1,535	77	94	673	51	4,096	66,536	506

Method 2		Released														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Released		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	0	0	0	2,914	281,957	1041	1,388	115,222	665	4,434	555,357	1461	8,736	952,535	1913
	6	0	0	0	1,113	32,349	353	45	698	52	90	1,443	74	1,248	34,490	364
	Total	0	0	0	4,028	314,306	1099	1,432	115,919	667	4,523	556,799	1463	9,983	987,024	1947
2004	5	0	0	0	3,496	386,078	1218	990	90,237	589	2,143	192,091	859	6,629	668,407	1602
	6	0	0	0	712	11,494	210	36	353	37	10	84	18	758	11,930	214
	Total	0	0	0	4,208	397,572	1236	1,027	90,590	590	2,152	192,175	859	7,387	680,337	1617
2005	5	0	0	0	1,231	80,782	557	1,040	71,102	523	1,266	84,263	569	3,537	236,147	952
	6	0	0	0	687	64,456	498	61	1,638	79	0	3	3	748	66,097	504
	Total	0	0	0	1,918	145,238	747	1,100	72,740	529	1,266	84,266	569	4,284	302,243	1078
2006	5	0	0	0	2,717	188,803	852	853	56,068	464	1,923	118,335	674	5,493	363,206	1181
	6	0	0	0	430	19,024	270	0	5	4	0	30	11	430	19,059	271
	Total	0	0	0	3,147	207,828	894	853	56,074	464	1,923	118,364	674	5,923	382,266	1212
2007	5	0	0	0	2,332	330,278	1126	1,256	197,333	871	1,033	137,120	726	4,620	664,730	1598
	6	0	0	0	350	6,062	153	7	222	29	0	0	0	358	6,285	155
	Total	0	0	0	2,682	336,340	1137	1,263	197,555	871	1,033	137,120	726	4,978	671,015	1606

Appendix I. Detailed estimates of mortalities

Detailed estimates of mortalities in the Area 5 and 6 selective Chinook fishery, 2003 through 2007.

Method 1		Kept														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Kept		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	2,251	58,935	476	53	236	30	225	7,120	165	0	0	0	2,529	66,291	505
	6	941	8,320	179	22	103	20	0	0	0	0	0	0	964	8,423	180
	Total	3,192	67,255	508	76	338	36	225	7,120	165	0	0	0	3,493	74,714	536
2004	5	2,706	46,213	421	0	0	0	194	1,524	77	0	0	0	2,900	47,736	428
	6	669	4,275	128	5	9	6	2	6	5	0	0	0	676	4,290	128
	Total	3,375	50,488	440	5	9	6	196	1,530	77	0	0	0	3,576	52,027	447
2005	5	1,520	23,810	302	23	92	19	100	449	42	26	108	20	1,669	24,459	307
	6	404	14,938	240	0	0	0	0	0	0	4	3	3	408	14,941	240
	Total	1,924	38,747	386	23	92	19	100	449	42	30	111	21	2,078	39,400	389
2006	5	3,105	57,049	468	10	23	9	196	940	60	7	19	9	3,318	58,031	472
	6	338	1,961	87	0	0	0	2	5	4	8	30	11	349	1,996	88
	Total	3,443	59,009	476	10	23	9	198	945	60	15	49	14	3,666	60,026	480
2007	5	2,969	57,478	470	23	143	23	280	1,522	76	94	673	51	3,367	59,815	479
	6	715	6,675	160	7	33	11	7	14	7	0	0	0	729	6,721	161
	Total	3,684	64,152	496	30	176	26	287	1,535	77	94	673	51	4,096	66,536	506

Method 1		Released														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Released		
Year	Area	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI	Estimate	Variance	+/- 95% CI
2003	5	140	5,610	147	622	6,005	152	412	5,432	144	1,256	17,912	262	2,430	34,959	366
	6	32	600	48	206	484	43	11	40	12	22	80	18	271	1,205	68
	Total	172	6,210	154	828	6,489	158	423	5,472	145	1,278	17,992	263	2,701	36,164	373
2004	5	247	8,940	185	843	9,818	194	342	6,656	160	689	11,422	209	2,121	36,836	376
	6	46	344	36	156	264	32	11	28	10	3	7	5	215	642	50
	Total	292	9,284	189	999	10,082	197	353	6,684	160	692	11,429	210	2,336	37,479	379
2005	5	99	2,797	104	266	1,930	86	307	3,178	110	366	3,519	116	1,038	11,424	209
	6	0	539	46	94	403	39	11	43	13	0	0	1	105	985	62
	Total	99	3,336	113	360	2,333	95	318	3,221	111	366	3,520	116	1,143	12,409	218
2006	5	164	5,926	151	551	4,157	126	244	3,119	109	520	5,439	145	1,480	18,641	268
	6	0	166	25	57	131	22	0	0	1	0	1	2	57	299	34
	Total	164	6,092	153	609	4,288	128	244	3,119	109	520	5,440	145	1,537	18,940	270
2007	5	186	12,076	215	497	9,069	187	379	11,366	209	300	8,608	182	1,363	41,119	397
	6	52	517	45	79	221	29	3	19	8	0	0	0	133	756	54
	Total	238	12,592	220	576	9,290	189	382	11,385	209	300	8,608	182	1,496	41,875	401

Appendix I. Continued.

Method 2		Kept														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Kept		
Year	Area	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C
2003	5	2,251	58,935	476	53	236	30	225	7,120	165	0	0	0	2,529	66,291	505
	6	941	8,320	179	22	103	20	0	0	0	0	0	0	964	8,423	180
	Total	3,192	67,255	508	76	338	36	225	7,120	165	0	0	0	3,493	74,714	536
2004	5	2,706	46,213	421	0	0	0	194	1,524	77	0	0	0	2,900	47,736	428
	6	669	4,275	128	5	9	6	2	6	5	0	0	0	676	4,290	128
	Total	3,375	50,488	440	5	9	6	196	1,530	77	0	0	0	3,576	52,027	447
2005	5	1,520	23,810	302	23	92	19	100	449	42	26	108	20	1,669	24,459	307
	6	404	14,938	240	0	0	0	0	0	0	4	3	3	408	14,941	240
	Total	1,924	38,747	386	23	92	19	100	449	42	30	111	21	2,078	39,400	389
2006	5	3,105	57,049	468	10	23	9	196	940	60	7	19	9	3,318	58,031	472
	6	338	1,961	87	0	0	0	2	5	4	8	30	11	349	1,996	88
	Total	3,443	59,009	476	10	23	9	198	945	60	15	49	14	3,666	60,026	480
2007	5	2,969	57,478	470	23	143	23	280	1,522	76	94	673	51	3,367	59,815	479
	6	715	6,675	160	7	33	11	7	14	7	0	0	0	729	6,721	161
	Total	3,684	64,152	496	30	176	26	287	1,535	77	94	673	51	4,096	66,536	506

Method 2		Released														
		Legal-size Marked			Legal-size Unmarked			Sublegal-size Marked			Sublegal-size Unmarked			All Released		
Year	Area	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C	Estimate	Variance	+/- 95% C
2003	5	0	0	0	437	6,344	156	278	4,609	133	887	22,214	292	1,601	33,167	357
	6	0	0	0	167	728	53	9	28	10	18	58	15	194	813	56
	Total	0	0	0	604	7,072	165	286	4,637	133	905	22,272	293	1,795	33,981	361
2004	5	0	0	0	524	8,687	183	198	3,609	118	429	7,684	172	1,151	19,980	277
	6	0	0	0	107	259	32	7	14	7	2	3	4	116	276	33
	Total	0	0	0	631	8,945	185	205	3,624	118	430	7,687	172	1,267	20,256	279
2005	5	0	0	0	185	1,818	84	208	2,844	105	253	3,371	114	646	8,032	176
	6	0	0	0	103	1,450	75	12	66	16	0	0	1	115	1,516	76
	Total	0	0	0	288	3,268	112	220	2,910	106	253	3,371	114	761	9,548	192
2006	5	0	0	0	408	4,248	128	171	2,243	93	385	4,733	135	963	11,224	208
	6	0	0	0	64	428	41	0	0	1	0	1	2	64	429	41
	Total	0	0	0	472	4,676	134	170	2,243	93	385	4,735	135	1,027	11,654	212
2007	5	0	0	0	350	7,431	169	251	7,893	174	207	5,485	145	807	20,809	283
	6	0	0	0	53	136	23	1	9	6	0	0	0	54	145	24
	Total	0	0	0	402	7,568	171	253	7,902	174	207	5,485	145	861	20,955	284

Appendix J. Observed recoveries of coded wire tags

Observed recoveries of coded wire tags from Chinook salmon during the Chinook Mark-Selective Fisheries in Marine Areas 5 and 6, 2003 through 2006.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Aug 1 2003	050182		1999	MAKAH NFH ON SOOES R	SOOES R 20.0015	FWS	80
05	Jul 20 2003	054523		2000	SPRING CR NFH	SPRING CR 29.0159	FWS	84
05	Aug 2 2003	060270		2000	MOKELUMNE R FISH INS	JERSEY PT,SAN JOAQ.R	EBMD	61
05	Jul 27 2003	065459		2000	NIMBUS FISH HATCHERY	WICKLAND OIL NET PEN	CDFG	57
05	Aug 2 2003	093250		2000	BIG CR HATCHERY	BIG CR (LWR COL R)	ODFW	65
05	Jul 8 2003	093250		2000	BIG CR HATCHERY	BIG CR (LWR COL R)	ODFW	63
05	Jul 27 2003	093250		2000	BIG CR HATCHERY	BIG CR (LWR COL R)	ODFW	67
05	Jul 21 2003	184124	y	1999	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	81
05	Aug 1 2003	184551		2000	H-CHEHALIS R	R-CHEHALIS R	CDFO	65
05	Jul 6 2003	184552		2000	H-NANAIMO R	R-NANAIMO R	CDFO	58
05	Jul 26 2003	184614	y	2000	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	53
05	Aug 1 2003	184916	y	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	56
05	Aug 1 2003	210135		1998	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	78
05	Aug 1 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	68
05	Jul 13 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	Jul 25 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	88
05	Jul 27 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	83
05	Jul 27 2003	210166	y	1999	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	72
05	Jul 7 2003	210221		1999	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	67
05	Jul 19 2003	210269		2000	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	57
05	Aug 2 2003	210272		2000	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	70
05	Jul 11 2003	210272		2000	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	65
05	Jul 13 2003	210273		2000	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	56
05	Aug 2 2003	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	55
05	Jul 20 2003	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	65
05	Jul 26 2003	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
05	Jul 26 2003	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	62
05	Aug 2 2003	210294		2000	PUYALLUP TRIBAL HATCHERY	DIRU CR 10.0029	PUYA	54
05	Aug 1 2003	630171	y	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	87
05	Jul 8 2003	630171	y	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	56
05	Jul 16 2003	630186		1999	NORTH TOUTLE HATCHRY	GREEN R 26.0323	WDFW	71
05	Jul 13 2003	630196		2000	ELOCHOMAN HATCHERY	ELOCHOMAN R 25.0236	WDFW	58
05	Jul 27 2003	630197	y	1999	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	84
05	Jul 21 2003	630279		2000	KALAMA FALLS HATCHRY	KALAMA R 27.0002	WDFW	66
05	Jul 8 2003	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	61
05	Jul 13 2003	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	62
05	Jul 27 2003	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	69
05	Aug 1 2003	630398		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	64
05	Jul 26 2003	630469		1999	SIMILKAMEEN HATCHERY	SIMILKAMEEN R 490325	WDFW	58
05	Jul 5 2003	630476		1999	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	62
05	Jul 13 2003	630476		1999	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	58
05	Jul 7 2003	630668	y	2000	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	57
05	Jul 13 2003	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	55
05	Jul 27 2003	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	53
05	Jul 26 2003	630677		2000	LYONS FERRY HATCHERY	BIG CANYON ACCL POND	NEZP	56
05	Aug 2 2003	630683	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	69
05	Jul 27 2003	630683	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	58
05	Aug 1 2003	630687	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	53
05	Jul 11 2003	630687	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	56
05	Jul 16 2003	630697		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	70

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Aug 1 2003	630789		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	55
05	Jul 19 2003	630789		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	71
05	Aug 2 2003	630790		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	55
05	Jul 8 2003	630790		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	52
05	Jul 26 2003	630790		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	55
05	Jul 30 2003	630793		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	56
05	Jul 27 2003	630794		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	51
05	Jul 26 2003	630795		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	50
05	Jul 11 2003	630867		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	63
05	Jul 11 2003	630867		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	56
05	Jul 27 2003	630867		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	58
05	Aug 2 2003	630868		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	56
05	Aug 1 2003	630872		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	55
05	Jul 26 2003	630872		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	59
05	Jul 27 2003	630872		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	54
05	Jul 5 2003	630877		2000	WASHOUGAL HATCHERY	WASHOUGAL R 28.0159	WDFW	55
05	Jul 24 2003	630989		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	58
05	Aug 2 2003	630990		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	53
05	Jul 26 2003	630995		2000	WELLS HATCHERY	COLUMBIA NEAR WELLS	WDFW	50
05	Jul 27 2003	631272		2000	EASTBANK HATCHERY	WENATCHEE R 45.0030	WDFW	53
05	Aug 2 2003	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	48
05	Jul 27 2003	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	49
05	Jul 19 2003	631283		2000	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	
05	Jul 21 2003	631312		1999	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	83
06	Jul 14 2003	054421		1999	SPRING CR NFH	SPRING CR 29.0159	FWS	87
06	Jul 8 2003	182811		2000	H-COWICHAN R	R-COWICHAN BAY	CDFO	62
06	Jul 19 2003	184336		1999	H-NANAIMO R	R-NANAIMO R	CDFO	92
06	Aug 3 2003	184539		2000	H-COWICHAN R	R-COWICHAN R	CDFO	72
06	Jul 21 2003	210151		1998	MARBLEMOUNT HATCHERY	SKAGIT R 03.0176	WDFW	92
06	Aug 3 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
06	Jul 6 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
06	Jul 25 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	54
06	Jul 26 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
06	Jul 30 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	
06	Jul 30 2003	210153	y	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	97
06	Jul 12 2003	210166	y	1999	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	70
06	Jul 11 2003	210269		2000	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	64
06	Jul 30 2003	210269		2000	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	56
06	Jul 31 2003	210269		2000	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	68
06	Aug 3 2003	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	81
06	Jul 27 2003	630164		1999	MARBLEMOUNT HATCHERY	SKAGIT R + CASCADE R	WDFW	70
06	Aug 3 2003	630171	y	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	79
06	Jul 26 2003	630171	y	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	77
06	Jul 30 2003	630171	y	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	73
06	Jul 18 2003	630173	y	1999	SAMISH HATCHERY	FRIDAY CR + SAMISH R	WDFW	77
06	Aug 3 2003	630189	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	73
06	Jul 6 2003	630189	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
06	Jul 18 2003	630197	y	1999	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	76
06	Jul 8 2003	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	68
06	Jul 25 2003	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	65
06	Jul 31 2003	630399		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	70
06	Jul 31 2003	630399		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	70
06	Jul 24 2003	630683	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	60

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 11 2004	050780		2001	SPRING CR NFH	SPRING CR 29.0159	FWS	76
05	Jul 17 2004	050780		2001	SPRING CR NFH	SPRING CR 29.0159	FWS	91
05	Jul 24 2004	050780		2001	SPRING CR NFH	SPRING CR 29.0159	FWS	66
05	Aug 1 2004	050784		2001	MAKAH NFH ON SOOES R	SOOES R 20.0015	FWS	70
06	Jul 27 2004	051083		2001	QUILCENE NFH	BIG QUILCENE 17.0012	FWS	62
05	Jul 25 2004	062761		2002	FEATHER R HATCHERY	BENICIA	CDWR	43
05	Jul 29 2004	065288		2001	TRINITY R HATCHERY	TRINITY R HATCHERY	HVT	55
05	Aug 3 2004	091938		2000	COLE RIVERS HATCHERY	MORGAN CR (COOS R)	ODFW	78
06	Jul 25 2004	093452		2001	BIG CR HATCHERY	BIG CR (LWR COL R)	ODFW	76
05	Jul 11 2004	093628		2001	BONNEVILLE HATCHERY	UMATILLA R	ODFW	55
05	Jul 21 2004	184448		2001	H-COWICHAN R	R-COWICHAN BAY	CDFO	76
06	Jul 23 2004	184645		2001	H-COWICHAN R	R-COWICHAN R	CDFO	70
05	Jul 4 2004	184706		2001	H-SHUSWAP R	R-SHUSWAP R MID	CDFO	74
05	Jul 2 2004	184909		2001	H-INCH CR	R-STAVE R	CDFO	69
05	Jul 6 2004	184909		2001	H-INCH CR	R-STAVE R	CDFO	65
05	Jul 25 2004	184909		2001	H-INCH CR	R-STAVE R	CDFO	74
05	Aug 2 2004	184911		2001	H-CHEHALIS R	R-CHEHALIS R	CDFO	68
05	Jul 24 2004	184914	y	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	64
05	Jul 5 2004	184916	y	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	63
05	Jul 6 2004	184916	y	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	61
05	Jul 25 2004	184916	y	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	76
05	Aug 1 2004	184921		2002	H-CHEHALIS R	R-CHEHALIS R	CDFO	52
05	Jul 17 2004	185533	y	2002	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	48
05	Aug 8 2004	210272		2000	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	73
06	Aug 2 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	81
05	Jul 2 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	71
05	Jul 10 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
05	Jul 14 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
06	Jul 17 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
06	Jul 24 2004	210279	y	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	83
05	Jul 4 2004	210293		2000	PUYALLUP TRIBAL HATCHERY	COWSKULL ACCLIM POND	PUYA	67
05	Jul 17 2004	210294		2000	PUYALLUP TRIBAL HATCHERY	DIRU CR 10.0029	PUYA	74
06	Jul 29 2004	210294		2000	PUYALLUP TRIBAL HATCHERY	DIRU CR 10.0029	PUYA	89
05	Jul 16 2004	210324		2001	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	53
05	Jul 10 2004	210343		2001	COWSKL & RUSHWTR PDS	COWSKL & RUSHWTR PDS	PUYA	60
05	Jul 17 2004	210343		2001	COWSKL & RUSHWTR PDS	COWSKL & RUSHWTR PDS	PUYA	65
06	Jul 24 2004	210343		2001	COWSKL & RUSHWTR PDS	COWSKL & RUSHWTR PDS	PUYA	72
05	Jul 29 2004	210343		2001	COWSKL & RUSHWTR PDS	COWSKL & RUSHWTR PDS	PUYA	60
05	Jul 25 2004	210344		2001	PUYALLUP TRIBAL HATCHERY	DIRU CR 10.0029	PUYA	60
05	Aug 1 2004	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	59
05	Aug 1 2004	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	Jul 17 2004	210391		2001	COUNTY LINE PONDS	SKAGIT R 03.0176	WDFW	65
05	Jul 2 2004	210392		2001	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	56
05	Jul 9 2004	212950		2000	MARBLEMOUNT HATCHERY	RED CR 03.1325	WDFW	75
05	Jul 10 2004	212951		1999	HOKO FALLS HATCHERY	HOKO R 19.0148	MAKA	95
05	Jul 4 2004	630183		2000	LYONS FERRY HATCHERY	BIG CANYON ACCL POND	NEZP	59
06	Aug 6 2004	630189	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	76

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
06	Jul 3 2004	630189	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	75
05	Jul 18 2004	630282		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	88
05	Jul 10 2004	630398		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	66
06	Jul 16 2004	630398		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	79
05	Jul 24 2004	630398		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	80
05	Jul 31 2004	630398		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	76
05	Jul 1 2004	630668	y	2000	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	80
06	Aug 3 2004	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	75
06	Jul 3 2004	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	79
05	Jul 14 2004	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	78
06	Jul 21 2004	630669	y	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	65
05	Aug 1 2004	630678		2000	LYONS FERRY HATCHERY	SNAKE R @PITTSBURG L	NEZP	57
05	Jul 23 2004	630678		2000	LYONS FERRY HATCHERY	SNAKE R @PITTSBURG L	NEZP	53
05	Jul 31 2004	630678		2000	LYONS FERRY HATCHERY	SNAKE R @PITTSBURG L	NEZP	63
06	Jul 23 2004	630683	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	75
06	Jul 14 2004	630684	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	86
06	Jul 29 2004	630684	y	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	81
05	Jul 10 2004	630687	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	80
06	Jul 23 2004	630687	y	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	65
05	Aug 3 2004	630694	y	2000	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	77
06	Jul 27 2004	630694	y	2000	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	76
05	Jul 1 2004	630783		2000	MCALLISTER HATCHERY	MCALLISTER CR11.0324	WDFW	68
05	Jul 25 2004	630794		2000	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	68
06	Jul 25 2004	630883		2000	TUMWATER FALLS HATCH	CAPITOL LK (THUR)	WDFW	75
05	Jul 29 2004	630883		2000	TUMWATER FALLS HATCH	CAPITOL LK (THUR)	WDFW	83
05	Aug 1 2004	630889		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	51
05	Jul 16 2004	630889		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	65
05	Jul 18 2004	630889		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	55
05	Jul 30 2004	630889		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	60
05	Jul 9 2004	630891		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	54
05	Jul 16 2004	630891		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	58
05	Jul 17 2004	630891		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	53
05	Jul 25 2004	630891		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	45
05	Jul 25 2004	630891		2001	TURTLE ROCK HATCHERY	COL R @ TURTLE ROCK	WDFW	51
06	Jul 31 2004	630896		2001	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	71
05	Jul 6 2004	630996		2000	SIMILKAMEEN HATCHERY	SIMILKAMEEN R 490325	WDFW	66
05	Aug 6 2004	631272		2000	EASTBANK HATCHERY	WENATCHEE R 45.0030	WDFW	68
05	Jul 10 2004	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	66
05	Jul 11 2004	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	64
05	Jul 17 2004	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	67
05	Jul 30 2004	631273		2000	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	61
05	Jul 30 2004	631294		2001	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	63
05	Aug 3 2004	631295		2001	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	58
05	Jul 21 2004	631379		2001	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	64
05	Aug 8 2004	631380	y	2001	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	58
05	Jul 25 2004	631382		2001	PRIEST RAPIDS HATCHERY	COLUMBIA R AT PRIEST	WDFW	58
05	Jul 17 2004	631469		2001	FRIENDS OF COWLITZ	COWLITZ R 26.0002	WREG	56

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 24 2004	631548		2001	GRANT COUNTY PUD	COLUMBIA R - GENERAL	WDFW	60
05	Jul 30 2004	631549		2001	WELLS HATCHERY	COLUMBIA NEAR WELLS	WDFW	54
05	Jul 31 2004	631549		2001	WELLS HATCHERY	COLUMBIA NEAR WELLS	WDFW	55
05	Jul 31 2004	631549		2001	WELLS HATCHERY	COLUMBIA NEAR WELLS	WDFW	62
05	Aug 1 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	53
05	Jul 5 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	49
05	Jul 6 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	52
05	Jul 11 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	60
05	Jul 15 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	56
05	Jul 17 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	55
05	Jul 18 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	50
05	Jul 21 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	53
05	Jul 21 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	57
05	Jul 29 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	56
05	Jul 29 2004	631585		2001	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	53
05	Jul 18 2004	631587		2001	DRYDEN POND	WENATCHEE R 45.0030	WDFW	47
05	Jul 27 2004	631587		2001	DRYDEN POND	WENATCHEE R 45.0030	WDFW	56
05	Jul 29 2004	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	47
06	Jul 3 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	65
05	Jul 4 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
05	Jul 10 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	61
05	Jul 17 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	69
05	Jul 20 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	56
05	Jul 25 2004	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	45

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
06	Jul 1 2005	210479	y	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
05	Jul 1 2005	632167		2002	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	53
05	Jul 1 2005	631587		2001	DRYDEN POND	WENATCHEE R 45.0030	WDFW	89
05	Jul 2 2005	210407	y	2002	DUNGENESS HATCHERY	GRAY WOLF R 18.0048	WDFW	70
05	Jul 2 2005	631781		2002	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	60
05	Jul 4 2005	183224		2001	H-CLAYOQUOT	R-KENNEDY R LOW	CDFO	80
06	Jul 8 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	68
06	Jul 8 2005	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
05	Jul 8 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	59
05	Jul 9 2005	630865		2001	GORST CR REARING PND	GORST CR 15.0216	SUQ	66
05	Jul 10 2005	090119		2000	WILLAMETTE HATCHERY	BLIND SL (LWR COL R)	ODFW	82
05	Jul 12 2005	210509		2002	LUMMI SEA PONDS	NOOKSACK R 01.0120	LUMM	81
05	Jul 14 2005	630399		2000	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	69
06	Jul 15 2005	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	82
05	Jul 16 2005	631887		2002	GLENWOOD SPRINGS	EAST SOUND BAY-ORCAS	WDFW	50
05	Jul 16 2005	631545		2002	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	63
05	Jul 16 2005	631771		2002	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	73
05	Jul 16 2005	631969		2002	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	55
05	Jul 17 2005	631974		2002	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	60
05	Jul 20 2005	185527		2002	H-NANAIMO R	R-NANAIMO R	CDFO	60
05	Jul 20 2005	631789	y	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.01	WDFW	42
05	Jul 20 2005	631799		2002	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	56
05	Jul 20 2005	210485		2002	COWSKULL ACCLIM POND	COWSKULL ACCLIM POND	PUYA	69
05	Jul 20 2005	631546	y	2002	KENDALL CR HATCHERY	DEADHORSE CR 01.0495	WDFW	55
05	Jul 20 2005	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	39
05	Jul 20 2005	630890		2001	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	74
05	Jul 20 2005	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	61
05	Jul 21 2005	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	58
05	Jul 21 2005	631387	y	2002	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	59
05	Jul 21 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	64
05	Jul 21 2005	632167		2002	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	62
05	Jul 21 2005	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	62
05	Jul 21 2005	631555		2002	BIG BEEF CR HATCHERY	BIG BEEF CR HATCHERY	WDFW	57
05	Jul 21 2005	210508		2002	LUMMI SEA PONDS	LUMMI SEA PONDS	LUMM	64
05	Jul 21 2005	631784	y	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	61
05	Jul 22 2005	631414	y	2002	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	56
05	Jul 22 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
05	Jul 22 2005	631585		2001	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	66
05	Jul 22 2005	631552		2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	75
05	Jul 22 2005	631414	y	2002	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	56
05	Jul 22 2005	631548		2001	WELLS HATCHERY	WELLS DAM- CHIEF JOE	WDFW	67
05	Jul 22 2005	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	59
05	Jul 22 2005	210509		2002	LUMMI SEA PONDS	NOOKSACK R 01.0120	LUMM	70
05	Jul 22 2005	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	54
05	Jul 22 2005	062763		2002	FEATHER R HATCHERY	BENICIA	CDWR	74
05	Jul 23 2005	631776	y	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 23 2005	612659				Nez Perce		53
05	Jul 23 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	62
05	Jul 23 2005	631377	y	2001	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	84
06	Jul 23 2005	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	60
05	Jul 23 2005	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	67
05	Jul 23 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	59
05	Jul 23 2005	631553		2002	GORST CR REARING PND	GORST CR 15.0216	SUQ	65
05	Jul 23 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
05	Jul 23 2005	631007		2002	TURTLE ROCK HATCHERY	COLUMBIA R - GENERAL	WDFW	53
05	Jul 24 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	60
06	Jul 24 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	67
05	Jul 24 2005	632167		2002	LYONS FERRY HATCHERY	SNAKE R-LOWR 33.0002	WDFW	50
06	Jul 24 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
05	Jul 24 2005	631436		2001	GORST CR REARING PND	GORST CR 15.0216	SUQ	65
06	Jul 25 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	78
06	Jul 25 2005	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	83
05	Jul 26 2005	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	65
06	Jul 26 2005	631436		2001	GORST CR REARING PND	GORST CR 15.0216	SUQ	72
06	Jul 26 2005	210483	y	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	70
06	Jul 29 2005	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	71
05	Jul 29 2005	210511		2002	WHITE RIVER HATCHERY	WHITE R 10.0031	MUCK	52
05	Jul 30 2005	185660		2003	H-COWICHAN R	R-COWICHAN R UP	CDFO	49
06	Jul 30 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	70
05	Jul 31 2005	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	55
06	Aug 4 2005	636322	y	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	83
06	Aug 4 2005	631558		2002	MINTER HATCHERY	MINTER CR 15.0048	WDFW	75
05	Aug 6 2005	631375	y	2001	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	86
06	Aug 7 2005	210406		2001	LUMMI SEA PONDS	SLATER SLOUGH 1.0156	LUMM	80
05	Aug 7 2005	631377	y	2001	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	72
06	Aug 8 2005	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	73
06	Aug 8 2005	630783		2000	MCALLISTER HATCHERY	MCALLISTER CR11.0324	WDFW	68
06	Aug 8 2005	210390	y	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
05	Aug 10 2005	631887		2002	GLENWOOD SPRINGS	EAST SOUND BAY-ORCAS	WDFW	60
05	Aug 10 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	72
05	Aug 10 2005	631898		2002	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	56
05	Aug 10 2005	210402		2001	MARBLEMOUNT HATCHERY	BAKER R 03.0435	WDFW	70
05	Aug 10 2005	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	61

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 2 2006	051576		2003	SPRING CR NFH	SPRING CR 29.0159	FWS	80
05	Jul 7 2006	051764		2003	COLEMAN NFH	COLEMAN NFH	FWS	62
05	Aug 18 2006	062410		2004	FEATHER R HATCHERY	WICKLAND OIL NET PEN	CDWR	53
05	Jul 2 2006	064580		2003	MERCED R FISH FACIL.	JERSEY PT,SAN JOAQ.R	CDFG	71
05	Aug 19 2006	093752		2002	RINGOLD SPRINGS HATCHERY	COLUMBIA R - GENERAL	WDFW	83
05	Aug 12 2006	093819		2002	CEDC YOUNGS BAY NET	YOUNGS R & BAY	ODFW	88
05	Aug 20 2006	093956		2003	GARDINER CR (STEP)	UMPQUA R	ODFW	71
05	Jul 6 2006	185162	y	2003	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	62
05	Aug 12 2006	210270		2002	HOKO FALLS HATCHERY	HOKO R 19.0148	MAKA	81
05	Aug 2 2006	210479	y	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
06	Jul 19 2006	210479	y	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	81
05	Jul 21 2006	210479	y	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	69
05	Aug 19 2006	210480		2002	HOKO FALLS HATCHERY	HOKO R 19.0148	MAKA	81
05	Aug 5 2006	210483	y	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
05	Jul 16 2006	210483	y	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
05	Aug 6 2006	210484	y	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	73
06	Jul 23 2006	210506		2002	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	79
05	Aug 12 2006	210508		2002	LUMMI SEA PONDS	LUMMI SEA PONDS	LUMM	71
05	Aug 11 2006	210509		2002	LUMMI SEA PONDS	NOOKSACK R 01.0120	LUMM	74
05	Jul 14 2006	210519		2003	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	74
05	Jul 15 2006	210541		2003	MARBLEMOUNT HATCHERY	BAKER R 03.0435	WDFW	74
05	Aug 18 2006	210542		2003	WHITEHORSE POND	WHITEHORSE SPRINGS	STIL	56
05	Aug 8 2006	210546		2003	CLARKS CRK HATCHERY	CLARKS CRK HATCHERY	PUYA	53
05	Aug 11 2006	210546		2003	CLARKS CRK HATCHERY	CLARKS CRK HATCHERY	PUYA	55
05	Jul 29 2006	210546		2003	CLARKS CRK HATCHERY	CLARKS CRK HATCHERY	PUYA	52
06	Aug 19 2006	210547	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	58
06	Jul 6 2006	210547	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	69
05	Aug 6 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	63
05	Aug 6 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	57
05	Aug 8 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	55
05	Aug 12 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	51
05	Jul 26 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	71
05	Jul 29 2006	210548	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	58
05	Aug 19 2006	210558		2003	COUNTY LINE PONDS	SKAGIT R 03.0176	WDFW	59
05	Jul 11 2006	210558		2003	COUNTY LINE PONDS	SKAGIT R 03.0176	WDFW	67
05	Aug 6 2006	210559		2003	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	56
05	Aug 6 2006	210559		2003	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	57
05	Aug 18 2006	210559		2003	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	52
05	Jul 21 2006	210559		2003	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	57
05	Sep 25 2006	210588		2004	WHITEHORSE POND	WHITEHORSE SPRINGS	COOP	53
05	Aug 12 2006	210599		2004		BAKER R 03.0435	WDFW	48
05	Aug 21 2006	610147		2003	LYONS FERRY HATCHERY	CAPTAIN JOHNS PD	NEZP	55
05	Aug 23 2006	610147		2003	LYONS FERRY HATCHERY	CAPTAIN JOHNS PD	NEZP	49
06	Jul 16 2006	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	75
06	Jul 23 2006	631371	y	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	77

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 2 2006	631386		2002	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	73
05	Jul 26 2006	631386		2002	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	76
05	Aug 12 2006	631405		2001	GORST CR REARING PND	GORST CR 15.0216	SUQ	95
05	Jul 2 2006	631547		2002	CHAMBERS CR + GARRISON	CHAMBERS CR 12.0007	WDFW	81
05	Aug 4 2006	631558		2002	MINTER HATCHERY	MINTER CR 15.0048	WDFW	75
06	Jul 21 2006	631558		2002	MINTER HATCHERY	MINTER CR 15.0048	WDFW	83
05	Aug 3 2006	631769		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	55
05	Aug 5 2006	631769		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	53
05	Aug 6 2006	631769		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	56
05	Jul 7 2006	631769		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	55
4B	Jul 29 2006	631769		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	69
05	Aug 14 2006	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	78
05	Jul 15 2006	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	82
05	Jul 22 2006	631774	y	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	75
06	Aug 5 2006	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	82
05	Aug 8 2006	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	81
05	Jul 8 2006	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	87
06	Jul 16 2006	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	71
06	Aug 8 2006	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	76
06	Jul 12 2006	631780		2002	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	76
05	Jul 16 2006	631781		2002	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	65
06	Jul 16 2006	631781		2002	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	81
05	Jul 30 2006	631781		2002	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	62
05	Aug 2 2006	631783	y	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	89
05	Aug 4 2006	631784	y	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	91
06	Aug 5 2006	631784	y	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	73
05	Aug 19 2006	631789	y	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	60
05	Jul 4 2006	631789	y	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	80
05	Jul 10 2006	631798		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	85
05	Jul 27 2006	631799		2002	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	66
05	Aug 26 2006	631876		2003	HUPP SPRINGS REARING	MINTER CR 15.0048	WDFW	51
05	Aug 21 2006	631880		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	49
05	Aug 6 2006	631895	y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	58
05	Aug 20 2006	631897		2003	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	52
06	Jul 16 2006	631966		2002	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	84
05	Aug 3 2006	631977		2003	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	58
05	Aug 5 2006	631977		2003	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	57
05	Aug 8 2006	631977		2003	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	58
05	Jul 29 2006	631977		2003	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	59
05	Aug 8 2006	632277		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	65
05	Jul 29 2006	632277		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	53
05	Aug 21 2006	632278		2003	GORST CR REARING PND	GORST CR 15.0216	SUQ	54
05	Aug 12 2006	632281	y	2003	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	60
05	Aug 19 2006	632281	y	2003	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	58
05	Aug 5 2006	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	61

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Aug 21 2006	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	56
05	Aug 5 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	55
05	Aug 5 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	56
05	Aug 11 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	Aug 19 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	59
05	Jul 1 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	73
06	Jul 8 2006	632283	y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	72
05	Aug 5 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	60
05	Aug 6 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	70
05	Aug 6 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	54
05	Aug 8 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	54
05	Aug 20 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	69
05	Jul 4 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	67
05	Jul 14 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	62
4B	Jul 14 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	65
06	Jul 15 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	78
05	Jul 29 2006	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	58
05	Aug 18 2006	632368		2003	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	53
05	Aug 5 2006	632375	y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	54
05	Aug 5 2006	632375	y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	59
06	Aug 8 2006	632375	y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	67
05	Aug 14 2006	632375	y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
06	Aug 18 2006	632375	y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	76
05	Jul 7 2006	632378	y	2003	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	54
05	Aug 8 2006	632383	y	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66
05	Aug 11 2006	632383	y	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	68
05	Jul 12 2006	632383	y	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66
05	Aug 12 2006	632385		2003	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	55
05	Aug 14 2006	632385		2003	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	54
06	Aug 18 2006	632388		2003	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	79
05	Aug 12 2006	632389		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	54
05	Jul 8 2006	632389		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	52
05	Jul 30 2006	632389		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	65
05	Aug 2 2006	632471		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	58
05	Aug 11 2006	632472		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	57
05	Jul 15 2006	632472		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	55
05	Aug 18 2006	632488		2003	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	75
05	Aug 13 2006	632491		2003	PORTAGE BAY HATCHERY	PORTAGE BAY/SHIP CNL	UW	91
05	Aug 6 2006	632577		2003		COLUMBIA R - GENERAL	WDFW	50
05	Aug 21 2006	632577		2003		COLUMBIA R - GENERAL	WDFW	55
05	Aug 12 2006	632579		2003		SIMILKAMEEN R 490325	WDFW	47
05	Aug 4 2006	632580		2004		COLUMBIA R - GENERAL	WDFW	56
05	Aug 19 2006	632870		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	55
05	Aug 14 2006	051399		2002	MAKAH NFH ON SOOES R	SOOES R 20.0015	FWS	77

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 1 2007	632799		2004		COLUMBIA R - GENERAL	WDFW	75
05	Jul 14 2007	632864		2004		COLUMBIA R - GENERAL	WDFW	52
05	Jul 29 2007	632580		2004		COLUMBIA R - GENERAL	WDFW	57
05	Jul 29 2007	632864		2004		COLUMBIA R - GENERAL	WDFW	55
05	Jul 29 2007	633168		2004		SIMILKAMEEN R 490325	WDFW	54
05	Aug 4 2007	210599		2004		BAKER R 03.0435	WDFW	50
05	Aug 4 2007	632864		2004		COLUMBIA R - GENERAL	WDFW	48
05	Jul 1 2007	210520		2003	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	86
05	Jul 17 2007	210520		2003	BERNIE GOBIN HATCH	TULALIP CR 07.0001	TULA	93
06	Jul 13 2007	632786		2004	CHAMBERS CR HATCHERY	CHAMBERS CR 12.0007	WDFW	56
05	Jul 17 2007	632786		2004	CHAMBERS CR HATCHERY	CHAMBERS CR 12.0007	WDFW	64
06	Jul 27 2007	632786		2004	CHAMBERS CR HATCHERY	CHAMBERS CR 12.0007	WDFW	69
06	Aug 9 2007	632786		2004	CHAMBERS CR HATCHERY	CHAMBERS CR 12.0007	WDFW	69
05	Jul 7 2007	632996		2004	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	58
05	Jul 19 2007	633065		2004	COWLITZ SALMON HATCH	COWLITZ R 26.0002	WDFW	53
05	Aug 4 2007	632874		2004	ENDICOTT PD (LLTK)	SKOKOMISH R 16.0001	WDFW	47
05	Aug 9 2007	632468		2003	ENDICOTT PD (LLTK)	SKOKOMISH R 16.0001	WDFW	64
05	Jul 1 2007	632472		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	74
05	Jul 1 2007	632870		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	64
05	Jul 7 2007	632871		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	70
05	Jul 8 2007	632871		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	72
05	Jul 13 2007	632472		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	71
06	Jul 24 2007	632870		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	69
05	Jul 30 2007	632870		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	72
05	Aug 3 2007	632870		2004	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	75
05	Aug 9 2007	632166		2003	GARRISON HATCHERY	CHAMBERS CR 12.0007	WDFW	65
05	Jul 2 2007	632796	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	55
05	Jul 15 2007	633366	Y	2005	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	60
06	Jul 21 2007	632375	Y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	82
06	Jul 24 2007	632897	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	56
06	Jul 29 2007	632375	Y	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
06	Jul 29 2007	632897	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	58
05	Aug 3 2007	632897	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	68
06	Aug 4 2007	632897	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	77
05	Aug 9 2007	632897	Y	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
06	Jul 1 2007	632279		2003	GORST CR REARING PND	GORST CR 15.0216	SUQ	76
06	Jul 20 2007	632279		2003	GORST CR REARING PND	GORST CR 15.0216	SUQ	87
05	Jul 25 2007	632880		2004	GORST CR REARING PND	GORST CR 15.0216	SUQ	64
05	Jul 1 2007	210592	Y	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	71
05	Jul 4 2007	210592	Y	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	54
05	Jul 6 2007	210592	Y	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
05	Jul 21 2007	632283	Y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	90
06	Jul 28 2007	632283	Y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
05	Aug 3 2007	632283	Y	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	80
05	Jul 1 2007	025650		2005	H-CHEHALIS R	R-HARRISON R	CDFO	46
05	Jul 30 2007	185030	Y	2005	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	41
05	Jul 27 2007	210543		2003	HOKO FALLS HATCHERY	HOKO R 19.0148	MAKA	85

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 1 2007	632471		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	74
06	Jul 7 2007	632471		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	65
06	Jul 10 2007	632389		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	76
06	Jul 20 2007	632389		2003	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	81
06	Aug 4 2007	631777		2002	HOODSPORT HATCHERY	FINCH CR 16.0222	WDFW	87
05	Jul 19 2007	632464		2003	ICY CR HATCHERY	GREEN R 09.0001	WDFW	89
05	Jul 21 2007	632464		2003	ICY CR HATCHERY	GREEN R 09.0001	WDFW	82
06	Aug 9 2007	631864		2002	ICY CR HATCHERY	GREEN R 09.0001	WDFW	86
05	Jul 14 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	68
06	Jul 14 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	71
06	Jul 15 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	85
05	Jul 17 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	66
05	Jul 25 2007	632388		2003	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	79
05	Jul 27 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	76
05	Jul 28 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	67
05	Jul 29 2007	632388		2003	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	90
05	Jul 29 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	75
05	Jul 29 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	61
05	Aug 3 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	60
05	Aug 4 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	80
05	Aug 4 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	75
05	Aug 4 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	77
05	Aug 9 2007	632972		2004	ISSAQUAH HATCHERY	ISSAQUAH CR 08.0178	WDFW	54
06	Jul 17 2007	210598		2004	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	87
05	Aug 4 2007	210598		2004	KALAMA CR HATCHERY	KALAMA CR 11.0017	NISQ	68
05	Aug 3 2007	632785	Y	2004	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	58
05	Jul 28 2007	632978		2004	LAKEWOOD HATCHERY	CHAMBERS CR 12.0007	WDFW	56
05	Jul 1 2007	610150		2004	LYONS FERRY HATCHERY	SNAKE R@PITT. LNDG	NEZP	57
05	Jul 27 2007	633283		2004	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	52
05	Jul 28 2007	631769		2003	LYONS FERRY HATCHERY	LYONS FERRY REL.SITE	WDFW	73
05	Jul 28 2007	633283		2004	LYONS FERRY HATCHERY	SNK BLW GRANDE RHOND	WDFW	55
05	Jul 13 2007	632889	Y	2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	55
05	Aug 2 2007	632391		2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	63
05	Aug 4 2007	632391		2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	53
05	Aug 4 2007	632889	Y	2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	64
06	Jul 8 2007	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	69
06	Jul 18 2007	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	89
05	Jul 27 2007	632965		2004	MINTER HATCHERY	MINTER CR 15.0048	WDFW	71
06	Jul 28 2007	632284		2003	MINTER HATCHERY	MINTER CR 15.0048	WDFW	81
05	Aug 4 2007	632965		2004	MINTER HATCHERY	MINTER CR 15.0048	WDFW	65
06	Jul 1 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	63
05	Jul 19 2007	210548	Y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	71
05	Jul 22 2007	210548	Y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	78
06	Jul 28 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
06	Aug 3 2007	210547	Y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	80
05	Aug 3 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
06	Aug 4 2007	210547	Y	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	74

Appendix J. Continued.

Area	Recovery Date	Tag code	DIT	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Aug 4 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	70
05	Aug 9 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
06	Aug 9 2007	632783	Y	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	50
05	Jul 15 2007	109577		2005	OXBOW HATCHERY	SNAKE@ HLLS CNYON DM	IDFG	46
05	Aug 4 2007	052771		2004	QUILCENE BAY SEA PENS	QUILCENE BAY SEA PENS	SKOK	47
06	Aug 9 2007	052771		2004	QUILCENE BAY SEA PENS	QUILCENE BAY SEA PENS	SKOK	64
05	Jul 2 2007	632890		2004	RFEG 6 HOOD CANAL	HAMMA HAMMA 16.0251	WDFW	73
05	Jul 6 2007	632890		2004	RFEG 6 HOOD CANAL	HAMMA HAMMA 16.0251	WDFW	69
06	Jul 27 2007	632890		2004	RFEG 6 HOOD CANAL	HAMMA HAMMA 16.0251	WDFW	69
05	Jul 4 2007	632384	Y	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	62
05	Jul 14 2007	632383	Y	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	67
05	Jul 17 2007	632794	Y	2004	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66
05	Jul 30 2007	633369	Y	2005	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	43
06	Jul 19 2007	632378	Y	2003	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	78
06	Jul 20 2007	632967	Y	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	72
05	Jul 25 2007	632967	Y	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	81
05	Aug 9 2007	632967	Y	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	75
05	Jul 28 2007	052874	Y	2005	SPRING CR NFH	SPRING CR 29.0159	FWS	49
05	Jul 8 2007	632873		2004	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	62
05	Jul 8 2007	632873		2004	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	75
05	Jul 14 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	71
05	Jul 14 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	71
05	Jul 22 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	79
05	Jul 28 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	73
06	Jul 28 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	79
05	Jul 28 2007	633089		2004	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	68
05	Jul 30 2007	632873		2004	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	62
05	Aug 3 2007	632282		2003	TUMWATER FALLS HATCH	DESCHUTES R 13.0028	WDFW	74
06	Jul 8 2007	632385		2003	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	88
05	Jul 9 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	66
05	Jul 14 2007	632385		2003	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	72
05	Jul 15 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	67
05	Jul 19 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	74
06	Jul 21 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	73
05	Jul 25 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	61
06	Jul 28 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	72
05	Aug 3 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	81
06	Aug 3 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	68
05	Aug 4 2007	632964		2004	VOIGHTS CR HATCHERY	VOIGHT CR 10.0414	WDFW	76
05	Jul 15 2007	632876		2004	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	62
05	Jul 27 2007	632876		2004	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	59
06	Aug 9 2007	632789	Y	2004	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	54
05	Aug 9 2007	632876		2004	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	62
05	Jul 25 2007	610148						51
05	Aug 5 2007	610148						55

Appendix K. Observed harvested Chinook salmon with Double Index Tag (DIT) coded wire tags

Observed harvested Chinook salmon with Double Index Tag (DIT) coded wire tags during the Chinook Selective Fisheries in Marine Areas 5 and 6, 2003 through 2006.

Area	Recovery Date	Tag Code	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (CM)
05	Jul 21 2003	184124	1999	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	81
05	Jul 26 2003	184614	2000	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	53
05	Aug 1 2003	184916	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	56
05	Aug 1 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	68
06	Aug 3 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
06	Jul 6 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
05	Jul 13 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	Jul 25 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	88
06	Jul 25 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	54
06	Jul 26 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
05	Jul 27 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	83
06	Jul 30 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	
06	Jul 30 2003	210153	1999	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	97
06	Jul 12 2003	210166	1999	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	70
05	Jul 27 2003	210166	1999	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	72
05	Aug 2 2003	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	55
06	Aug 3 2003	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	81
05	Jul 20 2003	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	65
05	Jul 26 2003	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
05	Jul 26 2003	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	62
05	Aug 1 2003	630171	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	87
06	Aug 3 2003	630171	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	79
05	Jul 8 2003	630171	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	56
06	Jul 26 2003	630171	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	77
06	Jul 30 2003	630171	1999	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	73
06	Jul 18 2003	630173	1999	SAMISH HATCHERY	FRIDAY CR + SAMISH R	WDFW	77
06	Aug 3 2003	630189	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	73
06	Jul 6 2003	630189	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
06	Jul 18 2003	630197	1999	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	76
05	Jul 27 2003	630197	1999	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	84
05	Jul 7 2003	630668	2000	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	57
05	Jul 13 2003	630669	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	55
05	Jul 27 2003	630669	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	53
05	Aug 2 2003	630683	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	69
06	Jul 24 2003	630683	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	60
05	Jul 27 2003	630683	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	58
05	Aug 1 2003	630687	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	53
05	Jul 11 2003	630687	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	56

Appendix K. Continued.

Area	Recovery Date	Tag Code	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (CM)
5	July 24, 2004	184914	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	64
5	July 5, 2004	184916	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	63
5	July 6, 2004	184916	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	61
5	July 25, 2004	184916	2001	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	76
5	July 17, 2004	185533	2002	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	48
5	July 2, 2004	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	71
5	July 10, 2004	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
5	July 14, 2004	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
6	July 17, 2004	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
6	July 24, 2004	210279	2000	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	83
5	August 1, 2004	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
5	August 1, 2004	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	59
6	July 3, 2004	630189	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	75
5	July 1, 2004	630668	2000	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	80
5	July 14, 2004	630669	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	78
6	July 3, 2004	630669	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	79
6	July 21, 2004	630669	2000	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	65
6	July 23, 2004	630683	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	75
6	July 14, 2004	630684	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	86
6	July 29, 2004	630684	2000	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	81
5	July 10, 2004	630687	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	80
6	July 23, 2004	630687	2000	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	65
6	July 27, 2004	630694	2000	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	76
5	July 4, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
5	July 10, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	61
5	July 17, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	69
5	July 20, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	56
5	July 25, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	45
6	July 3, 2004	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	65

Appendix K. Continued.

Area	Recovery Date	Tag code	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
06	8-Jul-05	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	75
06	15-Jul-05	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	82
06	8-Aug-05	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	73
06	8-Aug-05	210390	2001	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
05	2-Jul-05	210407	2002	DUNGENESS HATCHERY	GRAY WOLF R 18.0048	WDFW	70
06	1-Jul-05	210479	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	61
06	26-Jul-05	210483	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	74
05	20-Jul-05	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	39
06	8-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	68
05	21-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	64
05	22-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
05	23-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	62
05	23-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	59
05	23-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
06	24-Jul-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
05	10-Aug-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	72
05	10-Aug-05	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	61
05	6-Aug-05	631375	2001	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	86
05	23-Jul-05	631377	2001	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	84
05	7-Aug-05	631377	2001	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	72
05	21-Jul-05	631387	2002	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	59
05	22-Jul-05	631414	2002	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	56
05	22-Jul-05	631414	2002	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	56
05	20-Jul-05	631546	2002	KENDALL CR HATCHERY	DEADHORSE CR 01.0495	WDFW	55
05	20-Jul-05	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	61
05	21-Jul-05	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	58
06	23-Jul-05	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	60
05	23-Jul-05	631776	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	21-Jul-05	631784	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	61
05	20-Jul-05	631789	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.01	WDFW	42
05	23-Jul-05	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	67
06	25-Jul-05	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	83
06	4-Aug-05	636322	2001	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	83

Appendix K. Continued.

Area	Recovery Date	Tag code	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 6 2006	185162	2003	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	62
05	Aug 2 2006	210479	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
06	Jul 19 2006	210479	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	81
05	Jul 21 2006	210479	2002	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	69
05	Aug 5 2006	210483	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
05	Jul 16 2006	210483	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
05	Aug 6 2006	210484	2002	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	73
06	Aug 19 2006	210547	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	58
06	Jul 6 2006	210547	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	69
05	Aug 6 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	63
05	Aug 6 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	57
05	Aug 8 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	55
05	Aug 12 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	51
05	Jul 26 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	71
05	Jul 29 2006	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	58
06	Jul 16 2006	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	75
06	Jul 23 2006	631371	2002	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	77
05	Aug 14 2006	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	78
05	Jul 15 2006	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	82
05	Jul 22 2006	631774	2002	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	75
05	Aug 4 2006	631784	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	91
06	Aug 5 2006	631784	2002	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	73
05	Aug 19 2006	631789	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	60
05	Jul 4 2006	631789	2003	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	80
05	Aug 12 2006	632281	2003	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	60
05	Aug 19 2006	632281	2003	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	58
05	Aug 5 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	55
05	Aug 5 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	56
05	Aug 11 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	57
05	Aug 19 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	59
05	Jul 1 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	73
06	Jul 8 2006	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	72
05	Aug 5 2006	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	54
05	Aug 5 2006	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	59
06	Aug 8 2006	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	67
05	Aug 14 2006	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	52
06	Aug 18 2006	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	76
05	Jul 7 2006	632378	2003	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	54
05	Aug 8 2006	632383	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66
05	Aug 11 2006	632383	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	68
05	Jul 12 2006	632383	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66

Appendix K. Continued.

Area	Recovery Date	Tag code	Brood Year	Rearing Hatchery	Release Site	Release Agency	Fork Length (cm)
05	Jul 28 2007	052874	2005	SPRING CR NFH	SPRING CR 29.0159	FWS	49
05	Jul 30 2007	185030	2005	H-CHILLIWACK R	R-CHILLIWACK R	CDFO	41
06	Aug 3 2007	210547	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	80
06	Aug 4 2007	210547	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	74
05	Jul 19 2007	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	71
05	Jul 22 2007	210548	2003	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	78
05	Jul 1 2007	210592	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	71
05	Jul 4 2007	210592	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	54
05	Jul 6 2007	210592	2004	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	79
05	Jul 21 2007	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	90
06	Jul 28 2007	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	78
05	Aug 3 2007	632283	2003	GROVERS CR HATCHERY	GROVERS CR HATCHERY	SUQ	80
06	Jul 21 2007	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	82
06	Jul 29 2007	632375	2003	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
06	Jul 19 2007	632378	2003	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	78
05	Jul 14 2007	632383	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	67
05	Jul 4 2007	632384	2003	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	62
06	Jul 1 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	63
06	Jul 28 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
05	Aug 3 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	62
05	Aug 4 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	70
05	Aug 9 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	67
06	Aug 9 2007	632783	2004	NISQUALLY HATCHERY	CLEAR CR 11.0013C	NISQ	50
05	Aug 3 2007	632785	2004	KENDALL CR HATCHERY	NOOKSACK R -NF 01.0120	WDFW	58
06	Aug 9 2007	632789	2004	WALLACE R HATCHERY	WALLACE R 07.0940	WDFW	54
05	Jul 17 2007	632794	2004	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	66
05	Jul 2 2007	632796	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	55
05	Jul 13 2007	632889	2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	55
05	Aug 4 2007	632889	2004	MARBLEMOUNT HATCHERY	CASCADE R 03.1411	WDFW	64
06	Jul 24 2007	632897	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	56
06	Jul 29 2007	632897	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	58
05	Aug 3 2007	632897	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	68
06	Aug 4 2007	632897	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	77
05	Aug 9 2007	632897	2004	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	63
06	Jul 20 2007	632967	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	72
05	Jul 25 2007	632967	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	81
05	Aug 9 2007	632967	2004	SOOS CREEK HATCHERY	BIG SOOS CR 09.0072	WDFW	75
05	Jul 15 2007	633366	2005	GEORGE ADAMS HATCHRY	PURDY CR 16.0005	WDFW	60
05	Jul 30 2007	633369	2005	SAMISH HATCHERY	FRIDAY CR 03.0017	WDFW	43

Appendix L. Estimated mortality of unmarked DIT Chinook due to catch and release mortality

Observed number of Double Index Tagged (DIT) Chinook kept by anglers, and the estimated mortality of unmarked DIT Chinook due to catch and release mortality, during the Chinook Selective Fisheries in Marine Areas 5 and 6, 2003 through 2006.

2003 Recoveries

Hatchery	Brood Year	DIT Tagged fish Observed	Estimated Harvest of Marked DIT fish	Estimated Angler Releases of UnMarked DIT fish	Estimated Mortality of Unmarked DIT fish	Variance of Estimated Mortality of DIT Fish	Standard Error of Estimated Mortality of DIT Fish
George Adams	2000	3	11.42	11.34	1.13	0.32	0.57
Grovers Creek	1999	10	35.16	35.05	3.51	0.98	0.99
Grovers Creek	2000	5	19.78	20.05	2.01	0.61	0.78
Chilliwack	1999	1	4.07	4.00	0.40	0.12	0.35
Chilliwack	2000	1	4.07	4.08	0.41	0.13	0.35
Chilliwack	2001	1	4.18	4.10	0.41	0.13	0.36
Marblemount	1999	2	6.54	6.66	0.67	0.17	0.41
Nisqually	1999	2	7.47	7.32	0.73	0.14	0.37
Nisqually - A	2000	2	4.95	5.36	0.54	0.09	0.31
Nisqually - B	2000	2	9.90	9.78	0.98	0.39	0.63
Samish	1999	1	2.48	2.54	0.25	0.04	0.20
Soos Creek	1999	5	19.08	19.52	1.95	0.62	0.79
Soos Creek	2000	2	8.71	9.08	0.91	0.36	0.60
Wallace	2000	1	5.71	5.84	0.58	0.28	0.53
Total		38			14.47		

Appendix L. Continued.

2004 Recoveries

Hatchery	Brood Year	DIT Tagged fish Observed	Estimated Harvest of Marked DIT fish	Variance of Estimated Harvest of Marked DIT Fish	Estimated Angler Releases of Unmarked DIT fish	Estimated Mortality of Unmarked DIT fish	Variance of Estimated Mortality of Unmarked DIT Fish	Standard Error of Estimated Mortality of Unmarked DIT Fish
George Adams	2000	3	7.1	10.02	7.2	0.7	0.1	0.32
George Adams	2001	6	22.6	70.03	21.2	2.1	0.62	0.79
Grovers Creek	2000	6	19.2	50.86	19.4	1.9	0.52	0.78
Grovers Creek	2001	2	7.5	20.49	7.5	0.8	0.21	0.45
Chilliwack	2001	4	15.0	41.8	14.7	1.5	0.4	0.63
Chilliwack	2002	1	3.8	10.93	3.8	0.4	0.11	0.33
Marblemount	2000	2	7.6	24.14	7.6	0.8	0.24	0.49
Nisqually A	2000	1	1.7	1.24	1.9	0.2	0.01	0.12
Nisqually B	2000	3	7.6	12.61	7.7	0.8	0.13	0.36
Soos Creek	2000	4	9.7	16.62	10.1	1.0	0.18	0.43
Wallace	2000	1	5.5	24.22	5.6	0.6	0.25	0.5
Wallace	2001	1	5.0	19.62	4.9	0.5	0.19	0.44
Total		34				11.2		

Appendix L. Continued.

2005 Recoveries

Hatchery	Brood Year	DIT Tagged fish Observed	Estimated Harvest of Marked DIT fish	Variance of Estimated Harvest of Marked DIT Fish	Estimated Angler Releases of Unmarked DIT fish	Estimated Mortality of Unmarked DIT fish	Variance of Estimated Mortality of Unmarked DIT Fish	Standard Error of Estimated Mortality of Unmarked DIT Fish
Dungeness	2002	1	2.51	3.78	2.43	0.24	0.04	0.19
George Adams	2001	3	12.02	44.23	11.27	1.13	0.39	0.97
George Adams	2002	9	27.43	61.40	27.32	2.73	0.61	2.23
Grovers Creek	2001	4	8.25	9.74	8.26	0.83	0.10	0.59
Grovers Creek	2002	2	5.63	11.62	5.50	0.55	0.11	0.44
Kendall Creek	2002	1	3.65	9.67	3.71	0.37	0.10	0.32
Kendall Creek	2003	1	3.65	9.67	4.46	0.45	0.14	0.38
Marblemount	2002	2	7.30	19.34	7.33	0.73	0.19	0.62
Nisqually	2002	1	6.17	31.93	6.92	0.69	0.40	0.63
Nisqually	2003	1	3.65	9.67	3.60	0.36	0.09	0.31
Samish	2001	2	6.08	13.13	5.94	0.59	0.13	0.49
Samish	2002	3	9.13	20.87	9.23	0.92	0.21	0.75
Soos Creek	2001	1	2.43	3.46	2.21	0.22	0.03	0.17
Soos Creek	2002	1	3.65	9.67	3.81	0.38	0.11	0.32
Wallace River	2002	1	3.65	9.67	3.72	0.37	0.10	0.32
Total		33	105.19		105.70	10.57		

Appendix L. Continued.

2006 Recoveries

Hatchery	Brood Year	DIT Tagged fish Observed	Estimated Harvest of Marked DIT fish	Variance of Estimated Harvest of Marked DIT Fish	Estimated Angler Releases of Unmarked DIT fish	Estimated Mortality of Unmarked DIT fish	Variance of Estimated Mortality of Unmarked DIT Fish	Standard Error of Estimated Mortality of Unmarked DIT Fish
George Adams	2002	2	5.99	12.03	5.97	0.60	0.12	0.49
George Adams	2003	5	20.23	62.09	20.15	2.01	0.62	1.75
Grovers Creek	2002	3	10.28	26.03	10.07	1.01	0.25	0.85
Grovers Creek	2003	6	24.09	73.40	22.60	2.26	0.64	1.96
Chillawack	2003	1	4.85	18.66	4.57	0.46	0.17	0.41
Kendall Creek	2003	2	9.11	32.53	8.97	0.90	0.32	0.79
Nisqually	2002	3	12.34	38.55	13.39	1.34	0.45	1.16
Nisqually	2003	8	31.35	92.62	30.88	3.09	0.90	2.66
Samish	2002	3	11.27	31.63	11.38	1.14	0.32	0.97
Samish	2003	3	10.40	25.83	10.24	1.02	0.25	0.86
Soos Creek	2002	2	8.41	26.94	8.78	0.88	0.29	0.77
Soos Creek	2003	1	4.85	18.66	4.86	0.49	0.19	0.43
Wallace River	2003	2	7.55	21.39	7.43	0.74	0.21	0.64
Total		41	160.7		159.28	15.93		

Appendix L. Continued.

2007 Recoveries

Hatchery	Brood Year	DIT Tagged fish Observed	Estimated Harvest of Marked DIT fish	Variance of Estimated Harvest of Marked DIT Fish	Estimated Angler Releases of Unmarked DIT fish	Estimated Mortality of Unmarked DIT fish	Variance of Estimated Mortality of Unmarked DIT Fish	Standard Error of Estimated Mortality of Unmarked DIT Fish
George Adams	2003	2	3.45	2.50	3.47	0.35	0.03	0.22
George Adams	2004	5	15.43	49.71	15.50	1.55	0.50	1.26
George Adams	2005	1	5.43	24.08	5.43	0.54	0.24	0.49
Grovers Creek	2003	3	10.98	36.11	11.87	1.19	0.42	1.01
Grovers Creek	2004	3	8.56	17.43	7.58	0.76	0.14	0.61
Chillawack	2005	1	3.78	10.52	6.09	0.61	0.27	0.52
Kendall Creek	2004	1	3.78	10.52	5.45	0.55	0.22	0.47
Marblemount	2004	2	9.21	34.59	9.43	0.94	0.36	0.83
Nisqually	2003	4	14.30	50.95	14.60	1.46	0.53	1.23
Nisqually	2004	6	19.83	62.42	19.72	1.97	0.62	1.63
Samish	2003	1	5.43	24.08	5.56	0.56	0.25	0.50
Samish	2004	1	5.46	24.30	5.31	0.53	0.23	0.48
Samish	2005	1	3.78	10.52	4.17	0.42	0.13	0.36
Soos Creek	2003	1	1.71	1.21	1.71	0.17	0.01	0.11
Soos Creek	2004	3	11.38	43.66	11.40	1.14	0.44	0.97
Spring Creek	2005	1	3.20	7.02	3.18	0.32	0.07	0.26
Wallace River	2004	1	2.53	3.86	2.54	0.25	0.04	0.20
Total		37	128		133	13		