Regional Operational Plan SF.1J.2013.11

2013 Southeast Alaska Marine Boat Sport Fishery Harvest Studies

by

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June 2013

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$log_{2,}$ etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN SF.1J.2013.11

2013 SOUTHEAST ALASKA MARINE BOAT SPORT FISHERY HARVEST STUDIES

by

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Division of Sport Fish

June 2013

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Plan Type:	Category III

Approval

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PURPOSE

The primary purpose of this project is to estimate the harvest of Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, and Pacific halibut *Hippoglossus stenolepis* for the marine boat sport fisheries in Southeast Alaska, and secondarily for rockfish *Sebastes spp.* and lingcod *Ophiodon elongata* (Figures 1–3). These fisheries are diverse and effort is mostly concentrated around the major communities of Juneau, Ketchikan, Sitka, Wrangell, and Petersburg. Substantial effort is also expended near remote fishing lodges and smaller communities throughout the region such as Craig/Klawock, Gustavus, Elfin Cove, and Yakutat. The data needs and impetus for management of all these species varies. [1]

The generalized approach is to survey sport anglers and sample their catches at primary access points such as harbors and boat launches, and use these data together with the Statewide Harvest Survey (SWHS)[2] to estimate desired parameters. For example, relative to Chinook salmon the state has an obligation to estimate the contribution of hatchery and wild stocks originating from Southeast Alaska, Canada, and the Pacific Northwest under the US/Canada Pacific Salmon Treaty (Public Law 99-5), so identification of coded wired tags (CWT) is critical. The sport charter harvest of Pacific halibut is managed under a guideline harvest level (GHL) adopted by the North Pacific Fisheries Management Council (NPFMC) and port sampling provides essential data on lengths and average weights needed for estimating harvested biomass by guided and unguided fishers. Harvest per unit effort (HPUE) for coho salmon in the Juneau and Ketchikan marine sport fisheries is used to monitor the relative abundance and movement of coho salmon to inside waters from early June to September depending on the strength of the run, and the Juneau HPUE is specifically cited in 5 AAC 29.110 (Management of Coho Salmon Troll Fishery).

The information needed for managing these diverse fisheries require on-site sampling of the select characteristics of each fishery, such as lengths of Pacific halibut, CWTs from Chinook salmon, and rockfish species composition. The Statewide Harvest Survey (SWHS) provides total estimates of the harvest (and catch) of the corresponding sport fisheries, but as an off-site annual mail survey of participating households it cannot provide accurate estimates of these types of parameters. The general study design approach for this project is to estimate proportions or averages of the specific elements of each fishery (e.g., proportion of the harvest of Chinook salmon that are from Alaskan hatchery production) and apply these proportions and averages to the corresponding estimate from the SWHS. The following subsections describe the primary information needs that this on-site harvest studies project provides.

BACKGROUND

The Marine Harvest Studies Program has not undergone any major revisions since being overhauled prior to the 2011 sampling season. In 2011, however, the survey procedures for the Marine Harvest Studies Program were redesigned for the major ports of Juneau, Ketchikan, and

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[1] An expanded version of this introduction purpose statement and the backround section, which includes historical and management data, is included in Appendix A1.

[2] The annual mail survey of licensed sport anglers in Alaska conducted by ADF&G, Division of Sport Fish.

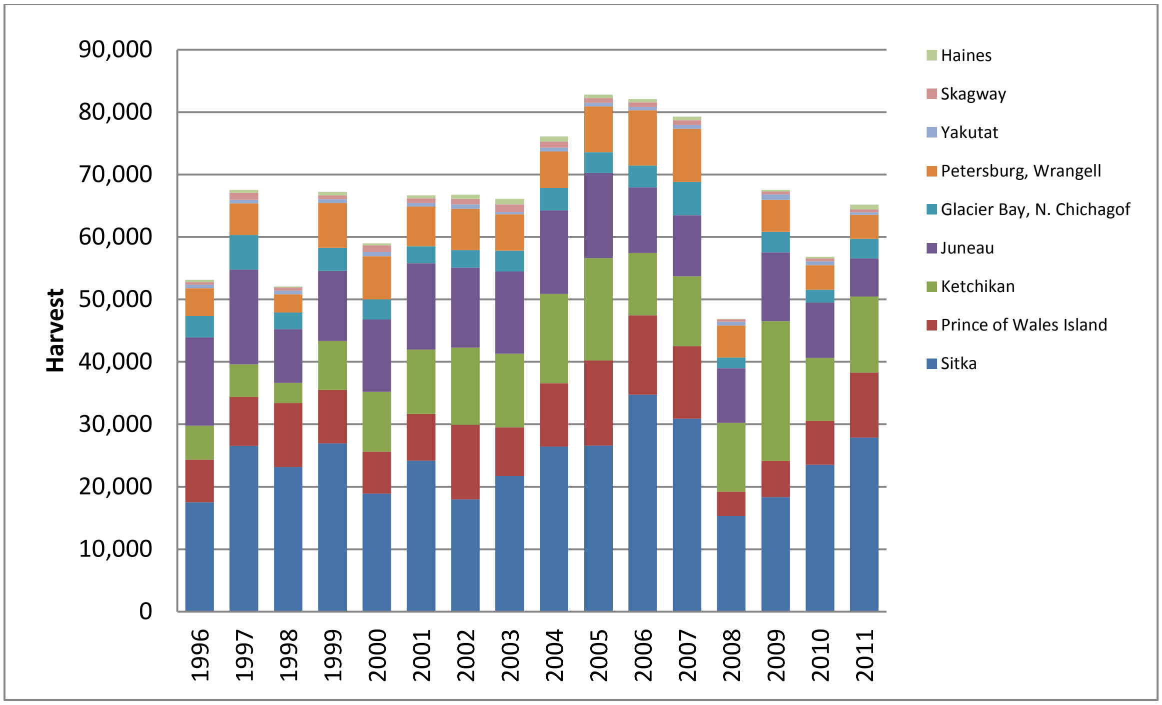

Figure 1.–Recreational Chinook salmon harvest in Southeast Alaska, 1996-2011 (Howe et al. 2001 a–d; Walker et al. 2003; Jennings et al. 2004, 2006 a–b, 2007, 2009 a–and b, 2010 a–b, 2011a–b, and *in prep*).

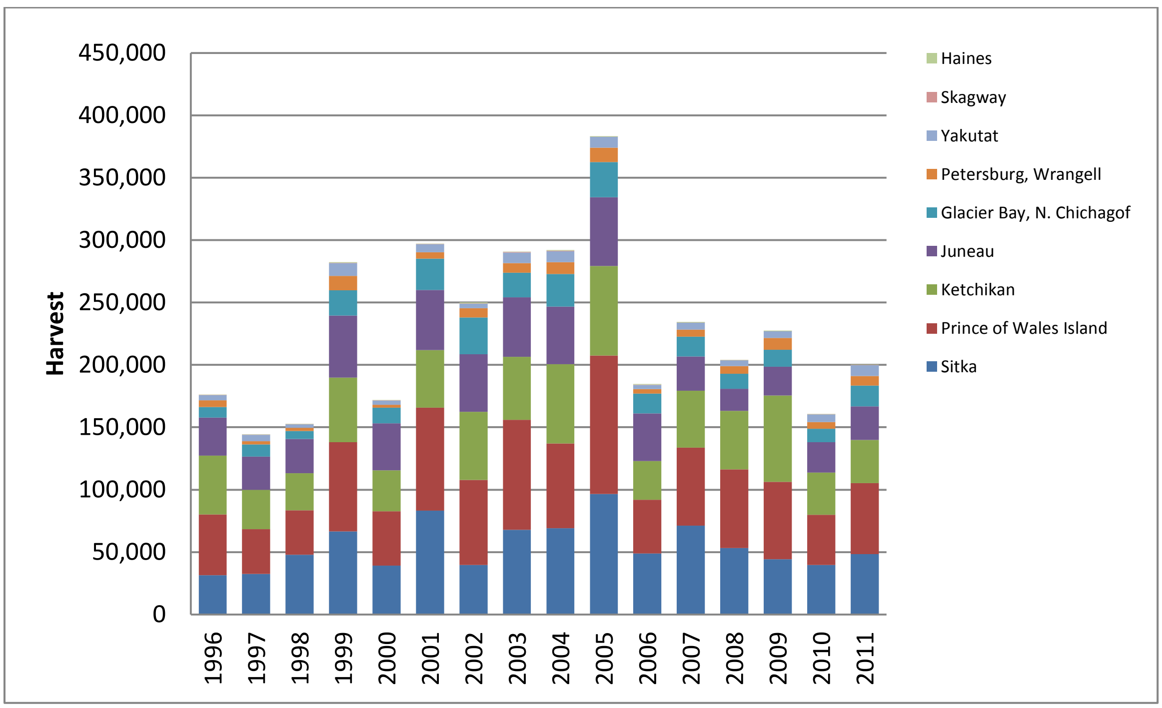

Figure 2.–Recreational coho salmon harvest in Southeast Alaska, 1996-2011 (Howe et al. 2001 a–d; Walker et al. 2003; Jennings et al. 2004, 2006 a–b, 2007, 2009 a–b, 2010 a–b, 2011 a–b, and *in prep*).

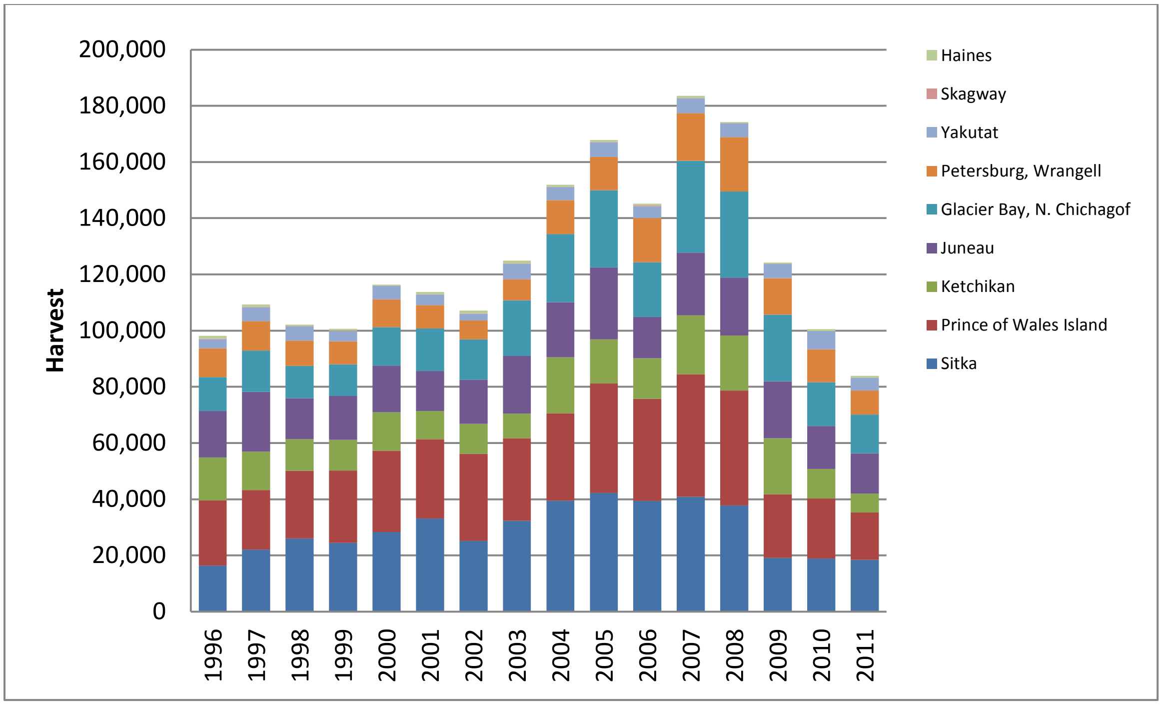

Figure 3.–Recreational Pacific halibut harvest in Southeast Alaska, 1996-2011 (Howe et al. 2001 a–d; Walker et al. 2003; Jennings et al. 2004, 2006 a–b, 2007, 2009 a–b, 2010 a–b, 2011 a–b, and *in prep*).

Sitka, along with some adaptations to survey procedures in the minor ports. The redesign was prompted not only to fit the project within then current budgetary constraints, but also to address the changing nature of the types of information needed for managing the marine boat sport fisheries in Southeast Alaska. Correspondingly, the SWHS also underwent a redesign for the 2011 season. Due to the nature of the underlying procedure for obtaining the preliminary SWHS estimates associated with the primary objectives for this project (see the Objectives section below), the values obtained by the project for 2013 are expected to be subject to unknown error that will not be evident until completion of at least three paired SWHS and on-site harvest sampling data with the two new designs (see additional details regarding these constraints in the Study Design subsection).

This operational plan represents the planning conducted to date to implement the design of the project for 2013. The plan documents the study design, sample size goals, sampling schedules, data collection and recording protocols to be implemented for the 2013 survey. The data reduction and data analysis procedures presented herein are likely to be revised as further planning and analysis (e.g., comparing the sampling design with past-year data) is continued following the initiation of field activities in late April.

Chinook Salmon

Chinook salmon are the species of fish most preferred and targeted by sport anglers fishing in Southeast Alaska (Schwan 1984). Although Chinook salmon are available year round in Southeast Alaska, effort for (and harvest of) Chinook salmon in marine sport fisheries increases rapidly in May with the arrival of maturing fish. Harvests of Chinook salmon generally decline rapidly in July, although sometimes substantial numbers of Chinook salmon are taken in Juneau, Ketchikan, and Sitka in July, August, and September. Many of the fish taken later in the season are immature Chinook salmon known as “feeders”, which rear in Southeast Alaska waters.

The Alaska Board of Fisheries (BOF) continues to allocate 20% of the combined commercial troll and sport US/Canada Pacific Salmon Treaty (Public Law 99-5) catch quota for Chinook salmon to the Southeast Alaska sport fishery. (see Appendix A1 for history of Chinook salmon management in Southeast Alaska).

The harvest estimates from the annual mail survey of licensed sport anglers in Alaska (SWHS) produces harvest estimates for any particular year sometime after June the following year. This project will provide preliminary projections of the final estimates that will be derived following the publication of the annual SWHS mail survey harvest estimates. The projections are calculated by multiplying observed catch and harvest in each sampled port by an expansion factor for each SWHS area (expansion factors are derived from the ratios of past final SWHS estimates and observed on-site statistics).

A preliminary estimate of the annual Southeast Alaska “treaty” Chinook sport harvest from onsite survey data is also provided to the Pacific Salmon Commission in October of the year of the estimate as a preliminary number for accounting purposes (hereafter referenced as ‘Pacific Salmon Treaty harvest’). These preliminary estimates are derived from combining the preliminary harvest estimates with information from sampling of the Chinook harvest for the absence of an adipose fin, indicating the presence of a CWT. The proportion of Alaska hatchery stocks as estimated from the CWT information is multiplied by the preliminary total harvest to obtain the preliminary Pacific Salmon Treaty harvest. Additionally, estimates of preliminary contributions by CWT lot for non-Alaska hatcheries as well as a few tagged wild stocks are also obtained by this project.

Data useful for management of Chinook stocks in specific areas are also collected. For example, managers for the Taku River and Stikine River fisheries use inseason harvest information to monitor the return used for management as a transboundary river. Accordingly, weekly estimates of the Pacific Salmon Treaty harvest will be estimated by this project for District 8[3] in the Petersburg/Wrangell area associated with the Stikine River, and District 11 in the Juneau area associated with the Taku River.

In addition, data on age composition of Chinook salmon taken in the spring in Juneau, Ketchikan, Petersburg, and Wrangell will be gathered for sibling models used in projections for Pacific Salmon Treaty and other stocks.

The genetic stock identification of Chinook salmon being harvested by the various fisheries in Southeast Alaska is a management tool being evaluated by the Pacific Salmon Commission. Accordingly, genetic structures will be collected in a number of fisheries to address this evaluation. Additionally, heads will be collected for otoliths in Sitka and Craig/Klawock as part of this stock identification effort.

A popular shoreline fishery for Chinook salmon occurs at False Outer Point near Juneau in the spring. Gathering CWTs from this fishery will provide additional baseline data for stock composition of this fishery as well as provide additional recoveries of tagged wild Taku River

[3] Districts reference the Commercial Salmon Districts.

stocks. Accordingly, this one shoreline fishery will be surveyed in a manner similar to sampling boat access locations at the various ports.

COHO SALMON

Estimates of Alaska hatchery contributions for coho salmon harvested in the sport fisheries in Juneau, Ketchikan, Sitka, Craig/Klawock, Petersburg, Wrangell, Gustavus, Elfin Cove, and Yakutat are also calculated for evaluation of enhancement projects. Additionally, recovery of tagged indicator stocks of wild coho salmon may be expected, especially in the Juneau fishery from wild stock tagging programs at Auke Creek and in the Taku and Berners river drainages, and in the Ketchikan fisheries from a tagging project in the Hugh Smith drainage.

Coho salmon harvest rates by the marine sport fisheries are an important tool for management of this fishery. Harvest per unit effort (HPUE) for coho salmon in the Juneau and Ketchikan marine sport fisheries is used to monitor the relative abundance and movement of coho salmon to inside waters from early June to September depending on the strength of the run, and the Juneau HPUE is specifically cited in 5 AAC 29.110 (Management of Coho Salmon Troll Fishery). Coho HPUE statistics are used along with fishery performance information from the commercial fisheries and early season escapement estimates to assist managers with inseason management. Measures of sport HPUE may be somewhat biased because of the way data are reported during an interview and should be used with caution to implement management measures in a fishery. Nonetheless, HPUE can still be quite useful to both managers.

OTHER SPECIES

Harvests of other fish species occur within most of the surveyed fisheries and estimates of these harvests are also important for management and informational purposes. Some of the management needs for these other species are as follows.Sport charter harvest of Pacific halibut is managed under a GHL adopted by the NPFMC. Average weights in the sport harvest are needed to estimate removals in weight units for purposes of stock assessment and management. Estimates of fishery parameters obtained by this project will be forwarded to the project staff for the operational plan entitled “Statewide Pacific halibut harvest estimation”. That project will combine the average weights for both components of the fishery (guided and unguided) from this on-site sampling project with estimates from the SWHS and logbooks to obtain estimates and projections of sport halibut removals in biomass units for both the NPFMC and the International Pacific Halibut Commission (IPHC). Additionally, release information for halibut is provided to the statewide Pacific halibut project for use in estimating total mortalities. The data provided by this program will be utilized by the statewide Pacific halibut project to help assess the performance of the regulation while simultaneously addressing contemporary assumptions about halibut discard mortality rates in the Southeast Alaska halibut sport fishery. Finally, a proportion of the unguided halibut harvest that occurs prior to the mean IPHC survey date is also provided as requested by the IPHC.

For demersal shelf rockfish (DSR), this program will calculate average weights of the sport fishery harvest for the NPFMC using length-weight relationships developed from previous sport-harvested DSR species in Southeast Alaska. The seven DSR species are yelloweye *Sebastes ruberrimus*) quillback *S. maliger* copper *S. caurinus*, canary *S. pinniger*, tiger *S. nigrocinctus*, China *S. nebulosus*, and rosethorn *S. helvomaculatus*. Numbers of DSR released will also be recorded by species. The average weight estimates will be combined with projections of the total catch from the SWHS (in a similar manner as noted above for Chinook salmon), to obtain preliminary estimates of the biomass of removals of DSR for the fisheries of concern.

Additionally, species composition of the rockfish harvest in all ports will be estimated, and an estimate of the percent of change of yelloweye rockfish harvested (from previous years) by the beginning of August in the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat will be obtained for inseason management purposes.

In 2012 the BOF enacted a regulation making the release of rockfish at depth mandatory for guided anglers for the 2013 sport fishing season. The Marine Harvest Studies Program will, during the 2013 sampling season, assess what proportion of *unguided* anglers currently utilize deepwater release devices when releasing rockfish. Guided anglers should all be using devices. In addition to providing the Marine Harvest Studies Program with an estimate of current use, it will allow ADF&G personnel to provide anglers with education and information in regard to the use of release devices, and their ecological/biological and utilitarian value in the management of rockfish species.

For lingcod, this program will calculate average weights of the sport fishery and report them to the BOF and Division of Commercial Fisheries. Sport harvests (in numbers) of lingcod will continue to be monitored by the SWHS, but stocks will be managed by the estimated weight of the sport harvest in relation to lingcod management area quotas. Therefore, methods to estimate the average round weight of lingcod harvested in outer coast sport fisheries (Craig/Klawock, Sitka, Gustavus, Elfin Cove, and Yakutat) will be conducted.. The average weight estimates will be combined with projections of the total harvest from the SWHS to obtain preliminary estimates of the biomass of removals of lingcod for the fisheries of concern. In 2013, numbers of released lingcod will continue to be recorded to calculate CPUE that may be used to determine population trends.

The sablefish sport harvest is relatively small. However, some stocks of sablefish exploited by multiple Southeast Alaska fisheries may need to be managed conservatively. Accordingly, when sablefish are observed at the various ports surveyed by this project they will be measured for length and their numbers recorded as a baseline information tool.

Documenting fish released during an interview can sometimes produce statistics that are likely biased due to poor recall from a recently completed trip in comparison with data collected on the number of fish harvested, which a creel technician can usually confirm during the interview. However, if the number of fish released is low, then the number is believed to be more reliable. In 2013, numbers of released large and small Chinook, halibut, lingcod, and rockfish by species (or by species grouping) will be recorded to estimate mortality that can be used to estimate total removals by sport fisheries.

OBJECTIVES

PRIMARY OBJECTIVES

Unless otherwise stated, objectives are for all ports surveyed for the duration that the survey is in the port. Ports, dates, and associated objectives are as follows:

Port	Start date	End date	Objectives addressed by port
Juneau	April 29, 2013	September 15, 2013	1–5, 7, and 8
	April 29, 2013	September 15, 2013	1 and 3–8
Sitka, Ketchikan			
Petersburg, Wrangell	April 29, 2013	September 1, 2013	1–5, 7, and 8
Yakutat	April 29, 2013	September 1, 2013	1 and 3–8
Craig/Klawock Elfin Cove, Gustavus	May 6, 2013	September 1, 2013	1 and 3–8
Juneau-False Outerpoint Shoreline	April 15, 2013	May 31, 2013	1, 8

The objectives for the 2013 project include the following:

1. Estimate the preliminary 2013 values[4] of the following characteristics of the Chinook salmon harvest in Southeast Alaska:
    a. total sport harvest,
    b. relative and total Alaska hatchery and non-Alaska hatchery contributions, and
    c. Pacific Salmon Treaty harvest;

    with a precision of ±20 percentage points under 90% confidence for the estimate of relative Alaska hatchery contribution for each port.[5]
2. Estimate the early season (late April to mid July) Chinook Pacific Salmon Treaty harvest for Commerical Salmon Districts 8 (Petersburg/Wrangell) and 11 (Juneau)[6].
3. Estimate the preliminary 2013 values of the following characteristics of the coho salmon harvest in Southeast Alaska:
    a. total sport harvest, and
    b. relative and total Alaska hatchery and non-Alaska hatchery contribution;

    with precisions of ±20 percentage points under 90% confidence for the relative contribution estimates by coded wire tag lot for each port[7].
4. Estimate the average net weight of the harvest of Pacific halibut by guided and unguided anglers at each port, with relative precision of ±20% under 90% confidence for each user group at each port.

[4] The 'preliminary values' references that the estimates desired are projections of the final estimates that will be derived following the publication of the annual SWHS mail survey harvest estimates.

[5] The 2011–2013 project involve a relatively major redesign of survey procedures from previous years for the major ports of Juneau, Ketchikan, and Sitka. It is anticipated that following the completion of the 2011–2013 surveys, and the publication of the corresponding 2011–2013 SWHS harvest estimates, that objective criteria for the (a) total harvest, (b) total Alaska hatchery contributions, and (c) Pacific Salmon Treaty harvest will be determined. Only the relative Alaska hatchery contribution estimates are fully set by the sampling rates in the current project, and hence the reason for only listing that objective criteria for this year's plan.

[6] The precision realized from achieving objective 1 will suffice for the goal precision for this objective.

[7] Similar to the objective criterion associated with Chinook salmon harvest characteristics, for 2013 only the relative contribution estimates are fully set by the sampling rates in the current project.

5. Estimate the proportion of the Pacific halibut harvested by unguided anglers prior to the mean IPHC survey date[8], with a precision of ±20 percentage points under 90% confidence.
6. Estimate the average weight and preliminary biomass of the sport harvest of lingcod by guided and unguided anglers in Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat, such that the relative precision for the estimated average weight of the harvest at each port is:
    a. ±20% under 80% confidence for the harvest by unguided anglers,
    b. ±10% under 90% confidence for the harvest by guided anglers, and
    c. ±10% under 90% confidence for the harvest by all anglers.
7. Estimate the preliminary 2013 values of the following characteristics of the rockfish harvest:
    a. biomass of total sport removals (harvest and release mortality) for DSR from the Southeast Outside District (Craig/Klawock, Sitka, Gustavus, Elfin Cove, and Yakutat combined) for each user group (guided and unguided),
    b. species composition for all rockfish harvested by guided and unguided anglers at each port, and
    c. average weight by species for rockfish harvested by guided and unguided anglers at each port;

    with a relative precision of ±20% under 90% confidence for the estimate of average weight by species for each port.
8. Estimate the proportion of the catch of Chinook salmon (both <28 in and ≥28 in), rockfish (yelloweye, other DSR, slope, and pelagic), halibut, and lingcod released by species or species grouping.[9]

SECONDARY OBJECTIVES

In addition to meeting the primary objectives listed above, there are a number of secondary objectives that will address additional management needs. For example, the genetic stock identification of Chinook salmon being harvested by the various fisheries in Southeast Alaska is a management tool being evaluated by the Pacific Salmon Commission. Accordingly, genetic structures will be collected in a number of fisheries to address this evaluation, and heads will be collected for otoliths in Sitka and Craig/Klawock as part of this stock identification effort (i.e., Secondary Objective 1).

[8] Each year the IPHC conducts a longline survey of the Pacific halibut stock. The survey utilizes numerous stations in IPHC Area 2C and takes many days to complete. Harvest that occurs prior to the survey has the potential to affect the survey catch. Therefore, the IPHC annually requests estimates of the proportions of charter and noncharter harvest that occurred prior to the average survey date. These estimates, along with similar estimates from the commercial fishery, are used to standardize the longline survey abundance index to account for variation in the amount of harvest prior to the mean date of the survey.

[9] The precision realized from achieving the objective criterion for estimates of the preliminary harvest (previous objectives) will suffice for the goal precision for the estimated proportion of the catch released by the various species or species groupings for this objective.

To fulfill these management needs, the secondardy objectives include:

1. Collect genetic tissue samples (axillary appendage clips) and corresponding age structures (scales) from Chinook salmon harvested at all sampled ports (with a targeted sampling rate that is proportional to the observed harvest), and provide the proportion of the observed harvest sampled each week to the ADF&G Genetics Laboratory. In addition, the corresponding heads from the sampled Chinook salmon will be collected in Sitka and Craig/Klawock for stock identification purposes (via otoliths).
2. Report the coho salmon weekly HPUE, cumulative HPUE, and a seasonal summary of trends in Juneau to Division of Commercial Fisheries troll biologists June 15 through end of July.
3. Estimate the length composition of Pacific halibut harvested by guided and nonguided anglers at all sampled ports every 2 to 3 years.
4. Estimate the proportion of released Pacific halibut within each of the three following length categories: (a) length ≤45 in, (b) length >45 in and <68 in, or (c) length ≥68 in.
5. Project the 2013 preliminary harvest of lingcod by August 7 in the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat.[10]
6. Project the 2013 preliminary harvest of yelloweye rockfish by August 7 in the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat.
7. Measure lengths from all sablefish observed during interviews conducted at all surveyed ports, and track the catch (i.e., harvest and release) of sablefish in the Southeast Alaska sport fishery.
8. Collect species composition of the harvest information from all fisheries sampled.
9. Estimate the proportion of unguided boat trips that utilize deepwater release devices in the release of at least one rockfish during trips when rock fish were released. Provide the angling public with information and educational material related to the use of deepwater release devices.

METHODS

Due to the nature of the underlying procedure for obtaining the preliminary values for the final estimates associated with the primary objectives for this project, the values obtained by the project this year are expected to remain subject to unknown error that will not be evident until completion of at least 3 years (with the inclusion of the 2011 sampling) of paired SWHS and on-site harvest sampling data collected under the two new designs. It is anticipated that following the completion of at least 3 years of on-site surveys with the new design (the 2011–2013 surveys) and the publication of the corresponding SWHS harvest estimates, the expansion factors

[10] Preliminary estimates of the percent change in harvest of lingcod and yelloweye rockfish in the noted ports (Secondary Objectives 6 and 7), will be calculated by combining separate estimates for the guided and unguided components of the fishery, and utilized for inseason management purposes.

used to obtain the preliminary values of desired parameter estimates will be directly obtained from the pairing of final SWHS estimates and observed on-site data for the previous years[11].

The primary objectives for this project are generally aimed at obtaining the preliminary values of estimates of desired parameters (e.g., Pacific Salmon Treaty harvest). However, the estimates of these parameters will eventually be calculated using the information from the SWHS, which will serve as the final 'official' estimates for each parameter. Accordingly, the estimates of such parameters as relative Alaska hatchery contribution for Chinook salmon by port, average weight of lingcod harvested by port, etc. are directly impacted by the sampling rates outlined below. The sampling error for these intrinsic (to this project) parameter estimates will directly impact the overall error of the preliminary estimates, as well as the final 'official' estimates. Within this operational plan for 2013, only the sampling error associated with the intrinsic parameter estimates were used to state the goals for precision (as outlined in the Objectives section, above). Additionally, the revisions in the design were not completely factored into the setting of sample sizes or allocations of sampling effort due to time constraints as well as the uncertainty as to the change in the relationship between the revised SWHS and the revised on-site survey. Sample size goals were accordingly set primarily to mirror the goals set in 2010. It is anticipated that once 3 or more years of paired values of final SWHS and on-site sampling data are obtained, that goals for precision will be more directly aimed at the real parameters of interest (e.g., the Pacific Salmon Treaty harvest in total).

Procedures for obtaining estimates associated with each of the study objectives will be similar for each of the surveyed locations. The following sections detail the procedures that are common to multiple surveys. Site-specific differences in procedures are outlined in later sections of this operational plan.

STUDY DESIGN

The general approach for collecting the information necessary to achieve the objectives for this project involves sampling exiting boat parties at major harbors and boat ramps at each of the ports selected for surveying. The specific harbors and boat ramps to be surveyed at each port were selected to be representative of the majority of exiting sport fish boats accessing the fisheries. Because the less frequently used access locations represent so little of the fishery, departures from the assumption of no difference in the parameters of interest would be minimized in regard to the inference to the total fishery. In some instances, some locations of relatively minor use by the fishery were included for sampling in some ports, as these lower-use locations may be representative of locations of fishing or components of the fishing public that may be otherwise unrepresented with sampling only the heavier-use locations (for example Starrigavan boat launch in Sitka; although it is a low-use access location, it is primarily used by unguided anglers and may be periodically sampled to achieve adequate samples from that component of the fishery).

The days of the week and the time periods to sample were similarly restricted to those days and time periods wherein the majority of sport boats exit the fishery (as evidenced from historic creel or catch sampling surveys). Because there are patterns of differing relative use by guided versus

[11] It is likely that a total of 5 years of the most recent paired values of SWHS and on-site observed harvest will be used in the long-run for calculation of expansion factors, with the proviso that the on-site sampling program at each port remains at relatively similar intensity and coverage over all years used for expansion factor calculation.

unguided segments of each fishery in regards to the day of the week (e.g., more weekend use by unguided anglers), and within the fishing day (e.g., some guides time their fishing trips related to cruise boat schedules), then it will be necessary to estimate all parameters of interest separately by each of these components of the fishery. For example, the proportion of Alaska hatchery composition of the Chinook harvest of guided anglers in the Ketchikan area would be combined with the SWHS estimate of guided Chinook harvest for SWHS Survey Area A to obtain that parameter component of the overall Alaska hatchery harvest estimate (obtained by combining with the corresponding unguided component estimated in the same manner).

As noted above, the general study design approach for this project is to estimate proportions or averages of the specific elements of each fishery (e.g., proportion of the harvest of Chinook salmon that are from Alaskan hatchery production) and apply these proportions and averages to the corresponding estimate from the SWHS. The information necessary for estimating these proportions will be gathered by measuring characteristics of the catch of intercepted boat parties at the sampled harbors and boat launches. At all ports, "creel technicians" conduct complete interviews, which include gathering information from each intercepted boat party on: effort, harvest and catch, logbook information, and biological sampling of the catch. During all scheduled "interview" samples the creel technicians additionally gather and record information on the number of exiting boat parties that is used in the estimation process described below. In some instances the parameter of interest is the magnitude of the harvest or the numbers of fish released by species or species group itself (e.g., Primary Objective 1a: total sport harvest of Chinook salmon). The necessary information to address those needs is also incorporated into the design (see Data Analysis section for further details).

Additionally, in Ketchikan, Juneau, Sitka, and Craig/Klawock one or more "catch samplers" will concentrate their efforts on the sampling of Chinook and coho salmon for CWTs, and collection of biological samples for salmon and groundfish species. Catch sampling is performed at the busiest docks at the busiest times in order to maximize the number of available samples. This additional sampling is needed to meet the sampling goals in the high harvest ports where it is difficult for the interviewers to obtain the biological sampling goals while interviewing. Throughout the rest of the document, when referred to collectively, creel and catch samplers together will be identified as "survey technicians".

The design for sampling the catch is a stratified 4-stage sample survey with days to sample across the season representing the first-stage sampling units, the locations (i.e., harbors and boat launches) sampled within a selected day representing the second-stage sampling units, the boat parties exiting the fishery during each day at each exit location representing the third-stage sampling units, and then finally each fish (by species) representing the fourth-stage or "terminal" sampling unit. To avoid potential for subsampling bias, whenever a boat party is contacted for sampling, the entire catch of either all species of interest or subsets of species will be sampled. The strata are composed of the combination of general port location (e.g., Ketchikan) and components of the fishery (guided and unguided). The sampling unit selection procedures for this survey are not, however, done as a random probability-based sample survey in the standard sense, but were designed to obtain relative proportional sampling of the angling effort and harvest. Information on the number of exiting boat parties will be recorded at each sampled exit location during each sampled day for all 'creel samples', and when combined with the numbers of fish by species observed on each sampled boat will provide weighting factors for each sampling stage to address the likelihood that the sampling will not be exactly proportional to the harvest of all species at all times. The resulting estimation approach is comprised of a 4-stage weighted-average (see the Data Analysis section below for further details).

The majority of sampling effort directed at gathering the information necessary to address the objectives for this project will be obtained as described above, that is a stratified 4-stage sample survey with corresponding counts of boat parties for each harbor or launch sampled within each day sampled. These corresponding counts of boat parties are used in the weighted average estimation process.

In order to obtain the "preliminary 2013 values" associated with the primary objectives, a prediction of the corresponding harvest estimate from the SWHS will need to be made for each species by location. The general approach used to make this prediction has been used successfully in the past and involves using past ratios of either observed or estimated harvest by major species from this on-site survey compared to the final SWHS estimates for the corresponding year. The estimated harvest from the on-site creel surveys conducted in Ketchikan, Juneau, and Sitka formed the denominator of the expansion factor ratio for those locations in the past, whereas the observed harvest for the catch-sampling-only locations of Crag/Klawock; Petersburg, Wrangell; Elfin Cove, Gustavus; and Yakutat served as the components of denominator of the ratio for those locations. An average of the ratios obtained from 5 years of the most recently available SWHS estimates combined with the corresponding year's on-site values has been used in the past. However, since the 2011 redesign, we will use the average of the ratios available from 2011 until we have 5 years of ratios, in which case we will once again use the average of the 5 most recent year's ratios. To begin with we expect this expansion to be highly variable, but as we get closer to having 5 year's worth of ratios this number should start to stabilize and reflect the variation occurring in the sport fish harvest, and not just year to year differences. The expansion factor ratio would then be applied to the observed 2013 estimated averages or proportions for each corresponding parameter of interest (e.g., relative Alaska hatchery contribution) to obtain the preliminary 2013 values. Note that the expansion factors are developed separately for each SWHS Survey Area, as follows: Ketchikan represents SWHS Area A; Craig/Klawock = Area B; Petersburg and Wrangell = Area C; Sitka = Area D, Juneau = Area E; Gustavus and Elfin Cove = Area G, and Yakutat = Area H. In order to get a regionwide total estimate (expanding up for SWHS Area F, Haines/Skagway), a similarly derived 5-year average ratio of the total Southeast Alaska estimate from the SWHS to the sum of SWHS estimates for the Survey Areas represented in our on-site sampling (i.e., Areas A–E, G and H) will be used to expand to the total for the region.

As noted above, due to the nature of the tandem redesign of this project as well as the SWHS, the final precision estimates will very likely be quite different than the anticipated precision values from past years. That said, the allocation of technician-hours by day and location was designed to maximize the proportion of the harvest sampled at a relatively stable and consistent level throughout the surveyed periods. The following subsections include descriptions of the general estimation approach, and outline past levels of precision obtained for the primary objectives.

Preliminary 2013 Total Sport Harvest of Chinook and Coho Salmon (Primary Objectives 1a, 3a)

The total predicted harvest estimate for each port corresponding to each SWHS Survey Area as obtained by the ratio expansion factor approach described above will comprise the estimates of the preliminary 2013 total harvest of Chinook and coho salmon for each of those areas. The sum of the predicted harvest for the surveyed SWHS areas will then be expanded up to the regional total by the corresponding expansion factor (also as described above).

Hatchery and Nonhatchery Contributions-Chinook and Coho Salmon (Primary Objectives 1b and 3b)

During each of the surveys of the marine boat sport fisheries at each port (Ketchikan, Craig/Klawock, Petersburg, etc.) the technicians will attempt to inspect each harvested Chinook salmon for a missing adipose fin (indicating the probable presence of a CWT). The number of Chinook salmon inspected for adipose fin clips will be recorded, and heads from Chinook salmon with adipose fin clips will be collected and identified with a uniquely numbered cinch strap. Cinch strapped heads from Chinook salmon will be forwarded to the ADF&G Mark, Age, and Tag Laboratory (Tag Lab) for eventual dissection, tag removal, and decoding.

Information from the sampling program as well as the coastwide CWT database will be used to estimate the contributions of Alaska hatchery Chinook salmon using an adaptation of Bernard and Clark's (1996) procedures, as outlined in the Data Analysis section of this plan. Similar procedures will be used to estimate the contribution of non-Alaskan hatchery and tagged wild coho stocks to the marine boat sport fisheries.

The precision of Alaska hatchery contribution estimates of Chinook and coho salmon have generally been consistently met in the past (Table 1), thus the approximate allocation of sampling effort will be repeated, and with the expectations that the samples sizes (fish scanned for hatchery origin) will be similar in 2013 as observed in past years. Accordingly, similar levels of precision are expected in 2013.

The relative contribution estimates for each species by each CWT lot will be expanded by the corresponding predicted harvest estimate for the SWHS to obtain the preliminary 2013 values.

Pacific Salmon Treaty Harvest (Primary Objectives 1c and 2)

Estimates of the treaty harvest are then obtained by subtracting out from the total Chinook salmon preliminary harvest estimate the components of the harvest that do not count against the treaty (e.g., Alaskan hatchery harvest). The early season estimate of treaty harvest for Commercial Salmon Districts 8 (Petersburg/Wrangell) and 11 (Juneau) will be obtained in similar manner using the corresponding components of the preliminary 2013 harvest estimates combined with the past 5 years of recreational harvest timing data in these districts.

Average Weight Estimates (Primary Objective 4), and Length Composition (Secondary Objective 3) of Pacific Halibut

Pacific halibut landed by boat parties within all surveyed fisheries will be sampled for length in order to estimate average net (headed and eviscerated) weights by user group and port (Primary Objective 4). Only boat loads of halibut that can all be measured for length will be used to avoid any potential for subsampling biases. All lengths collected will be measured in millimeters (mm) total length (TL). The length of each sampled halibut will be converted to an estimated weight using the regression factor reported by Clark (1992). The estimates for average weight will then be the simple averages by port. In the future the average weight will be obtained via the 4-stage weighted average estimation approach described above (see further details in the Data Analysis section).

Table 1.–Relative precision of Alaska hatchery contribution estimates of Chinook and coho salmon obtained from creel survey and catch sampling programs, 2007–2010.

			Alaska hatchery (current goal ≤20%,90% confidence)	
Year	Type	Location	Chinook	Coho
2007	Creel surveys	Ketchikan	17%	5%
		Sitka	3%	5%
		Juneau	15%	7%
	Catch only	Craig/Klawock	4%	3%
		Petersburg	5%	9%
		Wrangell	8%	20%
		Gustavus	10%	11%
		Elfin Cove	6%	13%
		Yakutat	1%	4%
2008	Creel surveys	Ketchikan	20%	7%
		Sitka	6%	4%
		Juneau	15%	9%
	Catch only	Craig/Klawock	11%	5%
		Petersburg	7%	[a]
		Wrangell	5%	[a]
		Gustavus	24%	8%
		Elfin Cove	31%	16%
		Yakutat	0%	[a]
2009	Creel surveys	Ketchikan	16%	4%
		Sitka	2%	3%
		Juneau	15%	4%
	Catch only	Craig/Klawock	3%	2%
		Petersburg	6%	0%
		Wrangell	19%	12%
		Gustavus	6%	1%
		Elfin Cove	10%	8%
		Yakutat	1%	4%
2010	Creel surveys	Ketchikan	23%	6%
		Sitka	3%	5%
		Juneau	15%	5%
	Catch only	Craig/Klawock	3%	3%
		Petersburg	11%	6%
		Wrangell	10%	46%
		Gustavus	14%	9%
		Elfin Cove	0%	15%
		Yakutat	28%	3%

[a] No recoveries of Alaska hatchery coded wire tags occurred.

Periodically[12], the length composition of the halibut harvest by user group and port (Secondary Objective 3) will be estimated using the length data directly (using a 4-stage weighted average estimation approach with each harvested halibut encoded to series of 0s and 1s representing the various length increments (10 cm increments, see the Data Analysis procedures for further details).

To estimate the average net weights in 2013, sample size goals were set by the procedures used in past years[13]. Specifically, optimum relative sampling distributions were calculated for guided and unguided user groups using the optimum allocation formula for stratified random sampling (Thompson 2002). Mean net weights and standard deviations were computed by port and user group from 2012 data. Stratum weights were based on group-specific harvests reported in the 2011 SWHS. Because the ports of Petersburg and Wrangell are in the same SWHS area, the data for estimating the mean weight for these two ports were combined. Similarly, Gustavus and Elfin Cove are both in SWHS Area G, and their data were combined for estimation purposes as well. The optimal sampling allocations resulted in minimum sample size guidelines for each port (Table 2). These minimum sample size goals are appropriate for treating the data as if it were collected by a stratified simple random sample (with replacement). However, when the estimates and their standard errors are calculated via a 4-stage weighted average approach, the 'true' expected precisions are expected to differ somewhat from those calculated in the past. Analyses conducted for the similarly designed catch sampling program suggests that precisions obtained via the 4-stage weighted estimation approach may be appreciably worse (i.e., standard errors larger) than would be expected under a stratified simple random sampling approach. However, the sampling fractions for the various sampling stages (e.g., days and boat trips) for the "similarly designed survey" are lower than occurs in the Southeast Alaska sampling project, and the degradation in expected precisions due to this design effect are expected to be lesser for this project.

Halibut measurements will have a priority on a fraction of the sampled days, during which groundfish (i.e., halibut, lingcod, and rockfish) measurements will take priority over Chinook salmon genetics sampling. A systematic sampling protocol will be employed, in which one of *k* days are sampled. Groundfish sampling will be a priority on every third day in Juneau, Ketchikan, Sitka, Craig/Klawock, Petersburg/Wrangell, Gustavus, Elfin Cove, and Yakutat. The starting day on which to start sampling was randomly selected (e.g., number between 1 and 3) for the first week, and continued according to the systematic schedule for each port noted above.

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12 The IPHC has periodically requested the length composition estimates. They originally asked for length composition in the early 2000s in relation to what assumptions could be made about sport fishery selectivity. Most recently, they requested another summary in 2009; at that time we summarized the length composition over the 2005–2009 time period (length composition as proportions in 10 cm length groups).

13 Unfortunately the analysis of the data collected during the 2011 and 2012 survey has not been completed prior to planning for the 2013 survey. Accordingly a direct determination of sample size goals appropriate for the sampling design could not be implemented before planning was completed. In future years, it is anticipated that sample sizes will be determined empirically using the observed precision for estimates from each year's survey to adjust sample sizes to achieve the objective criteria.

Table 2.–Minimum target and expected sample sizes of Pacific halibut and lingcod lengths to be collected in 2013 for each of the sampled ports and user groups (NA = not applicable), and expected sample sizes for rockfish species composition for 2013.

Species	User group	Ketchikan		Craig/Klawock		Gustavus/ Elfin Cove		Petersburg/ Wrangell		Sitka		Juneau		Yakutat	
		Target	Expected[a]	Target	Expected[a]	Target	Expected[a]	Target	Expected[a]	Target	Expected[a]	Target	Expected[a]	Target	Expected[a]
Halibut	Noncharter	152	1,147	119	316	104	573	98	973	100	301	230	1,297	95	92
	Charter	235	721	538	431	270	1,427	106	245	280	2,377	257	165	427	859
	Total	387	1,868	657	747	374	2,000	204	1,218	380	2,678	487	1,462	522	1,711
Lingcod	Noncharter	41	46	27	96	25	50	NA	1	10	102	NA	2	8	40
	Charter	188	105	45	312	8	217	NA	1	27	495	NA	0	27	217
	Total	229	151	72	408	33	267	NA	2	37	597	NA	2	35	267
Rockfish	Noncharter		659		405		177		145		385		264		31
	Charter		760		710		1,226		23		3,143		41		395
	Total		1,419		1,115		1,403		168		3,528		305		426

[a] Expected sample sizes = 2012 actual sample size.

If the next selected sample day happened to fall on: 1) a nonwork day, 2) a day that was only being catch sampled (Ketchikan, Sitka, or Juneau), or 3) a designated derby sampling day[14], the closest "standard day" worked was selected for sampling (with a "coin flip" used to resolve ties). In those instances noted above, only the day to conduct sampling was adjusted forward - counts to the next groundfish priority day were not. In ports of Ketchikan, Sitka, or Juneau, where there are both creel and catch sampling programs, only creel samplers will reprioritize their sampling goals on the designated days. Catch samplers will maintain their assigned priorities for salmon. Data collected on designated groundfish sampling priority days will be denoted on the age-weight-length (AWL) mark-sense form differently than regular creel days, although all AWL - regardless of sampling priority day - will be included in the analysis of the length data to calculate estimates of mean net weight of halibut.

Differences in weight distributions between the groundfish priority days and the other sampling days will be analyzed postseason to determine if they are significant for purposes of pooling data. Inseason monitoring of port- and class-specific halibut samples will be maintained in order to ensure minimum sample size goals are met.

Proportion of Pacific Halibut Harvested by Unguided Anglers Prior to Mean IPHC Survey Date (Primary Objective 5)

The sampling weights used in the 4-stage weighted average estimator used to calculate the average net weights by component of the fishery (guided versus unguided, see Primary Objective 4, above) are approximations of the number of halibut harvested (i.e., approximately equivalent to a 'direct expansion' creel survey). The mean IPHC survey date will be identified postseason and then used to poststratify the estimates of harvest before and after that date, then the proportion of the harvest before the date will be calculated from these estimates (see the Data Analysis section for further details).

Average Weight and Preliminary Biomass Estimates of Lingcod (Primary Objective 6)

Lingcod landed by boat parties in Craig/Klawock, Sitka, Ketchikan, Gustavus, Elfin Cove, and Yakutat will be sampled for length in order to estimate the average round weight. The average round weight estimates for each user group will then be multiplied by the preliminary 2013 estimate of the harvest of lingcod (in numbers) for each user group[15] to obtain estimates of the preliminary biomass estimate of the harvest of lingcod at each port.

Sample size goals in 2013 for lingcod average round weight were set in the same manner as described above for the Pacific halibut net weight estimates (Primary Objective 4). The means and standard deviations of lingcod weights were computed by port and user group from 2012 data. Stratum weights were based on group-specific harvests reported in the 2011 SWHS. The optimal sampling allocations resulted in minimum sample size guidelines for each port (Table 2).

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[14] The derbies conducted at each location are directed at salmon and during these days the vast majority of harvest is of salmon with few other species observed. The primary survey/sampling duties of the technicians on derby days relate to collection of information related to the salmon harvest. It is expected that the resultant sampling rate will not be truly proportional because we have purposely avoided these derby day samples. However, because the 4-stage weighted estimation procedure factors in departures from nonproportional sampling, this should not be an issue. We will however evaluate the degree of departure from proportional sampling postseason, and will poststratify estimates of average net weight of Pacific halibut if necessary.

[15] The preliminary 2013 estimate of lingcod harvest at each port by user group will be calculated in the same manner as that described for estimates of the preliminary harvest of Chinook and coho salmon (Objectives 1a, and 3a).

As with the halibut weight estimates, these minimum sample size goals are appropriate for treating the data as if it were collected by a stratified simple random sample (with replacement). However, because the estimates and their standard errors will be calculated via a 4-stage weighted average approach, the ‘true’ expected precisions are expected to differ somewhat from those calculated in the past.

Rockfish Species Composition; and Average Weight Estimates and Preliminary Biomass of Demersal Shelf Rockfish (Primary Objective 7)

Rockfish landed by boat parties in Craig/Klawock, Sitka, Ketchikan, Petersburg, Wrangell, Elfin Cove, Gustavus, Juneau and Yakutat will be identified to species (Primary Objective 7b) and sampled for length. At the Southeast Outside District sampled ports (Craig/Klawock, Sitka, Gustavus, Elfin Cove, and Yakutat combined) the measured lengths will be converted to a round weight by species by user group using a length-weight relationship to estimate the average weight for each DSR species (Primary Objective 7c). Then the weights will be used to obtain this year’s preliminary biomass for the DSR rockfish species using the same approach outlined above for Pacific halibut average net weight estimates (Primary Objective 7a). If harvest by anglers is similar as occurred in 2012, then sample sizes for this objective in 2013 are expected to meet or exceed those experienced in 2010 (Table 2).

Release Estimates for Chinook Salmon, Rockfish, Pacific Halibut (Secondary Objective 4), and Lingcod (Primary Objective 8)

During all interview samples the boat parties will be asked to report the numbers of Chinook salmon (both <28 in and ≥28 in), rockfish (yelloweye, other DSR, slope, and pelagic), halibut (≤45 in, between 45 in and 68 in, and ≥68 in), and lingcod released by species (or species grouping for DSR, slope, and pelagic). These reported values will be combined with the observed/reported numbers of fish harvested to estimate the total catch by species, then used to calculate the proportion of the catch that was released. In addition, the data collected in regard to the three length classes of released halibut will be provided to the Statewide Pacific Halibut Estimation Program to assess the efficacy of the reverse slot limit as a management tool for sport-caught halibut. A coding of the numbers of fish caught that were released will be used in the actual calculation for the proportion released (i.e., 0 if caught fish harvested, 1 if released), so that the 4-stage weighted average approach can be implemented on the coded values to estimate these proportions (see the Data Analysis section for details).

Weekly Harvest per Unit Effort of Coho Salmon (Secondary Objective 2)

All boat parties intercepted for sampling by creel samplers will be asked to report the number of targeted rod-hours directed at fishing for coho salmon. This information will be paired with the corresponding number of coho salmon harvested on a weekly basis to calculate a weekly HPUE. The HPUE for coho salmon for the Juneau area will be cumulated for the period of June 15 through July 31, summarized, and used by Division of Commercial Fisheries for management of the commercial troll fisheries. As previously noted, measures of sport HPUE may be somewhat biased because of the way data are reported during an interview and should be used with caution to implement management measures in a fishery.

Mid Season Projected Preliminary 2013 Harvest of Lingcod and Yelloweye Rockfish (Secondary Objectives 5 and 6)

By the beginning of August, ADF&G managers need a projection of the relative magnitude of the total 2013 harvest of lingcod and yelloweye rockfish in the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat. The gauge of the relative magnitude will be made by comparing a projected total harvest for 2013 to past-year harvest estimates. The projected total harvest for 2013 will be estimated by the same ratio expansion approach used to estimate the preliminary 2013 harvest estimates for Chinook and coho salmon described previously (Primary Objectives 1a and 3a). In order to apply this approach mid season (by August), additional information on historic harvest timing from each port will be used to expand up the harvest observed through July upwards to the level expected by the end of the year.

Estimates of Genetic Composition of Chinook Salmon Harvest (Secondary Objective 1)

The genetic composition of the Chinook salmon harvested in the various fisheries (e.g., commercial salmon troll, commercial driftnet, and sport) in Southeast Alaska is being analyzed by the ADF&G, Division of Commercial Fisheries Genetics Laboratory in Anchorage. A small section (approximately 15 mm by 5 mm) of the tip of a Chinook salmon's axillary appendage will be collected and placed in a prelabeled vial filled with ethanol as the preserving agent.

Unbiased estimates of the stock composition of the Chinook salmon sport fishery will be obtained by taking a representative sample over time from each port's fishery (Table 3) to generate regional estimates using genetic stock identification. Chinook salmon harvested in local marine waters will be sampled from anglers bringing back fish to the docks/boat ramps at the sampled ports in Southeast Alaska during the 2013 season. Small (<28 in TL) Chinook salmon - which are only allowed to be harvested in the terminal harvest areas (THAs) - will be sampled along with the large (≥28 in TL) Chinook salmon being harvested and landed at the fishery exit points. The target sample sizes for large Chinook are based on the magnitude of each port's Chinook salmon harvest and for the requirement of a minimum sample size. Stock contribution estimates using genetics will be obtained for 4 different regions of Southeast Alaska, including samples obtained from smaller ports representing that region (Table 4). The actual number of samples used in the genetic analysis will depend on the proportion of harvest that each port contributed to the overall harvest of that region. Stock composition estimates for each area of the fishery will be weighted by harvest by port and biweek, and will be treated in total for the entire season with the exception of fish caught in the Outside region and for Commercial Salmon Districts 8 and 11. In the Outside region, when possible, estimates will be further stratified by fish caught prior to biweek 13 versus those caught after biweek 13; in Districts 8 and 11, when possible, estimates will be further stratified by fish caught prior to biweek 14 versus those caught after biweek 14. Unbiased estimates of stock composition will be obtained only if the harvest is sampled proportionally during the entire season for all areas of the fishery. Sampling rates by biweekly period within each area and season combination will be compared for proportional sampling (i.e., compare the number of Chinook salmon by size class sampled for genetic structures versus the index of harvest as obtained from the estimates associated with Primary Objectives 1a and 2). Results of this comparison will be reported to the genetics lab, and if necessary, either the genetics lab will substratify from the samples obtained (to achieve proportional sampling within each substratum), or the genetics lab will use hierarchical analysis

Table 3.–Samling goals for Chinook salmon by port for the Southeast Alaska sport fisheries during the spring and summer of 2013.

Port	Goal
Juneau	600
Haines	15
Skagway	20
Glacier Bay	65
Sitka	1,500
Yakutat	75
Elfin cove	50
Craig	500
Petersburg	450
Wrangell	200
Ketchikan	600
Total	4,075

Table 4.–Strata for which stock compostion estimates for Chinook salmon caught in Southeast Alaska sport fisheries will be generated.

SE AK region	Ports	Time strata
Northern Inside	Juneau, Haines, Skagway	All season
Outside	Glacier Bay, Sitka, Yakutat, Elfin Cove, Craig	All season
Outside	Glacier Bay, Sitka, Yakutat, Elfin Cove, Craig	Through biweek 13
Outside	Glacier Bay, Sitka, Yakutat, Elfin Cove, Craig	After biweek 13
Petersburg-Wrangell	Petersburg, Wrangell	All season
Ketchikan	Ketchikan	All season
District 108	Petersburg, Wrangell	All season
District 108	Petersburg, Wrangell	Through biweek 14
District 108	Petersburg, Wrangell	After biweek 14
District 111	Juneau	All season
District 111	Juneau	Through biweek 14
District 111	Juneau	After biweek 14

methods to weight the samples obtained (Sara Gilk-Baumer, ADF&G genetics lab, and S. McPherson, ADF&G Division of Sport Fish December 9, 2010 meeting in Douglas).

Note that all Chinook salmon that are genetically sampled will also be sampled for scales at all ports. The genetic sampling requires documenting the age of the individually sampled fish, thus scales will be taken with genetic samples. Additionally, the genetics lab has requested sampling of otoliths from Chinook salmon sampled for genetics at Sitka and Craig/Klawock. Accordingly, heads from genetically sampled fish at these ports will be collected for later processing.

Estimates of the Proportion of Unguided Boat Trips Utilizing Deepwater Release Devices in the Release of Rockfish (Secondary Objective 9)

During this sampling season the Marine Harvest Studies Program will collect data on current levels of utilization of rockfish release devices by unguided anglers. Unguided anglers who released rockfish during their trip will be asked if they employed the use of a rockfish release device at least one time during the trip; their answer will be recorded as Yes/No on a mark-sense form. The ratio of the number of boat trips in which a release device was utilized (i.e., Yes) to the total number of boat trips that released rockfish will be used to obtain an estimate the percentage of unguided anglers who are currently using at depth release devices. In addition, information pertaining to the merits of utilizing rockfish release devices and their proper use will be distributed to all anglers to increase public awareness and acceptance of the devices.

DATA COLLECTION

Creel Samplers

Data will be collected from each boat party interviewed during scheduled 'creel samples' (aka interview samples) at Ketchikan, Sitka, Juneau, Petersburg, Craig/Klawock, Wrangell, Gustavus, Elfin Cove, and Yakutat. All ports will have technicians that conduct interviews during each scheduled sampling period. Information collected will include number of rods fished, number of anglers fishing, hours fished, trip type (guided or unguided), number of days in trip, location fished, target (e.g., salmon or groundfish), and number of fish kept and/or released by species. In 2013, creel samplers will record the number of boats returning to the harbor and record as follows: 1) counted but not contacted, 2) contacted but not fishing, 3) fishing but not interviewed, and 4) interviewed. The samplers will record the logbook number of the charter operator, and whether or not the number of anglers (clients plus crew) or the numbers of fish harvested by species have been physically verified. All onsite interview data will be recorded on Port Sampling Interview mark-sense forms (version 1.1).

In addition to interviewing boat parties, creel samplers will also sample harvested fish as scheduled. Harvests of Chinook salmon and coho salmon checked for adipose fin clips will be recorded as "sampled", while harvests not checked will be recorded as "not sampled". Heads from adipose-finclipped fish will be collected and identified with a uniquely numbered cinch strap (assigned by the Tag Lab).

Chinook salmon selected for genetic sampling will be sampled for scales and have their axillary appendage, located above the pelvic fin, excised. This sampling will only occur if all of the Chinook salmon harvested by a given boat party can be examined and none of the harvest has been cleaned on the fishing grounds or enroute back to the port. Five scales will be sampled near the preferred area on each Chinook salmon, at a point on a diagonal line from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin, 2 rows above the lateral line (Welander 1940). If the scales in the preferred location cannot be obtained, another set of scales will be taken from as close to the preferred scale area as possible. However, scales will only be taken from the area bounded dorsally by the fourth row of scales above the lateral line, ventrally by the lateral line, and between lines drawn vertically from the posterior insertion of the dorsal fin and the anterior insertion of the anal fin. If no scales are available in the preferred area on the left side of the fish, scales will be collected from the preferred area on the right side of the fish. Scales will then be mounted on gum cards, and impressions will be made in cellulose acetates (Clutter and Whitesel 1956). The scales will then be aged using ADF&G procedures (S. McPherson, ADF&G, Divison of Sport Fish, Douglas, personnel communication). Lengths to the nearest 5 mm MEF[16] of these Chinook salmon will also be recorded on Alternate AWL mark sense forms (version 1.1) to which the gum cards are then taped. In addition, Chinook salmon heads will be collected at the ports of Sitka and Craig/Klawock for the purpose of otolith

[16] The measurement of MEF length, instead of snout to fork (SNF) length, will be collected for Chinook and coho salmon by the creel survey technicians for AWL, genetic and CWT sampling. The SNF length had been collected by the sport fish creel survey for approximately the past 20 years, while the commercial fishery port sampling, and escapement projects have been collecting MEF. The Tag Lab requested that the creel survey CWT sampled Chinook and coho have MEF lengths rather than SNF lengths in the fall of 2005, so beginning in 2006 MEF has been collected.

analysis. Similar to CWT-sampled Chinook salmon, heads collected for otolith sampling will likewise be identified by a uniquely numbered coordination tag (also assigned by the Tag Lab).

Total length to the nearest 5 mm of Pacific halibut, rockfish, lingcod and sablefish sampled will also be recorded on AWL forms. Halibut, rockfish, and lingcod will be measured only if all of the fish harvested by a given boat party can be examined and none of the catch has been butchered on the grounds or enroute back to port. All data recording procedures are outlined in detail in the Southeast Marine Harvest Surveys Creel Technician Manual provided to the field technicians.

Catch Samplers

Ketchikan, Sitka, Craig/Klawock, and Juneau will each have one or more additional technicians who concentrate on CWT sampling of Chinook and coho salmon and collection of biological samples. These additional technicians will not emphasize groundfish sampling on the aforementioned groundfish sampling days; however, as time allows they will record total length to the nearest 5 mm of Pacific halibut, rockfish, lingcod and sablefish. The catch samplers at these ports will record length, take scale and genetic samples from Chinook salmon brought into the docks during their shifts according to the percent of sampling set for each port, and check Chinook and coho salmon for clipped adipose fins.

The catch samplers will complete AWL forms for each species in the same format as the creel samplers. Catch samplers will record the boat numbers in the card position column, which will provide a tally of how many boats were sampled during their respective shifts. If they sample both salmon and groundfish from the same boat, the boat number will be the same. Boat numbers will be recorded for all species. The catch samplers will also record the number of boats they were unable to sample due to time constraints, uncooperative anglers, etc.

The Catch Sampling CWT Daily Summary form will be used to count the Chinook and coho salmon in the respective areas where they were harvested.

DATA REDUCTION

All technicians will first edit their data forms and then turn them in to the appropriate area office on a weekly basis: Ketchikan for the Ketchikan, Craig/Klawock, Petersburg, and Wrangell surveys; and Douglas for the Sitka, Juneau, Gustavus, Elfin Cove, and Yakutat surveys. The mark-sense data forms will be checked again, grouped into batches, and opscanned in Douglas. After op-scan reading is completed, the data will then be returned to the appropriate area office for final editing and analysis. Data will initially be edited in a word processing package on a microcomputer and then the data will be read into a statistical analysis system dataset using SAS®[17] for Windows. After final checking of the SAS dataset, the data will be analyzed according to the procedures outlined below. Once data are finalized, the data files will be archived at Research and Technical Services (RTS) in Anchorage and in the Douglas office.

Cinch-strapped heads collected from adipose-finclipped Chinook and coho salmon along with CWT Recovery Sampling forms will be taken or mailed to the Tag Lab in Juneau where any tags present will be removed and decoded. All shipments of cinch-strapped heads will include the following information: the date and number of heads, as well as the number of CWT Recovery

[17] This and subsequent product names are included for a complete description of the process and do not constitute product endorsement.

Sampling forms in each shipment. The tag recovery information from each head will then be entered into the Tag Lab database. In conjunction with Tag Lab personnel, the number of fish sampled for adipose fin clips and estimated harvest (for the onsite creel survey locations) will also be entered into a related database so that hatchery contribution estimates can be generated directly. Chinook salmon scales will be pressed onto acetates and then read by Division of Sport Fish personnel. Ages will be recorded on the matching Alternate AWL mark-sense forms, which will be op-scaned in Juneau. Pacific halibut, rockfish and lingcod lengths will also be recorded on alternate AWL forms and then scanned similarly to the Chinook salmon AWL forms.

DATA ANALYSIS

The data analysis procedures necessary to achieve the objectives for the 2013 project generally involve a 2-step estimation approach. The first step involves estimation of parameters that are intrinsic to the information gathered during the fielding of the project, i.e., data gathered regarding the characteristics of intercepted boat parties and their harvest during creel or catch sampling, or derived after laboratory follow-up activities (e.g., CWT analyses). The second step involves expanding these intrinsic estimates to preliminary projections, which will be finalized following publication of the SWHS results. Application of the 2-step estimation approach takes place for most of the objectives following the completion of all data collection by this project for the season, although for some objectives, the process occurs at "mid season" milestone dates (e.g., Secondary Objective 5: beginning of August projections related to lingcod harvest).

In the following subsections the general 2-step estimation approach is outlined for both the mid season and end-of-season projections of the preliminary 2013 parameter estimates. These subsections are then followed by specific details regarding application of the estimation approach for each of the objectives.

General Estimation Approach

Intrinsic Parameter Estimates

As noted previously, the general study design for this project involves estimation of proportions or averages of the specific elements of each fishery from the on-site survey, and then applying these proportions and averages to the corresponding estimate from the SWHS. The on-site sample survey design is a stratified 4-stage sample survey with days to sample across the season representing the first-stage sampling units, the harbors and boat launches sampled within a selected day representing the second-stage sampling units, and the boat parties exiting the fishery during each day at each exit location representing the third-stage sampling units, and then finally each fish (by species) representing the fourth-stage or "terminal" sampling unit. To avoid potential for subsampling bias, whenever a boat party is contacted for sampling the entire harvest of either all species of interest or subsets of species will be sampled. The strata are composed of the combination of general port location (e.g., Ketchikan) and components of the fishery (guided and unguided). The sampling unit selection procedure for this survey was not a random probability-based sample survey in the standard sense, but was designed to obtain relative proportional sampling of the angling effort and harvest. Information on the number of exiting boat parties will be recorded at each sampled access location during each sampled day for all samples, and when combined with the numbers of fish by species observed on each sampled boat will provide weighting factors for each sampling stage to address the likelihood that the sampling will not be exactly proportional to the harvest of all species at all times. The resulting estimation approach is comprised of a 4-stage weighted-average calculation.

At all ports, most or all of the survey technicians conduct creel surveys, which include gathering information from each intercepted boat party on: effort, harvest and catch, logbook information and biological sampling of the catch. During these scheduled creel samples, the interviewers additionally gather and record information on the number of exiting boat parties that is used in the weighting estimation process described below. As noted previously, one or more technicians at the ports of Ketchikan, Craig/Klawock, Sitka, and Juneau conduct catch-sampling only shifts. These catch samplers will collect and record a corresponding count of the number of exiting boat parties[18]. In 2013, as was the case in 2012, these catch sampling-only shifts are scheduled to occur on days in which creel sampling shifts occur as well. This modification to the scheduling from the process used in 2011 was necessitated by the weighting procedure outlined below.[19]

Standard estimation equations will be used to calculate estimates of the intrinsic averages or proportions associated with the objectives for this project for a stratified 4-stage sample survey with days, exit locations, boat parties, and harvested fish by species representing the sampling stages. Additionally the standard estimation equations for the corresponding variance estimates will be used as approximations of the sampling variance and standard errors (SEs). The equations were adapted from estimating equations in Sukhatme et al. (1984: section 8.10 pages 346–351) for estimating averages for a 3-stage sample survey. The coded-variable approach for obtaining estimates associated with proportions is also per Sukatme et al. (1984: section 2.10, pages 42–45). Because the sampling unit selection procedures for this survey are not, however, done as a random probability-based sample survey in the standard sense, the corresponding variance and SE estimates are, as noted above, considered approximations[20].

As noted above, the parameters of interest associated with the objectives for this project mostly represent averages or proportions of the corresponding harvest (or in some cases numbers of fish released) by species. In some instances the parameter of interest is the magnitude of the harvest or the numbers of fish released by species or species group itself (e.g. Primary Objective 1a: total sport harvest of Chinook salmon). The weighting factors associated with the weighting estimation approach provide estimates of the magnitude of the harvest itself. The averages associated with the "y" terms in the equations below represent the former parameter estimates (averages or proportions); whereas the "N" terms represent the latter parameter estimates (total harvest). Because sampling at all ports is directed at only a portion of the access locations from which anglers access the various fisheries, and sampling shifts are by design directed at the busier portions of the day and days of the week, then the estimated harvest is <u>not</u> an unbiased

[18] The level of detail of the count of boats associated with catch sampling will not be at the same degree in comparison to the counts conducted by creel samplers. The catch sampling activities often involves the catch samplers roaming from access location to access location within a scheduled shift to maximize the number of fish (of one or more species or group of species) sampled for biological characteristics. Similarly, the catch samplers will periodically focus on a portion of an access location and will not necessarily be able to ascertain the numbers of returning boat parties for the remainder of the access location not covered. Accordingly, the boat counts for these catch samplers will reference the number of 'missed' boats for the shift (regardless of location) and the general area sampled at each location, and will only be a gross measure of the general fishing activity for the weighting purposes only. The counts will not be used for estimation of total harvest indices.

[19] Specifically, estimates of the number of fish harvested that are used for calculating the sampling weights cannot be calculated from the information gathered by the catch samplers, hence the need to pair-up catch sampling shifts with creel interview shifts (with the latter providing the estimates of harvest used in the weighting process).

[20] The degree of approximation is expected to be slight in that the sample selection process in some instances closely approximates a random sampling process, or represents a census or a near census at some of the sampling stages in the 4-stage sampling process. Also, the use of the 4-stage variance estimating equations is expected to represent a better description of the sampling error than the 'naïve' estimators used in past years, wherein the multi-stage design was ignored and the data on such parameters as species composition for rockfish were treated as if it was obtained by a simple random sampling design with replacement, even though the data were obtained by a multi-stage sample survey without replacement.

estimate of the harvest by user group at each port for the season in total[21]. The use of the corresponding estimate of harvest is for use in expanding up to the preliminary 2013 values for the associated parameters corresponding to the values from the final SWHS harvest estimates, via the ratio estimation approach outlined later in this plan. Accordingly, these estimates of harvest are referenced herein as harvest indices.

Calculation of the proportional estimates associated with objectives that relate CWT contributions to Chinook and coho salmon (Primary Objectives 1b, 1c, and 3b) will not involve direct use of the 4-stage estimating equations. The specific equations for the CWT estimation approach that are adapted from Bernard and Clark (1996) are outlined after the 4-stage estimating equations below.

Four-stage Estimating Equations

The first step in the 4-stage estimating equation calculation involves estimating an average across all fish by species or species group within a sampled boat party:

$$\bar{y}_{hijk} = \frac{\sum_{o=1}^{n_{mhijk}} y_{hijko}}{n_{mhijk}} \tag{1}$$

where: n_{mhijk} is the number of fish sampled (e.g., measured) for the average or proportion from the total number harvested by sampled boat party k, at sampled access location j (i.e., the sampled harbor or boat launch) during sampled day i within stratum h[22]; and y_{hijko} equals the measurement (or converted measurement) for parameters of interest representing averages (e.g., weight of each fish) for the o^{th} fish sampled from each sampled boat party. In the case of parameters that represent proportions (for example, species composition), then the y_{hijko} equals the coding for proportional estimates as follows:

$$y_{chijko} = \begin{cases} 1, \text{ if the fish belongs to the category } c \text{ associated with each proportion;} \\ 0, \text{ otherwise.} \end{cases} \tag{2}$$

Note that there would be C separate values of these coded values associated with each category in the proportion. For example, if the proportions of interest had 4 categories (C = 4), there would be separate calculations for each of the 4 categories (denoted by the subscript c), and each would then be substituted into equation 1.

Note that the strata within each port are defined whether or not the sampled boat party is a charter or guided boat, versus an unguided or private boat party. Accordingly, all characteristics of the information gathered at the terminal (fourth stage) in this stratified multi-stage design belong to 1 of the 2 strata.

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[21] Additionally, because the counts of boat parties that are not sampled for creel or catch samples are only approximately accurate, then the expansion associated with the number of boat parties within a sampled shift (access location within a day for creel samples) only provides an approximate estimate of the harvest during the shift.

[22] Although strata are defined as the combination of major port and user group: guided or chartered, versus unguided or private, the referencing of strata (or stratum) in these equations is restricted to the distinction between the user groups (guided/unguided or chartered/private).

The estimate (from equation 1) will then be weighted by the relative 'size' of each boat party compared to other boat parties sampled (for the average or proportion) within the same access location sampled within the sampled day, with the weight calculated as follows (wherein 'size' relates to the number of fish by species or species group):

$$w_{4hijk} = \frac{N_{mhijk}}{\overline{N}_{mhij}} \tag{3}$$

where N_{mhijk} is the number of fish by species or species group selected for measurement from each sampled boat party's harvest (note that by design $N_{mhijk} = n_{mhijk}$ the number of fish sampled for the measurement or characteristic of interest for an individual sampled boat, i.e., only complete bags sampled); and $\overline{N}_{mhij}$ is the average across boat parties sampled at each sampled access location within a sampled day, calculated as:

$$\overline{N}_{mhij} = \frac{\sum_{k=1}^{b_{mhij}} N_{mhijk}}{b_{mhij}} \tag{4}$$

where b_{mhij} equals the number of boat parties sampled at each access location within each sampled day for the guided and unguided components of the fishery at each port for the average or proportional parameter estimates.

For the parameters involving estimates of the number of fish harvested (or the number of fish caught, or number released)[23], a parallel computation to those noted above in equation 4 is calculated for all fish harvested by species or species group over all the boats interviewed at each sampled access location within each sampled day (i.e., including both fish sampled and measured for the characteristic of interest, and fish that were not sampled), as follows:

$$\overline{N}_{hij} = \frac{\sum_{k=1}^{b_{hij}} N_{hijk}}{b_{hij}} = \frac{\sum_{k=1}^{b_{hij}} \left(N_{mhijk} + N_{uhijk}\right)}{b_{hij}} \tag{5}$$

where N_{uhijk} is the number of fish on an interviewed boat that were not sampled for the parameter or proportion of interest[24]; b_{hij} is the number of all boats interviewed within each sampled access location within each sampled day (includes boats that were interviewed but for

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[23] A few of the objectives or tasks require the estimation of the number of fish released or the number caught (harvested plus released) by species or species group; in the exposition of the equations in this section of the plan the equations used for estimating the numbers of fish harvested can be used with the number of fish reported released to obtain the estimate of fish released. The numbers released will only be referenced hereafter when necessary.

[24] For example, some fish of a particular species were cleaned at sea so the entire bag was not available for sampling, and fish in that boat for the species in question would not be sampled, but would be included for average calculation in equation 5.

which no fish were sampled for the measurement of interest); and N_{hijk} includes both sampled or measured fish and those not sampled or unmeasured (note in any one sampled boat party N_{hijk} is equal to either N_{mhijk} or N_{uhijk} depending upon whether the species or species group was sampled for measurements[25]).

The $\overline{N}_{hij}$ term is then used to expand up to the index of the number of fish harvested at the sampled access location within the sampled day within stratum *h* (guided versus unguided), as follows:

$$\hat{N}_{hij} = \frac{\hat{B}_{ij}\hat{b}_{hij}}{b_{ij}}\overline{N}_{hij} = \hat{B}_{hij}\overline{N}_{hij} \tag{6}$$

where b_{ij} is the total number of boat parties intercepted that were sport fishing regardless of strata (i.e., guided plus unguided boats); and $\hat{B}_{ij}$ is the estimated number of sport fishing boat parties exiting the access location *j* during each sampled day (note that counts of boat parties are not distinguished by user group, so no *h* subscript denoting guided versus unguided), calculated as:

$$\hat{B}_{ij} = A_{ij}\frac{b_{ij}}{a_{ij}} \tag{7}$$

where a_{ij} is the total number of boat parties that were either intercepted and determined to be sport fishing or were intercepted and determined to not be sport fishing; and A_{ij} is the number of all boats counted exiting the sampled access location during the sampled day (includes sport fishing and nonsport fishing boats, as well as "missed" boats)[26]. The calculation of these indices of harvest (the $\hat{N}_{hij}$ terms) for use in later expansion to project the final corresponding SWHS estimates of harvest will be limited to using the data from <u>creel samples only</u> (i.e., not including the catch sampler data), due to the limitations previously noted on the counts of boats within shifts conducted by catch samplers.

The values of $\hat{b}_{hij}$ for each stratum (guided/chartered versus unguided/private) are estimated by expansion of proportion of boats in each stratum compared to all sport fishing boats (which may include sport fishing boats that could not be assigned to a stratum), as follows:

$$\hat{b}_{Uij} = b_{ij}\frac{b_{Uij}}{\left(b_{Uij} + b_{Gij}\right)} \quad or \quad \hat{b}_{Gij} = b_{ij}\frac{b_{Gij}}{\left(b_{Uij} + b_{Gij}\right)} \tag{8}$$

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25 For the catch sampling data, counts of the number of fish "not measured" are not recorded, as the numbers of fish harvested for species or species groups for a boat party are only recorded for the fish that are measured (i.e., "catch sampled"). Accordingly, the catch sampling data are essentially treated as self-repesented in the weighting process. Accordingly, for the catch sampling data all $N_{hijk} = N_{mhijk}$ in equation 5.

26 Note that some boat parties at some access locations are known to never sport fish (see the Data Collection section and the creel technician manual for details), these boat parties are not included in either the A_i or the a_i counts.

where the U and G subscripts correspond to the unguided (private) versus guided (chartered) strata.

The next step for estimating the averages or proportional parameters involve applying the weight derived in equation 3 to each of the averages from equation 1 as follows:

$$\bar{y}_{whijk} = w_{4hijk}\bar{y}_{hijk} \tag{9}$$

which is then used to estimate the average across all boat parties by user group within a sampled access location within each sampled day:

$$\bar{y}_{hij} = \frac{\sum_{k=1}^{b_{mhij}} \bar{y}_{whijk}}{b_{mhij}} \tag{10}$$

The next step in estimating the index of the harvest of fish involves first averaging the number harvested across access locations sampled within each sampled day calculated as:

$$\bar{\hat{N}}_{hi} = \frac{\sum_{j=1}^{q_i} \hat{N}_{hij}}{q_i} \tag{11}$$

where $\hat{N}_{hij}$ is the index of the number of fish harvested by each species or species group for each sampled access location as calculated above in equation 6; and q_i is the number of access locations sampled within each sampled day (at this stage of the sampling there is no distinction between the guided and unguided components, and hence the dropping of the stratum subscript h in regards to the statistic q_i).

The $\bar{\hat{N}}_{hi}$ term is then used to expand up to the index of the number of fish harvested during the sampled day by user group (guided versus unguided), as follows:

$$\hat{N}_{hi} = Q_i\bar{\hat{N}}_{hi} \tag{12}$$

where Q_i is the number of access locations that could have been sampled within each day.

The next step in estimating the average or proportional parameters involves weighting across third-stage sampling units. Ideally, the third-stage sample weights to be used for estimating average or proportional parameters would have involved the estimated harvest index over all sport fishing boat parties sampled within a day across all access locations, both those sampled for the characteristic of interest and those not sampled (but sport fishing). However, because the nature of boat counts recorded by the two types of samplers (creel technicians versus catch samplers) is different, then a direct use of the estimated harvest index cannot be used. Specifically, the catch samplers do not classify unsampled ("missed" boats) in regards to whether or not they were sport fishing, whereas the creel technicians do record this classification.[27] Accordingly, the following calculations will be used to approximate the third-stage weights, first an approximate number of fish harvested by each stratum within each sampled day at each location is calculated[28]:

$$\tilde{N}_{hij} = \frac{A_{ij}\hat{b}_{hij}}{b_{ij}}\overline{N}_{hij} \tag{13}$$

These approximate harvest indices are then averaged over all access locations sampled within a day, as follows:

$$\overline{\tilde{N}}_{hi} = \frac{\sum_{j=1}^{q_i} \tilde{N}_{hij}}{q_i} \tag{14}$$

These terms are then used to calculate the approximate third-stage sample weights as follows:

$$\tilde{w}_{3hij} = \frac{\tilde{N}_{hij}}{\overline{\tilde{N}}_{hi}} \tag{15}$$

This approximate weight is then used for estimating the averages or proportional parameters by applying the weight derived in equation 15 to each of the averages from equation 10 as follows:

$$\overline{y}_{whij} = \tilde{w}_{3hij}\overline{y}_{hij} \tag{16}$$

which is then used to estimate the average across all sampled access locations by user group within each sampled day:

$$\overline{y}_{hi} = \frac{\sum_{j=1}^{q_i} \overline{y}_{whij}}{q_i} \tag{17}$$

27 Creel technicians record boats in a manner that distinguishes among the following three categories: (1) interviewed/sampled, (2) not interviewed but was sport fishing, and (3) not interviewed but was not sport fishing. Catch samplers only have a count of boats that were sampled and a count of total boats exiting the fishery at the access locations sampled, accordingly they can only be classified as (1) and the sum of (2) and (3).

28 Note that this equation represents an adaptation of equation 6 wherein the estimated number of sport fishing boats is replaced by the total number of boats counted exiting for each sampled day at each access location. Accordingly, these approximations are expected to be "overestimates" of the index of harvest, but the overestimation should be similar for the fish sampled by creel technicians versus catch samplers. Because the estimate from equation 6 cannot be calculated from the information collected by the catch samplers, this approximation represents a compromise to properly weight the combined samples taken within a sampling day (across access locations) regardless of the source of the sample (creel interview versus catch sample).

This average will then be weighted by the relative ‘size’ of each sampled day compared to all other days sampled. By design (starting in 2012), all catch sampling shifts are scheduled to occur on days with creel interview shifts, and as such the second-stage sampling weights to be used for weighting across days will be calculated directly from the estimates of the number of fish harvested as follows:

$$w_{2hi} = \frac{\hat{N}_{hi}}{\overline{\hat{N}}_h} \tag{18a}$$

where $\hat{N}_{hi}$ is the index of the number of fish harvested by each species or species group for each sampled day as calculated above in equation 12; and $\overline{\hat{N}}_h$ is the average number harvested across sampled days calculated as:

$$\overline{\hat{N}}_h = \frac{\sum_{i=1}^{d} \hat{N}_{hi}}{d} \tag{19}$$

where d is the number of days sampled for each major port (across all creel sampled locations).

In any instance in which catch sampling information exists without a matched creel sample with the corresponding estimate of the number of fish harvested within a day[29], then the second-stage sampling weight will be calculated approximately as follows:

$$w_{2hi} \approx \frac{\tilde{N}_{hi}}{\overline{\tilde{N}}_h} \tag{18b}$$

where $\tilde{N}_{hi}$ is the approximate index of the number of fish harvested by each species or species group for each sampled day as calculated by:

$$\tilde{N}_{hi} = Q_i \overline{\tilde{N}}_{hi} \tag{20}$$

and $\overline{\tilde{N}}_h$ is the approximate average index of the number harvested across sampled days calculated as:

$$\overline{\tilde{N}}_h = \frac{\sum_{i=1}^{d} \tilde{N}_{hi}}{d} \tag{21}$$

where d is the number of days sampled for each major port (across all sampled locations for both creel and catch samples).

[29] This may occur if a catch sampler samples a species or species group that are not otherwise observed in the creel interviews occurring on the same day, or if by happenstance a scheduled creel interview shift does not occur (for example, due to sampler illness).

The final step for estimating the averages or proportional parameters involve applying the weight derived in equation 18a or 18b to each of the averages from equation 17 as follows:

$$\bar{y}_{whi} = w_{2hi}\bar{y}_{hi} \tag{22}$$

which is then used to estimate the average across all sampled days by user group:

$$\bar{y}_h = \frac{\sum_{j=1}^{d} \bar{y}_{whi}}{d} \tag{23}$$

The overall number of fish harvested by each species or species group is obtained as follows (again only using the creel interview data), first by calculating the average number harvested across sampled days:

$$\bar{\hat{N}}_h = \frac{\sum_{i=1}^{d} \hat{N}_{hi}}{d} \tag{24}$$

where $\hat{N}_{hi}$ is from equation 12.

Then the $\bar{\hat{N}}_h$ term is used to expand up to the index of the number of fish harvested by user group (guided versus unguided) for the surveyed season, as follows:

$$\hat{N}_h = D\,\bar{\hat{N}}_h \tag{25}$$

where D is the number of days covering the survey (calculated from the first and last day of the survey at each major port, or through the last day of a “mid season” period).

The $\bar{y}_h$ from equation 23, which represents the estimate for the intrinsic parameter for averages or proportions to be used to expand into preliminary 2013values, in summary, will be calculated as follows:

$$\bar{y}_h = \frac{1}{d}\sum_{i=1}^{d}\left(\frac{w_{2hi}}{q_i}\sum_{j=1}^{q_i}\left(\frac{\tilde{w}_{3hij}}{b_{mhij}}\sum_{k=1}^{b_{mhij}}\left(\frac{w_{4hijk}}{n_{mhijk}}\sum_{o=1}^{n_{mhijk}} y_{hijko}\right)\right)\right) \tag{26}$$

Summarizing the overall harvest index value by user group is calculated as (equivalent to equation 25):

$$\hat{N}_h = \frac{D}{d}\sum_{i=1}^{d}\left(\frac{Q_i}{q_i}\sum_{j=1}^{q_i}\left(\hat{B}_{hij}\frac{\sum_{k=1}^{b_{hij}} N_{hijk}}{b_{hij}}\right)\right) \tag{27}$$

The variance of this harvest index by user group (for each species or species group) will be approximated using the standard 3-stage equation (adapted from Sukhatme et al. 1984)[30]:

$$\hat{V}\left[\hat{N}_h\right] \approx \left\{ (1-f_1) D^2 \frac{S_{1h}^2}{d} \right\} + \left\{ f_1 \frac{D^2}{d\,d'} \sum_{i=1}^{d'} (1-f_{2i})\, Q_i^2 \frac{S_{2hi}^2}{q_i} \right\} + \left\{ f_1 \frac{D^2}{d^2} \sum_{i=1}^{d} f_{2i} \frac{Q_i^2}{q_i q_i'} \sum_{j=1}^{q_i'} (1-f_{3ij}) \left(\hat{B}_{hij}\right)^2 \frac{S_{3hij}^2}{b_{hij}} \right\} \tag{28}$$

where: f_1, f_{2i}, and f_{3ij} are the sampling fractions for days, access locations, and boat parties, respectively (i.e., $f_1 = d/D; f_{2i} = q_i/Q_i; f_{3ij} \approx b_{ij}/\hat{B}_{ij}$)[31]; S_{1h}^2, S_{2hi}^2, and S_{3hij}^2 equal the: (1) among day, (2) among access location (within day), and the (3) among boat party (within access location) variance components for the harvest index, respectively, which are obtained as:

$$S_{1h}^2 = \frac{\sum_{i=1}^{d} \left(\hat{N}_{hi} - \overline{\hat{N}}_h\right)^2}{d-1} \qquad S_{2hi}^2 = \frac{\sum_{j=1}^{q_i} \left(\hat{N}_{hij} - \overline{\hat{N}}_{hi}\right)^2}{q_i - 1} \qquad S_{3hij}^2 = \frac{\sum_{k=1}^{b_{hij}} \left(N_{hijk} - \overline{N}_{hij}\right)^2}{b_{hij} - 1} \tag{29}$$

where d' is the number of days in which S_{2hi}^2 can be estimated (i.e., days with at least 2 access locations sampled); and q_i' is the number of locations in which S_{3hij}^2 can be estimated (i.e., locations with either: (1) at least 2 boat parties interviewed, or (2) the number of sport fishing boat parties interviewed equals the estimated number of exiting sport fishing boat parties: $b_{ij} = \hat{B}_{ij}$).

The variance for the average or proportional parameter estimates (for the average calculated in equation 26), is approximated by the standard 4-stage equation for averages (adapted from Sukhatme et al. 1984), as follows:

---

[30] Note that the estimates of harvest (the N terms) collapse to a 3-stage sample survey estimation as the terminal sampling stage for the numbers of fish by species or species group is the sampled boat party (not the individual fish sampled).

[31] Note that the sampling fraction for sport fishing boat parties is estimated, as some boats are not intercepted and classified as either sport fishing or nonsport fishing boats. However, nearly all boats both interviewed, or not interviewed, are generally classified as either sport fishing or nonsport fishing boats (i.e., very few unknowns), therefore the use of an estimate of the sampling fraction for this stage was deemed appropriate.

$$
\begin{aligned}
\hat{V}\left[\bar{y}_h\right] \approx & \left\{(1-f_1)\frac{s_{1h}^2}{d}\right\} \\
& + \left\{ f_1 \frac{1}{d\, d''} \sum_{i=1}^{d''} (1-f_{2i})\, w_{2hi}^2 \frac{s_{2hi}^2}{q_i} \right\} \\
& + \left\{ f_1 \frac{1}{d^2} \sum_{i=1}^{d} f_{2i} \frac{1}{q_i\, q_i''} w_{2hi}^2 \sum_{j=1}^{q_i''} (1-f_{m3ij}) \tilde{w}_{3hij}^2 \frac{s_{3hij}^2}{b_{hij}} \right\} \\
& + \left\{ f_1 \frac{1}{d^2} \sum_{i=1}^{d} f_{2i} \frac{1}{q_i^2} w_{2hi}^2 \sum_{j=1}^{q_i} f_{m3ij} \frac{1}{b_{mhij}\, b'_{mhij}} \tilde{w}_{3hij}^2 \sum_{k=1}^{b'_{mhij}} (1-f_{4hijk})\, w_{4hijk}^2 \frac{s_{4hjik}^2}{n_{mhijk}} \right\}
\end{aligned}
\qquad (30)
$$

where: f_1, and f_{2i} are as defined previously; f_{m3ij} is the sampling fraction for sport fishing boat parties for the estimation of averages and proportions (i.e., $f_{m3ij} \approx b_{mij} / \hat{B}_{ij}$, where b_{mij} is the number of boat parties in which the species or species group had bags measured for the proportion or average regardless of user group); f_{4hijk} is the sampling fractions for fish by species or species group within a sampled boat party (i.e., $f_{4hijk} = n_{mhijk} / N_{mhijk}$) which by design should equal one (and therefore the fourth major term of equation 30 should resolve to zero); the s_{1h}^2, s_{2hi}^2, s_{3hij}^2, and s_{4hijk}^2 terms equal the 1) among day, 2) among access location (within day), 3) among boat party (within access location), and 4) among fish (within boat party) variance components for the average or proportion estimate, respectively, which will be obtained as:

$$
s_{1h}^2 = \frac{\sum_{i=1}^{d} \left(\bar{y}_{whi} - \bar{y}_h\right)^2}{d-1} \qquad s_{2hi}^2 = \frac{\sum_{j=1}^{q_i} \left(\bar{y}_{whij} - \bar{y}_{hi}\right)^2}{q_i - 1}
$$

$$
s_{3hij}^2 = \frac{\sum_{k=1}^{b_{mhij}} \left(\bar{y}_{whijk} - \bar{y}_{hij}\right)^2}{b_{mhij} - 1} \qquad s_{4hijk}^2 = \frac{\sum_{o=1}^{n_{mhijk}} \left(y_{hijko} - \bar{y}_{hijk}\right)^2}{n_{mhijk} - 1} \qquad (31)
$$

d'' is the number of days in which s_{2hi}^2 can be estimated (i.e., days with at least 2 access locations sampled); q_i'' is the number of locations in which s_{3hij}^2 can be estimated (i.e., locations with either 1) at least 2 boat parties interviewed or 2) the number of sport fishing boat parties interviewed equals the estimated number of exiting sport fishing boat parties: $b_{ij} = \hat{B}_{ij}$); and b'_{mhijk} is the number of sport fishing boat parties in which s_{4hijk}^2 can be estimated (at least 2 fish measured per species or species group or all fish harvested by the sport fishing boat party sampled).

Across user group (guided versus unguided) or across port estimates of the numbers of fish harvested by species or species group and the associated variances can be obtained by summation:

$$\hat{N} = \sum_{h=1}^{L} \hat{N}_h \qquad \text{and} \qquad \hat{V}\left[\hat{N}\right] \approx \sum_{h=1}^{L} \hat{V}\left[\hat{N}_h\right] \tag{32}$$

where the terms $\hat{N}_h$ and $\hat{V}\left[\hat{N}_h\right]$ are as calculated above in equations 27 and 28, respectively; and L is the number of strata to combine (equal to 2 if the combination is just involving user groups, or more if involving combining of port estimates). Note that the overall across user group variance estimate is only approximate as it does not factor in the covariance for that level of poststratification. Because the guided versus unguided level of stratification is a poststratification classification, these components are not independently sampled and as such they are not statistically independent as are the 'prestratification' classification of individual ports, therefore the variance equation above is only approximate. Accordingly, if across user group estimates of the numbers of fish harvested are desired then an alternative approach that addresses the covariance issue is to ignore the user group distinction when applying the data to equations 27 and 28.

Across user group (guided versus unguided) or across port estimates of the average or proportions are weighted by the stratum weights of the corresponding stratum, as follows:

$$\bar{y} = \sum_{h=1}^{L} \hat{W}_h \bar{y}_h \qquad \text{where} \qquad \hat{W}_h = \frac{\hat{N}_h}{\hat{N}} \tag{33}$$

where the terms $\hat{N}_h$ reference the stratum estimates of the number of fish harvested (or caught) from equation 27; and $\hat{N}$ references the across strata estimate from equation 32. The variance of $\bar{y}$ will be estimated approximately[32] as:

$$\hat{V}[\bar{y}] \approx \sum_{h=1}^{L} \hat{W}_h^2 \, V[\bar{y}_h] \tag{34}$$

Standard errors of the estimates will be obtained simply by taking the square root of the appropriate variance estimate.

CWT Contribution Estimating Equations

Hatchery and tagged wild stock contributions will be estimated from the surveys using the procedures outlined by Bernard and Clark (1996). Estimates are obtained on a biweekly basis, treating all samples of fish within each biweekly period equally (i.e., ignoring the 4-stage

[32] As with the variance estimate for across user group estimates of the index of the number of fish harvested, these across variance estimates for the average or proportional parameter estimates are only approximate due to the covariance terms that are not explicitly calculated. An evaluation of the necessity of incorporating the covariance terms will be conducted during the data analysis phase for this project. Specifically, the procedures outlined in Appendix C1 will be followed to make the determination.

design)[33]. As such, the relative contributions of the releases of interest are assumed to be relatively consistent within each biweekly period. Considering that anglers in general fished the same stocks of fish within a biweekly period, this assumption should be valid[34]. The estimating procedures by Bernard and Clark (1996) that will be used are those appropriate for estimating contributions and variances when total harvest is estimated.

The notation used in the following equations essentially follows that used by Bernard and Clark (1996), with subscripts adapted to avoid confusion with other subscripts used in this operational plan. The first step involves estimating the contribution to each biweekly period in the fishery of each particular tag code[35]:

$$\hat{r}_{tc} = \hat{N}_t \hat{p}_{tc} \theta_c^{-1} \tag{35}$$

where: $\hat{r}_{tc}$ equals the estimated number of salmon from a hatchery (or wild stock) release identified by the unique tag code *c*, harvested in biweek *t*; $\hat{N}_t$ is the estimated total harvest index of salmon (one particular species only) for biweek *t*, calculated by applying equation 27 using the corresponding creel sample only from each biweek separately, and summing across the two user group (guided/unguided) components of the harvest index; θ_c is the proportion of a particular release that contained a CWT of the unique tag code *c*; and $\hat{p}_{tc}$ is calculated as:

$$\hat{p}_{tc} = \frac{m_{tc}}{\lambda_t n_t} \tag{36}$$

where n_t is the number of salmon (one particular species only) inspected for missing adipose fins from the sampled harvest in biweek *t*; corresponding to summing all of the n_{mhijk} terms (as defined for equation 1) for Chinook or coho salmon inspected for missing adipose fins from all samples within a biweekly period; m_{tc} equals the number of CWTs dissected out of the salmon heads and decoded as the unique tag code *c*, originally sampled from biweek *t*; and λ_t is defined as:

$$\lambda_t = \frac{a_t' t_t'}{a_t t_t} \tag{37}$$

where a_t is the number of salmon with a missing adipose fin that were counted from the sampled fish in biweek *t*; a_t' equals the number of salmon heads previously marked with a head strap that arrived at the Tag Lab from fish originally sampled from biweek *t*; t_t is the number of CWTs that were detected in the salmon heads at the Tag Lab from those salmon sampled in

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33 A large proportion of the Chinook and coho salmon that are scanned for adipose fin clips, and if clipped have their head collected for CWT dissection, etc. are collected in a manner that does not uniquely identify the boat from which the head was collected. Therefore, the 4-stage sample design cannot currently be applied to this estimation approach.

34 Prior to finalizing the data analysis associated with CWT estimates, an evaluation of this assumption will be conducted, for example by developing and implementing a 4-stage estimating equations appropriate to the CWT estimation process for the samples in which the CWT data can be matched to an individual boat party (creel samples only with AWL sheets) and then comparing the results from the procedures outlined herein.

35 Both the catch sampling and creel sampling data are used within each biweekly period for all the corresponding terms of the equations below, except where noted (e.g., creel samples only).

biweek t; and $t_t^{'}$ equals the number of CWTs that were removed from the salmon heads and decoded, from those salmon sampled in biweek t.

Estimates of across-biweek contributions by tag code, as well as by combined tag codes (e.g., all Alaskan hatchery tag codes) will be obtained by summing the estimates across biweeks and tag codes, as appropriate:

$$\hat{R} = \sum_t \sum_c \hat{r}_{tc} \tag{38}$$

Then the estimated relative contribution of a particular tag code or across tag codes is calculated by dividing through by the corresponding harvest index values for the entire season at a particular port, as follows:

$$\hat{u}_c = \frac{\sum_t \hat{r}_{tc}}{\sum_t \hat{N}_t} \quad \text{and} \quad \hat{U} = \frac{\hat{R}}{\sum_t \hat{N}_t} \tag{39}$$

where the $\hat{u}_c$ and $\hat{U}$ terms are the proportional contribution estimates that can then be applied to the projected SWHS estimates of overall Chinook or coho salmon harvest to calculate the corresponding preliminary 2013values for these parameters.

Estimates of the variance for contributions in a biweekly period will be estimated following the approach outlined by Bernard and Clark (1996):

$$\hat{V}[\hat{r}_{tc}] = \hat{r}_{tc}^2 \left\{ \frac{\hat{V}[\hat{p}_{tc}]}{\hat{p}_{tc}^2} + \frac{\hat{V}[\hat{N}_t]}{\hat{N}_t^2} - \frac{\hat{V}[\hat{p}_{tc}]\hat{V}[\hat{N}_t]}{\hat{p}_{tc}^2\ \hat{N}_t^2} \right\} \tag{40}$$

where $\hat{V}[\hat{N}_t]$ equals the estimated variance of overall harvest index estimate for biweek t, calculated by applying equation 28 using the corresponding <u>creel samples only</u> from each biweek separately, and summing across the guided and unguided components of the harvest index variance; and $\hat{V}[\hat{p}_{tc}]$ is the variance of $\hat{p}_{tc}$, which is estimated approximately using the large-sample approximation formula in Bernard and Clark (1996; their equation [12]). The large-sample approximation will be used because the data collected in the similarly designed surveys conducted in 1995 indicated that this approximation is relatively accurate for this survey:

$$\hat{V}[\hat{p}_{tc}] \approx \frac{\hat{p}_{tc}}{\lambda_t n_t}\left(1 - \lambda_t \hat{\phi}_t \theta_c\right) \tag{41}$$

where $\hat{\phi}_t = n_t / \hat{N}_t$.

Estimates of the variance of across-biweek contributions by tag code, as well as by combined tag codes will be obtained by the following equation (adapted from equation [3] in Bernard and Clark 1996):

$$\hat{V}[\hat{R}] = \sum_t \sum_c \hat{V}[\hat{r}_{tc}] + 2\sum_t \sum_c \sum_{u>c} \widehat{Cov}[\hat{r}_{tc}, \hat{r}_{tu}] \tag{42}$$

where $\hat{Cov}[\hat{r}_{tc},\hat{r}_{tu}]$ is the covariance between the estimated contribution of 2 different tag codes within each biweekly period, which will be calculated as per equation 43 below. Equation 42 is adapted from equation 14 from Bernard and Clark (1996), and is again the large-sample approximation that was demonstrated to be relatively accurate with the 1995 data:

$$\hat{Cov}[\hat{r}_{tc},\hat{r}_{tu}] \approx \hat{r}_{tc}\hat{r}_{tu}\frac{\hat{V}[\hat{N}_t]}{\hat{N}_t^2} \tag{43}$$

Finally, the variance for the relative contribution terms (*u* and *U* terms as defined in equation 39) will be approximated by using the formula for the variance of a quotient (page 181 in Mood et al. 1974):

$$\hat{V}[\hat{u}_c] \approx \left(\frac{\sum_t \hat{r}_{tc}}{\sum_t \hat{N}_t}\right)^2 \left\{\frac{\sum_t \hat{V}[\hat{r}_{tc}]}{\left(\sum_t \hat{N}_t\right)^2} + \frac{\sum_t \hat{V}[\hat{N}_t]}{\left(\sum_t \hat{r}_{tc}\right)^2}\right\} \quad \text{and} \quad \hat{V}[\hat{U}] \approx \left(\frac{\hat{R}}{\sum_t \hat{N}_t}\right)^2 \left\{\frac{\sum_t \hat{V}[\hat{R}]}{\left(\sum_t \hat{N}_t\right)^2} + \frac{\sum_t \hat{V}[\hat{N}_t]}{\left(\sum_t \hat{R}\right)^2}\right\} \tag{44}$$

Standard errors will be obtained as the square root of the appropriate variance.

Preliminary 2013 Estimates

The approach to estimating the preliminary 2013values associated with the objectives for this project involves applying the estimates of the intrinsic average and proportion parameters to a projection of the appropriate harvest (or in some cases total catch) from the SWHS. The projection of the harvest will be obtained by expanding the harvest indices (as in equation 27) by an expansion factor estimated from past year ratios of the published SWHS harvest estimates to the corresponding harvest values from this project. Because this year's project in Southeast Alaska has undergone substantive redesign from past years, especially for the ports of Ketchikan, Sitka, and Juneau, the historic ratios will not be used directly for this expansion. Instead, for these ports, past year data from the creel surveys conducted over the last 5 years will be sampled in a restricted manner simulating the survey design implemented in 2011. Additionally, as noted previously in this plan, the SWHS underwent a redesign prior to the 2011 sampling season. So, the ratios used for all ports this year will likely be subject to unknown error that will not be evident until several years of paired SWHS and intrinsic estimates are available.

Those matters aside, the estimating equations used for expansion follow. The expansion ratios are calculated as an across-year average, by user group (guided versus unguided), with on-site data and estimates from ports combined within each SWHS survey area (e.g., Petersburg and Wrangell would be combined for SWHS Survey Area C):

$$\bar{\pi}_h = \frac{\sum_{p=1}^{z} \hat{\pi}_{hp}}{z} \quad \text{or by user group combined:} \quad \bar{\pi} = \frac{\sum_{p=1}^{z} \hat{\pi}_p}{z} \tag{45}$$

where z is the number of years to average over (set to 5 years[36]); the $\hat{\pi}_{hp}$ and $\hat{\pi}_p$ terms are the corresponding estimated ratios for each year p by user group, calculated as:

$$\hat{\pi}_{hp} = \frac{\hat{H}_{hp}}{\hat{N}_{hp}} \quad \text{or by user group combined:} \quad \hat{\pi}_p = \frac{\hat{H}_p}{\hat{N}_p} \tag{46}$$

where $\hat{H}_{hp}$ and $\hat{H}_p$ are the corresponding estimates from the SWHS for year p; $\hat{N}_{hp}$ is the on-site harvest index for each year for each across user group for lingcod, rockfish, and halibut (obtained from equation 27); and $\hat{N}_p$ is the across user group harvest index for Chinook and coho salmon[37] for each corresponding year (obtained from equation 32).

The projected harvest (i.e., preliminary 2013 SWHS estimate) is then obtained by applying the across year ratio to this year's on-site harvest index as follows, by user group:

$$\tilde{H}_h = \bar{\pi}_h \ \hat{N}_h \quad \text{or by user group combined:} \quad \tilde{H} = \bar{\pi} \ \hat{N} \tag{47}$$

where $\hat{N}_h$ and $\hat{N}$ are from equations 27 and 32, respectively for this year's data.

The variance of $\tilde{H}_h$ will be estimated by (as per Goodman 1960), by user group:

$$\hat{V}\left[\tilde{H}_h\right] = \hat{N}_h^2 \ \hat{V}\left[\bar{\pi}_{\psi h}\right] + \bar{\pi}_h^2 \ \hat{V}\left[\hat{N}_h\right] - \hat{V}\left[\bar{\pi}_{\psi h}\right]\hat{V}\left[\hat{N}_h\right] \tag{48a}$$

or by user group combined:

$$\hat{V}\left[\tilde{H}\right] = \hat{N}^2 \ \hat{V}\left[\bar{\pi}_{\psi}\right] + \bar{\pi}^2 \ \hat{V}\left[\hat{N}\right] - \hat{V}\left[\bar{\pi}_{\psi}\right]\hat{V}\left[\hat{N}\right] \tag{48b}$$

where $\hat{V}\left[\hat{N}_h\right]$ and $\hat{V}\left[\hat{N}\right]$ are from equations 28 and 32, respectively for this year's data; and the $\hat{V}\left[\bar{\pi}_{\psi h}\right]$ and $\hat{V}\left[\bar{\pi}_{\psi}\right]$ terms are the variance for prediction including components for both the process error (reflecting the underlying variability from one year to the next due to changes in such factors as changes in the coverage of the on-site survey) and sampling error:

$$\hat{V}\left[\hat{\pi}_{\psi h}\right] = \frac{\sum_{p=1}^{z}\left(\hat{\pi}_{hp} - \bar{\pi}_h\right)^2}{(z-1)} + \frac{\sum_{p=1}^{z}\left(\hat{\pi}_{hp} - \bar{\pi}_h\right)^2}{z\,(z-1)} \tag{49a}$$

---

[36] The five most recent complete pairs of estimates from the on-site survey and SWHS are used to estimate the expansion ratio due to the progressive nature of the corresponding study designs for the two projects. For example, the coverage of the on-site survey has likely decreased in magnitude as the number of charter boat-based lodges located away from accessible sampling locations have increased. Accordingly, the most recent data pairs are expected to be better predictors for expansion in the current year. An evaluation of using a time series approach to estimating the expansion ratio may be evaluated to determine if a more accurate expansion ratio would result (i.e., projections closer to final SWHS estimates), in the following years.

[37] Both in past years and for 2013, the 'accounting' for CWT-sampled Chinook and coho salmon by catch samplers have not distinguished fish sampled by user group (guided versus unguided); accordingly for those species the expansion factors used ignore the user group distinction (and are derived by the total SWHS harvest and on-site harvest index regardless of user group).

or by user group combined:

$$\hat{V}\left[\hat{\pi}_{\psi}\right]=\frac{\sum_{p=1}^{z}\left(\hat{\pi}_{p}-\bar{\pi}\right)^{2}}{(z-1)}+\frac{\sum_{p=1}^{z}\left(\hat{\pi}_{p}-\bar{\pi}\right)^{2}}{z\,(z-1)} \tag{49b}$$

An additional calculation step needs to be followed in the case of individual species or species group estimation of harvest for rockfish as the SWHS does not provide individual species estimates for rockfish. Accordingly, the estimation process outlined above would first be applied to get the preliminary 2013harvest estimate for all rockfish species, then the individual harvest indices for each species or species group (e.g., DSR) would be used to apportion the overall rockfish harvest into each component as follows for each user group at each SWHS Survey Area level:

$$\tilde{H}_{sh}=\hat{\delta}_{sh}\tilde{H}_{h} \tag{50}$$

where $\tilde{H}_{sh}$ is the estimated preliminary value of harvest for the s^{th} species or species group of rockfish; $\tilde{H}_{h}$ is as per equation 47; and $\hat{\delta}_{sh}$ is the estimated proportion of rockfish within each SWHS Survey Area representing the s^{th} species or species group calculated as from the on-site harvest indices:

$$\hat{\delta}_{sh}=\frac{\hat{N}_{sh}}{\sum_{s=1}^{S}\hat{N}_{sh}} \tag{51}$$

where $\hat{N}_{sh}$ is the individual harvest index value (from equation 27) for species or species group *s*; and *S* is the total number of different species or species group for the appropriate overall total of rockfish harvest. The variance of $\tilde{H}_{sh}$ would then be calculated as per Goodman (1960):

$$\hat{V}(\tilde{H}_{sh})=\tilde{H}_{h}^{2}\,\hat{V}(\hat{\delta}_{sh})+\hat{\delta}_{sh}^{2}\,\hat{V}\left[\tilde{H}_{h}\right]-\hat{V}(\hat{\delta}_{sh})\,\hat{V}\left[\tilde{H}_{h}\right] \tag{52}$$

with the variance of $\hat{\delta}_{sh}$ calculated approximately as (adapted from Mood et al., 1974)[38]:

$$\hat{V}\left[\hat{\delta}_{sh}\right]\approx\frac{\left(\sum_{u=1}^{U}\hat{N}_{uh}\right)^{2}\sum_{u=1,u\neq s}^{U}\hat{V}\left[\hat{N}_{uh}\right]+\left(\sum_{u=1,u\neq s}^{U}\hat{N}_{u}\right)^{2}\hat{V}\left[\hat{N}_{sh}\right]}{\left(\sum_{u=1}^{U}\hat{N}_{sh}\right)^{4}} \tag{53}$$

and $\hat{V}\left[\hat{N}_{sh}\right]$ as per equation 28, for the corresponding rockfish species or species group.

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[38] The subscript *u* and the term *U* represents a substitution for the subscript s and term *S* in this equation, and they do not reference the tag code terms *U* or *u* as referenced previously in this plan.

Mid Season Projections

Mid season projections for the 2013 end-of-season preliminary values are estimated in a similar manner as described above for the **Preliminary 2013 Estimates**, with the additional step of expanding the data and estimates through the end of the appropriate mid season period by historic ratios for the mid season period to the total yearly estimate. So for example, if by July 31 *Y*% of the harvest of yelloweye rockfish historically occurs before that date, then the harvest index for yelloweye rockfish through the beginning of August would then be expanded upwards by multiplying by the factor of "*100/Y")*. Then the equations above (45 through 53), would be applied to this expanded projection of the end-of-season on-site harvest index to obtain the end-of-season preliminary 2013 value. Because these values are used for inseason management milestones at this time, then the mid season estimates will be calculated without corresponding estimates of the variance.

Preliminary 2013 Total Sport Harvest of Chinook and Coho Salmon (Primary Objectives 1a and 3a)

The preliminary 2013 total sport harvest of Chinook and coho salmon for Southeast Alaska will be estimated by the following step-wise process (implemented separately for each species):

1. Estimates of the harvest index for each user group (guided versus unguided) for each port will be calculated using equation 27, with corresponding variances approximated by equations 28 and 29.
2. The user group harvests would be summed across type (guided plus unguided) for each port, with the variances for these sums approximated by summation as well (approximation, as the two parameters are not estimated independently), as per equation 32.
3. The estimates for SWHS Survey Areas with more than one port sampled will be combined by summation. So the estimates for Petersburg and Wrangell will be combined to obtain 1 overall harvest index for SWHS Survey Area C; and Gustavus and Elfin Cove estimates will be combined for SWHS Survey Area G. The corresponding variances will also be summed.
4. Then each SWHS Survey Area's harvest index will be expanded by the most recent 5-year expansion factor ratios (Area B represented by Craig/Klawock – *but note below about the east and west sides of Prince of Wales Island*, Area C = Petersburg/Wrangell, Area G = Gustavus/Elfin Cove, and Area H = Yakutat)[39], or the expansion factor ratios to be simulated from recent on-site sampling data (for Area A = Ketchikan, Area D = Sitka, and Area E = Juneau), as outlined in equation 47 (for these estimates only the across user group ratios and statistics are used). Variances will be calculated as noted in equations 48 through 53.

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[39] The most recent expansion factors (π values) for the combination of ports representing the SWHS Survey Areas that will be sampled in 2013 in the same manner and at the same level (technician hours) as in past years (that is all except Ketchikan, Sitka, and Juneau) will be approximately valid to apply for the 2013 project. In other words the calculations outlined in equation 45 will not be used for these port-SWHS pairs, and the ratios used in the past (as updated for the most recently published year of SWHS data) will be used for expansion at these ports. Conversely, because the design of the on-site survey in Ketchikan, Sitka, and Juneau differs in nature and level, the past expansion factors are likely not appropriate to use for 2013, and as noted, revised factors will be calculated by mid July 2013).

In the Ketchikan area, the expansion factor calculation will take into account harvests from the east side of Princes of Wales Island (a portion of SWHS Survey Area B) because much of the harvest in this area is taken by anglers accessing the fishery from the Ketchikan road system. Similarly, this same portion of SWHS Survey Area B has been 'removed' from the expansion factor calculation for expanding the Craig/Klawock harvests.

5. Then each of these expanded projections for the 2013 SWHS preliminary values would be summed over each SWHS Survey Area (A through E, G, and H), with variances summed as well.

6. The final step is to adjust for SWHS Survey Area F (Haines/Skagway), which historically has a low overall Chinook and coho salmon harvest; this expansion is from the ratio of the percentage of harvest by each species in Area F to the total of SWHS Southeast Alaska harvest estimates (SWHS Survey Areas A through H). So, for example, if the Area F harvest of Chinook represents Y% of the total Southeast Alaska harvest, then the total preliminary 2013 harvest value for all areas except F would be expanded by dividing by "1-(Y/100)" (e.g., if Y% = 4%, then divide the summation obtained in step 5 by 0.96). The end result will represent the total preliminary 2013 value of the harvest by each species. The variance from step 5 would be multiplied by the square of the expansion (e.g., $(1/0.96)^2$ in the example above to get the variance of this total (with the standard error equal to the square root of the variance).

Hatchery and Nonhatchery Contributions-Chinook and Coho Salmon (Primary Objectives 1b and 3b)

Estimates of the relative and total harvest contributions of hatchery and nonhatchery CWT-tagged stocks to the harvest for Chinook salmon (Primary Objective 1b) and coho salmon (Primary Objective 3b) will be calculated in a stepwise manner as follows, implemented separately for each species, and each tag code or combinations of tag code (e.g., all Alaska hatchery codes):

1. Estimates of the relative contribution by tag code or combination of tag code are calculated as outlined in equation 39, with the variance calculated as in equation 44. These estimates are calculated with statistics combined across ports that are within the same SWHS Survey Areas in the same grouping manner as described above. The relative contribution estimates by port (or combined port) correspond to the objective criteria listed for Primary Objectives 1b and 3b.

2. Each relative contribution estimate for each SWHS Survey Area is then multiplied by the corresponding preliminary 2013total harvest value for the corresponding species to obtain the preliminary 2013 contribution estimates, by tag code or groups of tag codes as:

$$\tilde{r}_c = \hat{u}_c \tilde{H} \quad \text{and} \quad \tilde{R} = \hat{U}\,\tilde{H} \tag{54}$$

where $\hat{u}_c$ and $\hat{U}$ are from equation 39, and $\tilde{H}$ is from equation 47. The variance for these estimates will be calculated by Goodman (1960) for the variance of a product of random variables:

$$\hat{V}[\tilde{r}_c] = \hat{u}_c^2\, \hat{V}[\tilde{H}] + \hat{V}[\hat{u}_c]\,\tilde{H}^2 - \hat{V}[\tilde{H}]\hat{V}[\hat{u}_c] \tag{55a}$$

$$\hat{V}\left[\tilde{R}\right]=\hat{U}^{2}\hat{V}\left[\tilde{H}\right]+\hat{V}\left[\hat{U}\right]\tilde{H}^{2}-\hat{V}\left[\tilde{H}\right]\hat{V}\left[\hat{U}\right] \quad (55b)$$

where $\hat{V}[\hat{u}_c]$ and $\hat{V}[\hat{U}]$ are from equation 44; and $\hat{V}[\tilde{H}]$ is from equation 48b.

3. The total contribution estimates by tag code or combined tag code for each species over all survey areas is obtained by summation across SWHS Survey Areas in a similar manner as described above for the **Preliminary 2013 Total Sport Harvest**, with variances obtained by summation.

Pacific Salmon Treaty Harvest (Primary Objectives 1c and 2)

The Pacific Salmon Treaty harvest (Chinook salmon) will be estimated for Southeast Alaska in total (Primary Objective 1c) by first calculating the total Alaska hatchery contributions for each SWHS Survey Area as described above (**Hatchery and Nonhatchery Contributions-Chinook and Coho Salmon**). Then the following steps will be followed to estimate the preliminary treaty harvest for Southeast Alaska for 2013[40]:

1. The total contribution estimate of Alaska hatchery to the Chinook salmon harvest by SWHS Survey Area is then subtracted from the 2013 preliminary total harvest of Chinook salmon for each survey area, the resulting estimate of the preliminary total harvest of Chinook salmon without Alaskan hatchery fish (as Alaskan hatchery fish do not count towards the treaty). These reduced total harvests would then be summed across all surveyed SWHS Survey Areas.

   Because Wrangell Narrows is specifically denoted in the SWHS, and because we are able to identify those Chinook salmon harvested and sampled from Wrangell Narrows in the data, we omit these fish from the inseason harvest projection. The Wrangell Narrows-Blind Slough Terminal Harvest Area Salmon Management Plan (5 AAC 33.381) specifically notes Chinook harvested in that area as being 100% Alaska hatchery, and therefore would not count toward the quota.

2. The next step is to adjust for SWHS Survey Areas with low Chinook salmon harvest, which includes the Haines/Skagway and Yakutat areas. The expansion factor to be used was approximately 1.04 (derived from past SWHS estimates), which indicated that these combined SWHS Survey Area's harvests only represented a minor percentage (4%) of the Southeast Alaska regional harvest.

3. The final step will be to adjust the treaty harvest upward to reflect the subtraction of the base catch and "risk adjustment factor" from the total Alaskan hatchery contribution estimate[41]. The risk adjustment factor is calculated by multiplying the standard error of the Alaska hatchery contribution estimate by 1.272. This subtraction ensures that the calculated contribution does not exceed the actual contribution. The preseason estimate of the base catch and "risk adjustment factor" is 15% of the Alaska hatchery contribution.

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[40] Variances (and standard errors) are not currently estimated for the Pacific Salmon Treaty estimates as the point estimates are used 'as-is' for treaty purposes.

[41] The adjustment of the total Alaskan hatchery contribution estimate by the "risk adjustment factor" is determined by procedures associated with the U.S./Canada treaty. The end result of the subtraction of the adjustment factor from the contribution estimate is to increase the size of the treaty harvest estimate. The final estimate of the "risk adjustment factor" for the sport treaty harvest is calculated by John Carlile, Fishery Scientist, Division of Commercial Fisheries at ADF&G Headquarters.

The need for, as well as the process for calculating the early season (late April through mid July) treaty harvest for Commercial Salmon Districts 8 (Petersburg/Wrangell) and 11 (Juneau), follows:

> **District 8**: The Pacific Salmon Treaty requires the U.S. delegation (and Alaska in particular in this case) to provide weekly estimates of wild Stikine River large (≥28 in) Chinook salmon being harvested in District 8 by both sport and commercial fishermen during late April to mid July. Large Chinook salmon sport harvest in District 8 is sampled on-site at the ports of Petersburg (north end of District 8) and Wrangell (south end of District 8), and the on-site samplers summarize the District 8-specific information as part of their weekly paperwork. Recoveries of CWTs from large Chinook salmon in District 8 areas from the weekly sport fisheries are used to estimate the relative contribution of Alaska and non-Alaska hatchery fish, and non-Alaska wild fish. The total wild large Chinook salmon harvest is estimated by subtracting the estimated number of Alaska and non-Alaska hatchery fish, and non-Alaska wild fish from the estimated total harvest. The recent 5-year average of the expansion factor for each port (Petersburg has an expansion factor of 5 and Wrangell's is 4) is applied to the above relative estimates to project the total harvest of District 8 large Chinook salmon.
>
> **District 11**: The Pacific Salmon Treaty requires the U.S. delegation (and Alaska in particular in this case) to provide weekly estimates of wild Taku River large (≥28 in) Chinook salmon being harvested in District 11 by both sport and commercial fishermen during late April to early July. Large Chinook salmon harvested in District 11, which includes the majority of the Juneau-area marine waters, are sampled on site at the port of Juneau. In addition to the sampled docks and boat launches, during mid April to the end of May the unique shoreline Chinook fishery at Picnic Cove on the north end of Douglas Island is sampled, as it occurs in District 11. The District 11 harvest information is the majority of the entire harvest encountered by on site personnel in Juneau, so the data are examined and any Chinook salmon information from outside of District 11 is excluded. Recoveries of CWTs from large Chinook salmon from District 11 areas from the weekly sport fisheries are used to estimate the relative contribution of Alaska and non-Alaska hatchery fish, and non-Alaska wild fish. The total wild large Chinook salmon harvest is estimated by subtracting the estimated number of Alaska and non-Alaska hatchery fish, and non-Alaska wild fish from the estimated total harvest. An expansion factor for Juneau will be developed to expand to projected total harvest estimates for District 11.

Note that in both cases, due to the nature of this information need for addressing Pacific Salmon Treaty requirements inseason, no estimates of variance are required at this time.

Average Weight Estimates (Primary Objective 4), and Length Composition (Secondary Objective 3) of Pacific Halibut

Estimates of the mean net weights of halibut harvested at all sampled ports will be made in 2013 by first converting each measured length using the IPHC length-weight relationship to obtain an individual weight for each fish measured, as:

$$W_{hijko} = \alpha \, L_{hijko}^{\beta} \tag{56}$$

where W_{hijko} is the converted weight for each fish *o* in the k^{th} sampled boat party's bag, at access location *j*, on the sampled day *i* for each user group *h* (guided versus unguided), the L_{hijko} is the length for each halibut measured, and α and β are the estimated regression parameters for the length-to-weight conversion model endorsed by the IPHC (Clark 1992), with α = 6.921 x 10^{-6} and β = 3.24 for net weight in pounds converted from total length in centimeters. The individual lengths for each fish are converted to weights in this approach rather than applying the conversion to a mean length as per the recommendations by Nielsen and Schoch (1980). No correction will be made for transformation bias because the length-weight relationship was based on a large sample and the residual variance is extremely small (William Clark, IPHC, personal communication). Mean weight estimates are presented in pounds rather than kilograms because that is the standard unit used by halibut management agencies. The mean weight estimates by user group for each port or combined ports within each SWHS Survey Area are then calculated by substituting the converted weight values (W_{hijko}) for the y_{hijko} term in equation 26 resulting in the average net weight by user group at each port or combined port (the combined port estimates are produced by treating each access location at each port as if they were separate access locations in the combined port in the multi-stage calculations). The estimated variances for these averages will be approximated by similar substitution into equation 30, with standard errors calculated as the square root of the variances.

Proportion of Pacific Halibut Harvested by Unguided Anglers Prior to Mean IPHC Survey Date (Primary Objective 5)

The proportion of the Pacific halibut harvested by unguided anglers prior to the mean IPHC survey date will be as follows for each port (or combined port):

$$\hat{p}_{u(d<\overline{ID})} = \frac{\hat{N}_{u(d<\overline{ID})}}{\left(\hat{N}_{u(d<\overline{ID})} + \hat{N}_{u(d\geq\overline{ID})}\right)} \qquad (57)$$

where $\hat{p}_{u(d<\overline{D})}$ is the proportion of the halibut harvest index for the unguided component[42] of the fishery for the date *d* less than the mean IPHC survey date ($\overline{ID}$), $\hat{N}_{u(d<\overline{ID})}$ is the harvest index using <u>creel samples only</u> for the unguided component prior to the mean IPHC survey date (as previously noted the mean date will be provided by IPHC) at each port by using equation 27 on this restricted data set, and $\hat{N}_{u(d\geq\overline{ID})}$ is the unguided harvest index for dates greater than or equal to the mean IPHC survey date (again from equation 27 on those restricted dates). The variance of $\hat{p}_{u(d<\overline{D})}$ will be calculated approximately as (adapted from Mood et al. 1974):

$$\hat{V}\left[\hat{p}_{u(d<\overline{D})}\right] \approx \frac{\left(\hat{N}_{u(d<\overline{D})} + \hat{N}_{u(d\geq\overline{ID})}\right)^2 \hat{V}\left[\hat{N}_{u(d\geq\overline{ID})}\right] + \hat{N}^2_{u(d\geq\overline{ID})} \hat{V}\left[\hat{N}_{u(d<\overline{D})}\right]}{\left(\hat{N}_{u(d<\overline{D})} + \hat{N}_{u(d\geq\overline{ID})}\right)^4} \qquad (58)$$

[42] The subscript *u* represents unguided, and does not reference the tag code terms *U* or *u* as referenced previously in this plan.

where the corresponding variance terms are calculated from equation 28 on the two sets of data restricted by date.

The span of dates of the surveys at each port is expected to cover the vast majority of the halibut sport fishery for the unguided component, however an unknown portion of the total yearly harvest likely occurs both before and after the dates covered; accordingly, the proportions estimated by equation 57 may be biased by some unknown degree (but the bias is assumed to be minimal in magnitude).

Average Weight and Preliminary Biomass Estimates of Lingcod (Primary Objective 6)

The average round weight estimates for lingcod by user group (guided versus unguided) and user group combined for the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat will be calculated in the same manner as described above for the average weight of halibut. The corresponding estimated for the regression parameters are α = 7.9 x 10^{-6} and β = 3.07 for round weight in kilograms, with total length measured in centimeters for use in equation 56. The values for α and β are those used by the Division of Commercial Fisheries (Dave Carlile, biometrician, ADF&G, Division of Commercial Fisheries, Juneau, personnel communication). The mean weight estimates by user group and in total for each port or combined ports within each SWHS Survey Area are then calculated by substituting the converted weight values for the y_{hijko} term in equation 26, resulting in the average round weight by user group at each port or combined port (the combined port estimates are produced by treating each access location at each port as if they were separate access locations in the combined port in the multi-stage calculations). The estimated variances for these averages will be approximated by similar substitution into equation 30, with standard errors calculated as the square root of the variances.

The preliminary biomass estimate for each SWHS Survey Area will then be estimated by multiplying the resultant average weights for each port (or combined ports within each SWHS Survey Area) by the corresponding preliminary harvest estimate (by user group and user group combined), as follows:

$$\tilde{W}_h = \overline{w}_h \, \tilde{H}_h \quad \text{and} \quad \tilde{W} = \overline{w} \, \tilde{H} \tag{59}$$

where $\overline{w}_h$ and $\overline{w}$ are the average weight estimates by user group and by user group combined as calculated by equation 26 (with weight substituted for "*y*"); and $\tilde{H}_h$ and $\tilde{H}$ equal to the preliminary harvest of lingcod in numbers of fish for each user group and user group combined as obtained by equation 47. The variance of the estimated biomass will be calculated by the equation of Goodman (1960) as:

$$\hat{V}\left[\tilde{W}_h\right] = \overline{w}_h^2 \, \hat{V}\left[\tilde{H}_h\right] + \hat{V}\left[\overline{w}_h\right] \tilde{H}_h^2 - \hat{V}\left[\tilde{H}_h\right] \hat{V}\left[\overline{w}_h\right] \quad \text{and} \tag{60a}$$

$$\hat{V}\left[\tilde{W}\right] = \overline{w}^2 \, \hat{V}\left[\tilde{H}\right] + \hat{V}\left[\overline{w}\right] \tilde{H}^2 - \hat{V}\left[\tilde{H}\right] \hat{V}\left[\overline{w}\right] \tag{60b}$$

where $\hat{V}\left[\overline{w}_h\right]$ and $\hat{V}\left[\overline{w}\right]$ are from equation 30;and $\hat{V}\left[\tilde{H}_h\right]$ and $\hat{V}\left[\tilde{H}\right]$ are from equations 48a and 48b, respectively.

Table 5.–Summary of total length in centimeters to round weight in kilograms conversion-regression model parameters for rockfish species with adequate sample sizes for fitting the model, and for other species (within a species group) with small sample sizes to be used in Southeast Alaska sport fisheries for 2013. (Based on rockfish length-weight data collected by Southeast Alaska onsite creel surveys during 2006 and 2007).

Species	α	β	Species or small sample group	α	β
Black	0.000109	2.495	Silvergrey	0.000060	2.586
Bocaccio	0.000057	2.614	Tiger	0.000030	2.839
Canary	0.000112	2.472	Vermilion	0.000183	2.373
China	0.000066	2.643	Yelloweye	0.000024	2.902
Copper	0.000011	3.099	Yellowtail	0.000075	2.539
Dusky	0.000039	2.737	Dark	0.000047	2.729
Quillback	0.000033	2.820	Other pelagic	0.000084	2.559
Rougheye	0.000010	3.103	Other demersal	0.000025	2.892
Shortraker	0.000048	2.724	Other slope	0.000037	2.726

Rockfish Species Composition; and Average Weight Estimates and Preliminary Biomass Removals of Demersal Shelf Rockfish (Primary Objective 7)

The species composition of rockfish will be estimated as proportions of the harvest at each port (or combined ports within a SWHS Survey Area) and calculated as outlined in equation 51, with corresponding variances from equation 53.

The average weight by rockfish species for each species and species grouping will be estimated in the similar manner as described above for the halibut and lingcod. The regression parameters for converting lengths to weight were developed from paired length and weight data collected by this project during 2006 and 2007, or from other sources for species with low sample sizes (see Table 5).

As was done for the halibut and lingcod average weight calculation, each rockfish by species with a measured length will have the length converted to a weight (using equation 56 with the regression parameters in Table 5), and the resultant weights will be substituted into equation 26, resulting in the average round weight by user group at each port or combined port. The estimated variances for these averages will be approximated by similar substitution into equation 30, with standard errors calculated as the square root of the variances. These calculations will all be conducted separately for each species by user group (guided versus unguided).

The preliminary biomass estimates for harvest of DSR by user group in the Southeast Outside District (Craig, Sitka, Gustavus, Elfin Cove, and Yakutat combined) and its variance will be calculated as described above for lingcod, by applying equations 59 through 60a to the corresponding terms for each individual DSR species separately. In applying these equations, the terms $\tilde{H}_h$ and $\hat{V}\left[\tilde{H}_h\right]$ will be replaced by the corresponding values for each DSR species, i.e., $\tilde{H}_{sh}$ and $\hat{V}\left[\tilde{H}_{sh}\right]$ as calculated in equations 50 and 52, respectively. The overall preliminary biomass estimate of the harvest of DSR over all DSR species will be calculated as the sum of the individual biomass estimates by each of the DSR species within each user group and across the corresponding ports. The overall variance will similarly be obtained by summation across the species values.

To achieve Primary Objective 7a, the biomass of the harvested rockfish is only one component of the biomass of removals; the other component is the estimate of the biomass of released rockfish that die after release (release mortality). For this purpose, it will be assumed that 100% of all released rockfish of the DSR group will die. Although this level of release mortality may be biased high, this assumption is set conservatively for the long-term sustainability of the resource. The estimates of the proportion of each rockfish species in the DSR group will be obtained via the procedures outlined for Primary Objective 8 (see **Estimates of the Proportion Released for Chinook Salmon, Rockfish, Pacific Halibut, and Lingcod**, below)[43], which will be used to estimate the maximum release mortality biomass as follows:

$$\hat{WR}_h = \frac{\hat{W}_h}{\left(1-\overline{pr}_h\right)} \tag{61}$$

where $\hat{WR}_h$ is the estimated weight (biomass) of all removals of rockfish of each DSR species (harvest plus release mortality); $\overline{pr}_h$ is the estimated proportion of rockfish for each DSR species (from equation 26), and is $\hat{W}_h$ is the biomass of the harvested rockfish for each DSR species from equation 59. The variance of $\hat{WR}_h$ will be obtained approximately by (adapted from Mood et al. 1974):

$$\hat{V}\left[\hat{WR}_h\right] \approx \frac{\hat{W}_h^2\ \hat{V}\left[\overline{pr}_h\right] + \left(1-\overline{pr}_h\right)^2 \hat{V}\left[\hat{W}_h\right]}{\left(1-\overline{pr}_h\right)^4} \tag{62}$$

where $\hat{V}\left[\hat{W}_h\right]$ is from 60a and $\hat{V}\left[\overline{pr}_h\right]$ is from equation 30 (note that $\hat{V}\left[1-\overline{pr}_h\right] = \hat{V}\left[\overline{pr}_h\right]$).

Estimates of the Proportion Released for Chinook Salmon, Rockfish, Pacific Halibut, and Lingcod (Primary Objective 8)

The proportion of catch of Chinook salmon (both <28 in TL and ≥28 in TL), rockfish (yelloweye, other DSR, slope, and pelagic), halibut, and lingcod released by the sport fishery at each port (or combined port within a SWHS Survey Area) will be calculated as outlined above for the intrinsic 4-stage estimating equations using a coded version of the observed catch from <u>creel samples only</u>. Specifically, each fish reported caught (both the harvest and the reported number of fish released) by species or species grouping for each interviewed boat party will be coded as a "1" for a released fish, and a "0" for a harvested (kept) fish, as per equation 2. Then these coded values will be plugged into equation 26 to obtain the estimated proportion of fish released. The corresponding variance will be calculated by substituting the coded values into equation 30. Across-user group overall estimates of the proportion released and the associated variance will then be calculated as per equation 33 and 34. In applying equations 26, 30, 33, and 34, both the 4-stage sampling weights and the stratum weights will be calculated using the numbers of fish

[43] Estimates of the released proportion will be calculated by user group for achieving the information necessary for objective 7, even though the estimates for objective 8 do not require this distinction.

for each species or species group that were caught (including numbers harvested, plus number released) instead of the numbers harvested. So the numbers caught (c_{hijk}) will be substituted for the n_{hijk} terms in these equations.

Weekly Harvest per Unit Effort of Coho Salmon (Secondary Objective 2)

Inseason values of the HPUE will be calculated as unweighted means, as the objective is primarily directed at providing a measure of the hours necessary to harvest a coho salmon. This objectiveis directed at providing information to Division of Commercial Fisheries managers that can be directly compared to similar values from previous years. Additionally, because the measures of HPUE are summarized as weekly values or for the 6-week period of June 15–July 31, the impact from not weighting is expected to be relatively minor.[44] The calculation process for the unweighted HPUE values first involves obtaining the mean HPUE for all rods fished in each interviewed boat party (creel samples only):

$$\overline{HPUE}_{hijk} = \frac{N_{hijk}}{e_{hijk} v_{hijk}} \tag{63}$$

where N_{hijk} is as defined previously (see equation 5), e_{hijk} is the targeted[45] effort (boat-hours) of each interviewed boat party, and v_{hijk} is the targeted number of rods fished by the interviewed boat party.

Then the mean HPUE for each week or for the June 15 through July 15 period will be obtained over all boat parties interviewed within each of the corresponding periods:

$$\overline{HPUE}_p = \frac{\sum_{h=1}^{L} \sum_{i=1}^{d_p} \sum_{j=1}^{q_i} \sum_{k=1}^{b_{hij}} \overline{HPUE}_{hijk}}{\sum_{h=1}^{L} \sum_{i=1}^{d_p} \sum_{j=1}^{q_i} b_{hij}} \tag{64}$$

where all terms are as defined previously in this plan (however, d_p is defined as only including the days sampled within each corresponding period *p*). Because these values are used for inseason management milestones, the mean HPUE estimates will be calculated without corresponding estimates of the variance.

Mid Season Projection of Preliminary 2013 Lingcod and Yelloweye Rockfish Harvested (Secondary Objectives 5 and 6)

A mid season (through the beginning of August) projection of the annual 2013 preliminary harvest of lingcod and yelloweye rockfish associated with the SWHS Survey Areas covered by the ports of Sitka, Ketchikan, Craig/Klawock, Gustavus, Elfin Cove, and Yakutat will be made by the procedures outlined in the **Mid Season Projections** section above (see page 40 for the approach for making these projections). It is anticipated that for this season the bulk of the data

[44] This assumption will be evaluated during the postseason data analysis this year to determine the validity of the assumption.

[45] Boat-hours are recorded as fishing for salmon versus fishing for groundfish. The HPUE for Chinook and coho salmon will be calculated using the ‘salmon-hours’ and the HPUE for halibut will use the ‘groundfish-hours’.

collected and recorded by the creel sampling technicians may not be fully processed by the time that this mid season projection needs to be made. Accordingly, if that turns out to be the case this year, the weekly summaries of the numbers of lingcod and yelloweye rockfish observed will be summed up through August 4 and compared to a similar sums from past years. This comparison will be used to get a rough gauge as to whether or not the total harvest of yelloweye rockfish and lingcod will be greater or less than in recent years.

SITE-SPECIFIC PROCEDURES

Prior to the 2011 sampling season, the study design at Ketchikan, Juneau, and Sitka was an onsite direct expansion creel survey in which direct estimates of angler effort, catch, and harvest could be derived. Sample selection at the various stages in the multi-stage design had generally involved random selection from all available days, time periods within the 'angling day', and from the majority of access locations from which sport boat parties exited the sport fishery. The past-year surveys at the other ports were generally similar to the design to be implemented in the post-2011 sampling design. The 2011 sampling design underwent substantive changes at the ports of Ketchikan, Juneau, and Sitka, in relation to gathering and using boat party counts to weight the information collected during interviews and catch samples in a multi-stage manner (rather than treating data as if collected from a simple random sample). At all ports, the overall sample design for 2013 is as described in the Study Design section of the operational plan. The general design features for sample selection and the data analysis procedures, as described above, are the same for all locations (one exception is the sampling design for estimation of parameters related to derby-entered fish in the Juneau derby: see details in the site-specific section for that location below); as such, they are not repeated below. References to previous-year design features are in some cases referenced for clarity sake.

At all locations the sampling will be grouped in 2-week "seasonal" time periods (called biweekly periods). The biweekly periods during the entire season are as follows: 29 April–12 May, 13–26 May, 27 May–9 June, 10–23 June, 24 June–7 July, 8–21 July, 22 July–4 August, 5–18 August, 19 August–1 September, 2–15 September (note the start-end dates for each site differ as noted in the operational plan). The weekend-holidays include the dates of 27 May, 4 July, and 2 September (referenced below in regards to days to sample). These biweekly periods are only used directly in the estimation process for the CWT-related objectives (see Data Analysis section for details).

The following sections outline details regarding the specifics of access locations, days of the week, periods of the day, and allocation of technician shifts that are unique to each major port. Additionally, site specific details regarding data collection and recording procedures are outlined in further detail in the 2013 Creel Technician Manual.

KETCHIKAN MARINE BOAT FISHERY

The Ketchikan marine boat sport fishery will be surveyed from 29 April through 15 September, with the Ketchikan King Salmon Derby occurring from 25 to 27 May, 1 to 2 June, and 8 to 9 June. Five access locations will be sampled. The catch sampler will occasionally conduct biological sampling at the three docks not covered by the technicians collecting the complete interviews to help evaluate whether the docks should be included in the sampled sites in future

Table 6.–Summary of study design features for the 2013 onsite catch sampling survey of the Ketchikan marine boat sport fishery.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh-in stations sampled (4 total)
9	29 April–12 May	10	4	2	
10	13–24 May	10	4	2	
DERBY	25, 26 May	2	5	3	2
11	28–31 May and 3–7 June	4	5	3	
DERBY	27 May and 1–2, 8–9 June	5	5	3	2
12	10–23 June	10	5	3	
13	24 June–7 July	10	5	3	
14	8–21 July	10	5	3	
15	22 July–4 August	10	5	3	
16	5–18 August	10	5	3	
17	19 August–1 Sept	10	5	3	
18	2–15 September	10	5	3	

Years, and to increase the number of biological samples on the days with minimal effort. A total of 2 to 4 staff[46] are assigned to the project, working 6.5 hours each scheduled day. All weekends and holidays will be worked, and technicians will get two days off each week. The scheduling of days and periods to sample within the entire survey were structurally different for derby versus nonderby periods as described below.

Within any of the nonderby biweekly periods (i.e., biweeks 9, 10, 13–18), 2 to 4 technicians (2–3 creel samplers and 1 catch sampler) will be deployed to conduct the creel and catch sampling (Table 6). Harbors were selected at random without replacement (WOR) for each day sampled, except for the two days off. Within the two derby biweekly periods (i.e., biweeks 11 and 12), 4 technicians (3 creel samplers and 1 catch sampler) will conduct harvest sampling for 6.5 hours Wednesday through Sunday, with the nonderby day sampling periods determined as stated above. Each sampling day was selected at random WOR from all available harbors.

Two of the four derby weigh-in stations will be covered with a catch sampler. The weigh-in stations chosen are those most likely to provide the best chance of sampling the most entries. To ensure the samples are representative of the stock composition, a south-of-town or in-town harbor and a north-of-town harbor will be scheduled.

Additional CWT harvest inspection samples were scheduled during the spring Chinook fishery (17 May through 27 June) and the main coho season (starting on 1 July). These additional samples were directed at increasing the proportion of harvested Chinook and coho salmon inspected for adipose fin clips (denoting the possible presence of a CWT). The scheduling of these "CWT samples" was structured to consistently sample at locations with a substantial harvest of Chinook and coho salmon that "represented the fishery".

46 Dependent upon the period of the survey.

Within a biweekly period all weekends and holidays will be sampled and additional samples will be allocated to weekdays. The increased CWT sampling in 2013 is targeted at increasing CWT recoveries of wild stock Chinook and coho salmon (e.g., Unuk River stocks) and the Alaska hatchery contribution of Chinook salmon.

There will be creel sampling days during which groundfish sampling (e.g. Pacific halibut lengths) will be emphasized by creel samplers, with priority over collecting Chinook salmon scales.

SITKA MARINE BOAT FISHERY SURVEY

The Sitka marine boat sport fishery will be surveyed from 29 April to 15 September, with the Sitka Chinook Salmon Derby occurring from 25 to 27 May and 1 to 2 June. Eight access locations in the Sitka marine boat fishery will be sampled. Two days off will be shifted in a week if a standard day off falls on a holiday or a derby day. A total of 2 to 6 staff are assigned to the project and each of these staff can sample 10 days within each biweekly period. During the nonderby biweekly periods, the schedule was generated as follows: 1) two days off were set; 2) locations to sample from the access locations were selected at random WOR. A similar procedure was used for scheduling sampling during the derby biweekly period. The number of sampling units scheduled for the entire season is also summarized in Table 7.

Additional CWT harvest inspection samples were scheduled for 1–2 catch samplers to increase the proportion of harvested Chinook and coho salmon inspected for adipose fin clips. Selected creel sampling days during which groundfish sampling (e.g. Pacific halibut lengths) will be emphasized by creel samplers with priority.

JUNEAU MARINE BOAT AND ROADSIDE FISHERIES SURVEYS

The Juneau marine boat sport fishery will be surveyed from 29 April through 15 September, with the Golden North Salmon Derby occurring 9–11 August. Six access locations will be sampled. The catch sampling technician may periodically check on other harbors to do some biological sampling.

The sampling day during nonderby biweekly periods (biweeks 9–15; 17–18) will consist of 6.5 hour shifts that overlap. All weekends and holidays will be worked and in general all technicians will have two days off each week. A total of 3 to 5 staff are assigned to the project. Access locations were selected at random WOR.

Similarly, within the derby biweekly period (i.e., biweek 16), 3–5 creel samplers will conduct the creel survey and CWT sampling. The schedule was generated as follows: 1) days off were designated, and 2) access locations were selected at random WOR. In Juneau, the derby stations do not keep a count the total number of entered fish; therefore, all derby-entered Chinook and coho salmon will be counted and sampled for CWT at the processing plant with a subsample of Chinook salmon to be sampled for genetics[47]. The number of sampling units by stratum

[47] Because the total number derby-entered Chinook and coho salmon will be known after our sampling (as we will count all derby-entered fish at the processing plant), and because our sampling procedure for the Juneau derby will likely result in a larger fraction of this portion of the Juneau fishery being sampled (in comparison to the rest of the season), then the Juneau derby-entered Chinook and coho salmon will be treated as its own separate population for inference purposes (of a known size, so no expansion via the SWHS will be necessary for this 'population'). Accordingly, the total count of Chinook and coho salmon entered in the derby will be subtracted from the overall seasonal estimates from the SWHS during the process of calculating the preliminary values for the non-derby portion of the Juneau fishery.

Table 7.–Summary of study design features for the 2013 onsite catch sampling survey of the Sitka marine boat sport fishery.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh-in stations sampled
9	29 April–12 May	10	7	2	
10	13–24 May	10	8	3	
DERBY	25, 26 May	2	8	3	1
11	28–31 May, 3–9 June	6	8	3	
DERBY	27 May, 1–2 June	3	8	3	1
12	10–23 June	10	8	3	
13	24 June–7 July	10	8	3	
14	8–21 July	10	8	3	
15	22 July–4 August	10	8	3	
16	5–18 August	10	8	3	
17	19 August–1 September	10	8	3	
18	2–15 September	10	8	2	

scheduled for 2013 is outlined in Table 8. Additional CWT harvest inspection samples were scheduled for 1–2 additional samplers (i.e., catch samplers) to increase the proportion of harvested Chinook and coho salmon inspected for adipose fin clips, and increase the number of recoveries from a wild stock tagging program on the Taku River. Data from 2006 to 2010 show that Taku River tags were recovered from Chinook salmon sampled over the date range from 22 April to 6 June. Coded wire tag sampling is therefore scheduled from 29 April through 9 June 2013 to maximize the number of Chinook salmon examined, while attempting to collect a representative stock composition sample for the entire fishery.

Within a biweekly period, all Fridays, Saturdays and Sundays (and Memorial Day and Independence Day) will be sampled, with 2 days set as days off. CWT samples were scheduled to consistently sample at locations with a substantial harvest of Chinook and coho salmon that "represent the fishery" based on the prior year. As previously noted, it is not critical that sampling be exactly proportional to harvest as the weighting procedure to be implemented this year (described in the Study Design and Data Analysis sections) corrects for departures from proportional sampling. Regardless, this sampling schedule is thought to be representative of the entire spring fishery.

A shoreline fishery for Chinook salmon at False Outer Point (Picnic Cove) on the north end of Douglas Island will also be sampled in conjunction with CWT sampling effort. This fishery is believed to target almost entirely wild stocks headed for the Taku River (based on limited prior CWT sampling). A harvest estimate for this shoreline fishery will be obtained from the SWHS.

The additional sampler will also sample coho salmon for missing adipose fins from biweek 12 through biweek 17 to increase recoveries of Taku River wild stocks. Within a biweekly period,

Table 8.–Summary of study design features for the 2013 onsite catch sampling survey of the Juneau marine boat sport fishery.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh in stations
9	29 April–12 May	10	6	3	
10	13 May–26 May	10	6	3	
11	27 May–9 June	10	6	3	
12	10–23 June	10	6	3	
13	24 June–7 July	10	6	3	
14	8–21 July	10	6	3	
15	22 July–4 August	10	6	3	
16	5–8, 12–18 August	7	6	3	
DERBY	9–11 August	3	6	3	3
17	19 August–1 September	10	6	3	
18	2–15 September	10	6	2	

all weekends and holidays will be sampled and 2 or 3 additional samples per week were allocated to weekdays.

Selected creel sampling days in which Pacific halibut harvest will be sampled for length information with priority over collecting Chinook salmon scales.

CRAIG/KLAWOCK MARINE BOAT FISHERY SURVEY

During the sampling season, 4 technicians will sample the fishery. At the two primary ports being sampled there are 6 access locations in Craig, and 5 access locations in the Klawock area. Two creel technicians will conduct both creel survey and biological data sampling, while the third and fourth technician will be dedicated to collecting biological data only. The catch samplers will work 5 days a week at the ports not covered by the creel interviewers and will also conduct paired sampling on weekends with the creel technicians. This design should provide a consistent proportion of sampling effort throughout the season, and maximize the number of Chinook and coho salmon sampled.

PETERSBURG MARINE BOAT FISHERY SURVEY

During the sampling season, 1 technician will sample the harvest of boat anglers returning to access locations (harbors) in the Petersburg area. The technician will sample 5 days per week (all weekend/holidays plus 2 or 3 randomly selected weekdays). During the Petersburg Salmon Derby (24–27 May), additional staff will be stationed at the North Harbor weigh-in station for CWT and genetic sampling of Chinook salmon. The sampling schedule was generated with 2 days off and chosen weekly at random. Selected creel sampling days during which Pacific halibut harvest will be sampled for length information with priority over collecting Chinook salmon scales will be specified.

WRANGELL MARINE BOAT FISHERY SURVEY

During the sampling season, 1 technician will sample the harvest of boat anglers returning to access locations (harbors) in the Wrangell area. Three access locations in the Wrangell marine boat fishery will be sampled. Harbors were selected at random WOR.

Selected creel sampling days during which Pacific halibut harvest will be sampled for length information with priority over collecting Chinook salmon scales will be specified.

GUSTAVUS MARINE BOAT FISHERY SURVEY

During the sampling season, 1 technician will sample the harvest of boat anglers returning to access locations (harbors) in the Gustavus area. The sampling schedule was generated with 2 days off between Monday and Friday chosen weekly at random. The technician will collect Chinook salmon scale samples during the months of May and June (i.e., the spring fishery), as well as from Chinook salmon sampled for axillary appendage clips for the genetic sampling during the rest of the season.

Selected creel sampling days in Gustavus in which sampling Pacific halibut, rockfish, and lingcod for length information will have priority over collecting Chinook salmon scale samples will be specified.

ELFIN COVE MARINE BOAT FISHERY SURVEY

During the sampling season, 1 technician will sample the harvest of boat anglers returning to access locations (docks) in the Elfin Cove area. There is an inner and outer harbor separated by a narrow channel at Elfin Cove, and each harbor has 3 private/lodge docks and 1 public dock. For 2013, the schedule was set up as follows: 2 days off were chosen randomly between Monday and Friday of each week, then the inner or outer harbor was randomly selected for each day. The technician will collect Chinook salmon axillary appendage clips for and scale samples over the whole of the season.

Selected creel sampling days in Elfin Cove in which sampling Pacific halibut, rockfish, and lingcod for length information will have priority over collecting Chinook salmon scale samples will be specified.

YAKUTAT MARINE BOAT FISHERY SURVEY

During the sampling season, 1 technician will sample the harvest of boat anglers returning to 2 docks in Yakutat.

Because of the small fleet and 2 sampling sites, a sampling schedule was established that would effectively cover weekends/holidays and the busier weekdays. Days worked will be Saturday, Sunday, and holidays that fall on a weekday, with 2 days off randomly chosen between Monday and Friday. There is some uncertainty as to when the Yakutat Lodge dock will be operational during the 2013 season; therefore, the technician will randomly chose 2 days per week to sample at the Yakutat Lodge dock when the dock is operational.

Selected creel sampling days in which Pacific halibut, rockfish, and lingcod will be sampled for length information will be specified.

SCHEDULES AND REPORTS

Field activities associated with surveying the marine boat sport fisheries will be initiated in 2013 on 29 April and conclude on 15 September in accordance with the sampling schedules. The survey of the Juneau-False Outer Point Shoreline marine fishery will be initiated on 15 April and conclude on 31 May.

Data editing and analysis activities will be initiated in early May 2013. Mark-sense marine interview forms will be processed on a weekly basis starting on 6 May. Projections of treaty Chinook salmon harvests will be made 2 times. The first estimate of the treaty Chinook salmon harvest will be an inseason projection produced by late June (covering the 29 April to 23 June 2013 time period) for use in helping manage the commercial fisheries to obtain the overall Pacific Salmon Treaty quota for Southeast Alaska. The second estimate will be a postseason projection. Computations of HPUE in the marine coho salmon fishery will be provided to the Division of Commercial Fisheries on a biweekly basis beginning on 6 June 2013 to assist managers with the requirements of 5 AAC 29.110.

During May–July 2013, staff will calculate the expansion factor values from this survey in 2012 to the SWHS in 2012 for all ports to be used for 2013 estimates of preliminary values as outlined above in the **Data Analysis** section[48]. Starting in May and extending into July 2013, staff will also continue the development of SAS programming code to implement the changes in the data analysis procedures as outlined in this plan, which was initiated following last year's survey.

Final error correction, reduction, and analysis of the 2013 survey data will be completed by 25 October 2013. Final 'preliminary' estimates of the Southeast Alaska harvest of Chinook and coho salmon for the 2013 season will be produced by 31 October 2013.

All cinch-strapped salmon heads will be submitted to the Tag Lab by 23 September 2013. Final decoding of the tag lots for CWT-tagged salmon will be completed by 17 October 2013. Estimates of the contributions to the fishery by the various CWT lots will be completed by 7 November 2013.

All Pacific halibut length data will be corrected by 1 October 2013. Mean weight estimates and estimated proportion of unguided harvest prior to the mean IPHC survey date will be provided by 7 October 2013. Scales from Chinook salmon will be read by 14 January 2014. Age composition and length-at-age estimates for Chinook salmon will be produced by 15 February 2014.

All the Chinook salmon genetic samples collected during the 2013 creel survey season will be sent to the ADF&G, Division of Commercial Fisheries Genetics Laboratory by 6 October 2013. Information on the age composition of the sampled Chinook salmon will be provided to the Genetics Lab by 15 February 2014.

Report writing will be initiated in early December 2013 and this activity will continue with the development of a draft data report on 5 April 2014. This draft report will document the 2013

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[48] The simulations previously described, may be supplemented by the first matched-pair of esitmates for 2011 from last year's results along with the estimates from the 2011 SWHS if estimates from the latter are available in time for this year's mid year (the beginning of August) projections.

Table 9.–Deliverable product schedule for 2013–2014.

When	What	To whom	Title
May–early July 2013	District 11& 8 wild Chinook salmon harvest estimates	Ed Jones	Taku & Stikine Biologist
June–Sept. 2013 (weekly)	Coho salmon HPUE	Pattie Skannes	Comm. Fish Troll Manager
Late June 2013	Projected Chinook salmon harvest prior to July 1, 2013 commercial troll opening	Pattie Skannes & Brian Frenette	Comm. Fish Troll Biologist & Region 1 Supervisor
Early August 2013	Mid-season preliminary projections of rockfish and lingcod harvest in outside districts	Bob Chadwick	Region 1 Management Coordinator
Mid October 2013	Preliminary projected postseason Chinook harvest & CWT info	Pattie Skannes & Brian Frenette	Comm. Fish Troll Biologist & Region 1 Supervisor
Mid October 2013	Preliminary projected inseason coho salmon harvest	Leon Shaul & Brian Frenette for PSC	Comm. Fish Coho Biologist & Region 1 Supervisor
Mid October 2013	Average halibut weights, proportion of unguided harvest prior to mean IPHC survey date.	Scott Meyer & IPHC	Bottomfish Coordinator
October 2013	Average DSR weights & total biomass removal estimates (harvest and release)	Bob Chadwick & Kristen Green	Region 1 Management Coordinator & Comm. Fish Groundfish manager
Mid November 2013	Final projected post season Chinook salmon harvest & CWT info	Pattie Skannes & Brian Frenette for PSC	Comm. Fish Troll Biologist & Region 1 Supervisor
Mid November 2013	Final projected inseason coho harvest	Leon Shaul & Brian Frenette for PSC	Comm. Fish Coho Biologist & Region 1 Supervisor
November 2013	Biweekly sampling rate	Sara Gilk-Baumer	Genetic Lab coordinator
January 2014	Average lingcod weights & biomass harvest estimates	Bob Chadwick	Region 1 Management Coordinator
January 2014	Age composition of Chinook salmon stocks	Ed Jones	Taku & Stikine Biologist
April 2014	Draft report for project (with only information from on-site survey)	Internal Project Staff review	NA
November 2014	Draft report for project incorporating SWHS estimates	TBD	Region 1 Regional Research Supervisor

preliminary values associated with each of the objectives for this project at that time. Following the completion of final estimates from the SWHS for 2013, anticipated by June–August 2014, then this draft report for this project will be updated to include final (nonpreliminary) estimates for each of this project's objectives. The final draft will be submitted for regional review on or about November 30, 2014, followed by submission for eventual publication as an ADF&G Fishery Data Series Report.

The deliverable products along with milestone dates are summarized in Table 9, with further details.

The computer files associated with analyzing the 2013 creel survey data (e.g., the SAS data and program files, and auxiliary files) will be archived and submitted to Research and Technical

Serivces in Anchorage when the 2013 report is finalized (see Appendix B1 for example files). A draft operational plan for the 2014 field season will be produced by 18 March 2014.

RESPONSIBILITIES

List of personnel and duties:

Michael Jaenicke, Fishery Biologist III

Duties: Coordinates all aspects of the project. Assists biometrician with study design and schedule generation. Performs and coordinates data analyses in conjunction with biometrician. Lead author for final report and provides inseason data to appropriate personnel. Supervises project personnel in Ketchikan, Petersburg, Wrangell, and Craig/Klawock, Juneau, Gustavus, and Elfin Cove.

Diana Tersteeg, Research Analyst II

Duties: Performs data analyses in conjunction with project leader and biometrician. Responsible for researching and implementing future conversion of data collecting from paper recording to handheld devices. Design and write programs or queries using various statistical software packages such as SAS or database programs. Create statistically valid reports and technically detailed tables and figures (per department reporting policies) necessary to meet the annual reporting requirements of the program.

Brian Marston, Fishery Biologist III

Duties: Performs data analyses in conjunction with project leader and biometrician. Assists in schedule generation. Supervises project personnel in Yakutat.

Troy Tydingco, Fishery Biologist III; Patrick Fowler, Fishery Biolgist II

Duties: Perform data analyses in conjunction with project leader and biometrician. Assist in schedule generation. Supervise project personnel in Sitka.

Vacant, Fish Technician III; Judy Slattery, Fish Technician III,

Duties: As crew leaders in Sitka and Ketchikan they help supervise creel survey personnel in Sitka and Ketchikan in addition to checking and editing data. Assist in schedule generation, sublegal Chinook sampling and other office activities.

Sarah Power, Biometrician II

Duties: Provides input in sampling design and allocation, and designs scheduling procedures and incorporates into operational plan. Provides procedures for calculation of estimates and standard errors. Assist in report writing. Also reviews operational plan and final report.

Bruce Kruger, Mary Jo Lord-Wild, and Allen Hoffman, Fish Technician III

Duties: Conduct catch sampling in Craig, Elfin Cove and Gustavus as schedule dictates and provide summaries of data on a weekly basis. In addition notes potential sampling problems and advise possible solutions.

Fish Technician IIs and IIIs

Duties: Conduct creel or catch sample surveys as schedule dictates and provide summaries of data on a weekly basis.

REFERENCES CITED

Bernard, D. R., and J. E. Clark. 1996. Estimating salmon harvest with coded-wire tags. Canadian Journal of Fisheries and Aquatic Sciences 53:2323–2332.

Clark, W. G. 1992. Validation of the IPHC length-weight relationship for halibut. Pages 113-116 *in* Report and Assessment of Research Activities, 1991. International Pacific Halibut Commission, Seattle, WA.

Clutter, R. and L. Whitesel. 1956. Collection and interpretation of sockeye salmon scales. Bulletin of the International Pacific Salmon Fisheries Commission, No. 9.

Goodman, L.A. 1960. On the exact variance of a product. Journal of the American Statistical Association 66:608–713.

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001a. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-29 (revised), Anchorage.

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001b. Revised Edition: Harvest, catch, and participation in Alaska sport fisheries during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-25 (revised), Anchorage.

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001c. Revised Edition: Participation, catch, and harvest in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41 (revised), Anchorage.

Howe, A. L., R. J. Walker, C. Olnes, K. Sundet, and A. E. Bingham. 2001d. Participation, catch, and harvest in Alaska sport fisheries during 1999. Alaska Department of Fish and Game, Fishery Data Series No. 01-8, Anchorage.

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2004. Participation, catch, and harvest in Alaska sport fisheries during 2001. Alaska Department of Fish and Game, Fishery Data Series No. 04-11, Anchorage.

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2006a. Participation, catch, and harvest in Alaska sport fisheries during 2002. Alaska Department of Fish and Game, Fishery Data Series No. 06-34, Anchorage.

Jennings, G. B., K. Sundet, A. E. Bingham, and D. Sigurdsson. 2006b. Participation, catch, and harvest in Alaska sport fisheries during 2003. Alaska Department of Fish and Game, Fishery Data Series No. 06-44, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2007. Participation, catch, and harvest in Alaska sport fisheries during 2004. Alaska Department of Fish and Game, Fishery Data Series No. 07-40, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2009a. Participation, catch, and harvest in Alaska sport fisheries during 2005. Alaska Department of Fish and Game, Fishery Data Series No. 09-47, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2009b. Participation, catch, and harvest in Alaska sport fisheries during 2006. Alaska Department of Fish and Game, Fishery Data Series No. 09-54, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2010a. Participation, catch, and harvest in Alaska sport fisheries during 2007. Alaska Department of Fish and Game, Fishery Data Series No. 10-02, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. 2010b. Participation, catch, and harvest in Alaska sport fisheries during 2008. Alaska Department of Fish and Game, Fishery Data Series No. 10-22, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham.2011a. Participation, catch, and harvest in Alaska sport fisheries during 2009. Alaska Department of Fish and Game, Fishery Data Series No. 11-45, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham.2011b. Participation, catch, and harvest in Alaska sport fisheries during 2010. Alaska Department of Fish and Game, Fishery Data Series No. 11-60, Anchorage.

Jennings, G. B., K. Sundet, and A. E. Bingham. *In prep.*. Estimates of participation, catch, and harvest in Alaskan sport fisheries during 2011. Alaska Department of Fish and Game, Fishery Data Series , , Anchorage.

Mood, A.M, F.A. Graybill, and D.C. Boes. 1974. Introduction to the Theory of Statistics, third edition. McGraw-Hill, New York.

REFERENCES CITED (continued)

Nielsen, L. A. and W. F. Schoch. 1980. Errors in estimating mean weight and other statistics from mean length. Transactions of the American Fisheries Society 109:319–322.

Schwan, M. 1984. Recreational fisheries of Southeast Alaska, including Yakutat: an assessment. Alaska Department of Fish and Game, Juneau.

Suchanek, P. M., S. H. Hoffman, R. E. Chadwick, D. E. Beers, T. E. Brookover, M. W. Schwan, R. P. Ericksen, R. E. Johnson, B. J. Glynn, and B. J. Frenette. 2002. Area management report for the sport fisheries of Southeast Alaska, 2000. Alaska Department of Fish and Game, Fishery Management Report No. 02-04, Anchorage.

Sukhatme, P.V., B. V. Sukhatme, S. Sukhatme, and C. Asok. 1984. Sampling theory of surveys with applications, third edition. Iowa State University Press and Indian Society of Agricultural Statistics, Ames, Iowa.

Thompson, S. K. 2002. Sampling, second edition. John Wiley and Sons, New York.

Walker R. J., C. Olnes, K. Sundet, A. L. Howe, and A. E. Bingham. 2003. Participation, catch, and harvest in Alaska sport fisheries during 2000. Alaska Department of Fish and Game, Fishery Data Series No. 03-05, Anchorage.

Welander, A. D. 1940. A study of the development of the scale of the chinook salmon (*Oncorhynchus tshawytscha*). Master's thesis, University of Washington, Seattle.

APPENDIX A-HISTORY

Appendix A1.–Recent detailed history of the sport fisheries management and monitoring in Southeast Alaska.

HISTORY

Marine boat sport fisheries primarily targeted on Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, and Pacific halibut *Hippoglossus stenolepis* are the largest sport fisheries in Southeast Alaska. Boat fishing effort is mostly concentrated around the major communities of Juneau, Ketchikan, Sitka, Wrangell, and Petersburg. Substantial effort is also expended near remote fishing lodges and smaller communities throughout the region such as Craig/Klawock, Gustavus, Elfin Cove, and Yakutat. The marine harvest studies program provides critical support to meet management objectives for a variety of species in Southeast Alaska.

CHINOOK SALMON

Chinook salmon are the species of fish most preferred and targeted by sport anglers fishing in Southeast Alaska (Schwan 1984). Although Chinook salmon are available year round in Southeast Alaska, effort for (and harvest of) Chinook salmon in marine sport fisheries increases rapidly in May with the arrival of maturing fish. Harvests of Chinook salmon generally decline rapidly in July, although sometimes substantial numbers of Chinook salmon are taken in Juneau, Ketchikan, and Sitka in July, August, and September. Many of the fish taken later in the season are immature Chinook salmon known as "feeders", which rear in Southeast Alaska waters.

For 2011, the Alaska Board of Fisheries (BOF) has allocated 20% of the combined commercial troll and sport US/Canada Pacific Salmon Treaty (Public Law 99-5) catch quota for Chinook salmon to the Southeast Alaska sport fishery.

In 1992, the Alaska Board of Fisheries (BOF) allocated 17% of the combined commercial troll and sport US/Canada Pacific Salmon Treaty (Public Law 99-5) catch quota for Chinook salmon to the Southeast Alaska sport fishery. The BOF increased the allocation to the sport fishery from 17% to 18% in 1994, then to 19% in 1995, and then to 20% in 1996. The BOF also passed a Southeast Alaska King Salmon Management Plan (5 AAC 47.055) in 1992 which provided the Alaska Department of Fish and Game (ADF&G) several "regulatory tools" to manage the Chinook salmon sport fishery in-season to achieve annual allocations. The annual allocation did not include harvests of Chinook salmon produced by Southeast Alaska hatcheries (except for a base period catch and a risk adjustment factor) as harvests of these fish do not count against the US/Canada Pacific Salmon Treaty quota. The BOF also directed that ADF&G manage the Chinook salmon fishery to keep it open year round (while not exceeding the allocation), and that guided anglers were to be generally more restricted than unguided anglers if changes in the fishery were necessary to meet the allocation.

These BOF decisions made it necessary to expand harvest studies of the boat sport fisheries into all areas of the region where a substantial portion of the Chinook salmon harvest occurred so that management actions could be taken in-season to achieve the sport allocation. Expanded sampling of the sport harvest of Chinook salmon for coded wire tags (CWTs) was also necessary to better document Alaska hatchery contributions for US/Canada treaty catch reporting. Any fish that is of wild or non-Alaskan hatchery origin counts toward this catch quota and will be referred to herein as a "treaty" fish.

In February 1997, the BOF met and reaffirmed an allocation of 20% of the Southeast Alaska Chinook catch quota to the sport fishery. They also gave ADF&G some direction for management given the new abundance-based approach to Chinook salmon management which was initiated for the 1997 season. Given that abundance-based management resulted in larger variations in all-gear quotas of Chinook salmon, the BOF directed ADF&G to manage the sport fishery to an approximate allocation (harvest target) based on a preseason index of Chinook salmon abundance and projections of harvest given either a 1, 2, or 3 fish daily bag limit. The management error on the harvest target was again set by the BOF at 7.5% so precise monitoring continued.

In February 2000, the BOF met and once again reaffirmed a 20% allocation of Chinook salmon to the sport fishery. Because of the continuing problems with untimely release of the abundance index and available management "tools" becoming obsolete because of changes in fishing methods or treaty agreements, the BOF once again reworked the Southeast Alaska King Salmon Management Plan. Under the version passed in 2000, in-season estimates of Chinook salmon harvest will still be necessary but not to the level of detail and frequency as in the past. The sport Chinook salmon fishery will not be managed in-season to within ±7.5% of a "management target" as in the past, but will be managed according to the preseason abundance index and a new set of "tools" that will be implemented preseason based on that index.

In February 2003, the BOF met and reaffirmed a 20% allocation of Chinook salmon to the sport fishery. A revised set of "tools", developed by the King Salmon Task Force (a BOF appointed group of shareholders representing the Southeast Alaska Chinook salmon sport fisheries) during 2001–2002, was adopted by the BOF. Some of the key revisions include that the troll fishery quota will not be adjusted up or down based on the sport fishery performance; and that when the abundance index is greater than 1.2, the bag limit for resident anglers will be 2 king salmon, the bag limit for nonresident anglers will be one, and the annual limit for nonresidents will be 3 king salmon 28 inches or greater. The fishery will continue to be managed according to the preseason abundance index.

In February 2006, the BOF met and once again reaffirmed a 20% allocation of Chinook salmon to the sport fishery. A revised set of "tools" at the higher levels of abundance index were added to the "tools" established in February 2003, in order to provide the sport fishery a means of reducing the under-harvesting of the annual sport fish quota at high abundance indices. These new tools include liberalizing daily bag limits for residents, and daily and annual bag limits for nonresidents when the abundance index is greater than 1.2, and allowing the use of 2 rods per angler during October through March of the following year. The fishery will continue to be managed according to the preseason abundance index.

In February 2009, the BOF met and once again reaffirmed a 20% allocation of Chinook salmon to the sport fishery. A revised set of "tools" at the mid- to lower-levels of abundance index (AI) were added to the "tools" established in February 2003, in order to provide the sport fishery a means of managing the sport fishery at low abundance indices. These new tools include allowing resident anglers the use of two rods from October through the following March during years when the AI is less than or equal to 1.5, and in years when the AI is less than or equal to 1.1, the annual harvest for nonresident anglers will be three king salmon 28 inches or greater in length during May 1 to June 30, and from July 1 to December 31 the nonresident annual limit will be one king salmon 28 inches or greater in length. The fishery will continue to be managed according to the preseason abundance index.

Although 2011 harvest estimates from the annual mail survey of licensed sport anglers in Alaska (Statewide Harvest Survey or SWHS) have not yet been completed, a preliminary estimate of the 2011 Southeast Alaska "treaty" Chinook sport harvest from onsite creel survey data is 50,297 treaty fish (4,218 fish under the 20% allocation) from a total harvest of 60,538 fish. Alaska hatchery stocks accounted for about 20% of the total Chinook harvest in 2011 in Southeast Alaska.

Coded wire tag (CWT) sampling is necessary to document Alaska hatchery contributions. In an effort to reduce the number of CWTs lost by anglers heading or filleting their catch on the fishing grounds, an emergency order (EO) has been enacted in the spring of each year since 1998 in Southeast Alaska. The EO prohibited anglers fishing from boats in saltwater from removing the heads or filleting any Chinook salmon, coho salmon, or lingcod until they had “landed” their catch back at a port that was connected to a road system identified as being sampled by our program. The EO increased opportunities for staff to sample adipose-finclipped fish (indicating the probable presence of a CWT during dockside sampling. Additionally, designated catch samplers boosted recoveries in Juneau, Sitka, and Ketchikan with overall sampling at the following rates for Chinook salmon: Yakutat (30%), Sitka (27%), Glacier Bay (23%), Craig/Klawock (13%), Ketchikan (7%), Petersburg/Wrangell (16%), and Juneau (11%). These sampling rates were much improved over 1997 levels, and an EO and extra sampling will be enacted on a continuing basis.

In 2000, the boundary line between the Sitka and Glacier Bay SWHS areas was modified to provide better information about Icy Strait and Cross Sound harvests (Suchanek et al. 2002). This boundary change resulted in increased sport harvests in the Glacier Bay SWHS area and reduced harvests in the Sitka area. This boundary change exacerbated the impact of an existing gap in marine catch sampling coverage for the sport fishery in the Glacier Bay SWHS area. Therefore, we initiated a catch sampling program in the Glacier Bay area in 2002 at the port of Gustavus, as this was a centrally located port in this area with other fishing ports including Elfin Cove, Hoonah, and Pelican. One of the benefits of this new sampling site has been to document the Alaska hatchery contributions in the Glacier Bay area, allowing these fish to be identified as non-treaty Chinook salmon. During the 2003 season, CWT sampling of Chinook and coho salmon, and biological data from Chinook, halibut, and lingcod were collected in Elfin Cove (Glacier Bay Area) as part of a graduate student project and were combined with data gathered in Gustavus. Sampling in Elfin Cove in 2003 followed the guidelines established by ADF&G for sport fish sampling. Beginning in 2004, the port-sampling program in Elfin Cove became an ADF&G funded, staffed, and managed project.

Useful management data for stock studies in specific areas are also collected by this project. For example, early season harvests of Chinook salmon in the Juneau marine sport fishery are primarily mature fish returning to the Taku River. From the mid-1970s to 1989, the Juneau fishery had been restricted during the spring in order to protect and rebuild the Taku River Chinook salmon stock. An area closed during the spring was greatly reduced in size as the stock showed signs of recovery. In recent years, local hatchery stocks have substantially improved local Chinook salmon fishing, with only minimal overlap of these fish relative to the Taku River stock. Returning hatchery fish have helped to relieve pressure on the Taku River stock, primarily during early and mid-June. Prior to 2008, in an effort to further monitor the wild stocks, an estimate of the harvest of wild Taku River fish in the Juneau sport fishery was made by determining the maturity of Chinook salmon sampled in the spring. Because the maturity percent has remained consistent (~95%) over the last few years, we have decided to drop collection of the maturity data beginning in 2008. The catch sampling at Gustavus and Elfin Cove during May through August will provide information on when wild and hatchery Chinook salmon are moving through the Cross Sound and Icy Strait area. In addition, data on age composition of Chinook salmon taken in the spring in Juneau, Ketchikan, Petersburg, and Wrangell will be gathered.

The genetic stock identification of Chinook salmon being harvested by the various fisheries in Southeast Alaska is a management tool being evaluated by the Pacific Salmon Commission. Tissue samples from the Chinook salmon harvested in the commercial troll fishery began in 1999, and for 2004 to 2011 the commercial net fisheries and sport fisheries were selected to be sampled as well.

An important shoreline fishery for Chinook salmon in the spring occurs at False Outer Point near Juneau. Gathering CWTs from this fishery will provide additional baseline data for stock composition of this fishery as well as provide additional recoveries of tagged wild Taku River stocks.

COHO SALMON

Coho salmon harvest rates by the marine sport fisheries are of special interest as coho salmon management has become another priority issue within the region. Harvest per unit effort (HPUE) for coho salmon in the Juneau and Ketchikan marine sport fisheries is used to monitor the relative abundance and movement of coho salmon to inside waters, and the Juneau HPUE is specifically cited in 5 AAC 29.110 (Management of Coho Salmon Troll Fishery). Coho HPUE statistics are used along with fishery performance information from the commercial fisheries and early season escapement estimates to assist managers with in-season management. Coho salmon harvest rates, as determined from the creel survey programs, are also sought by recreational anglers and used to help shape their fishing activities. Estimates of Alaska hatchery contributions for coho salmon harvested in the sport fisheries in Juneau, Ketchikan, Sitka, Craig/Klawock, Petersburg, Wrangell, Gustavus, Elfin Cove, and Yakutat are also calculated for evaluation of enhancement projects. As for Chinook salmon, an EO that prohibits anglers fishing from boats in saltwater from removing the heads or filleting any Chinook or coho salmon has improved sampling rates of coho salmon over 1997 levels: Yakutat (15%), Sitka (25%), Ketchikan (12%), Glacier Bay (19%), Juneau (17%), Prince of Wales (18%), and Petersburg/Wrangell (6%). Additionally, recovery of tagged indicator stocks of wild coho salmon may be expected, especially in the Juneau fishery from wild stock tagging programs at Auke Creek and in the Taku and Berners river drainages, and in the Ketchikan and Sitka fisheries from tagging projects in the Unuk, Hugh Smith, and Nakwasina drainages as well as others in the region. The Petersburg and Wrangell fisheries were sampled during the coho season (mid-July through mid-September) most recently in 2000, and 2003–2009 and shortened to end of August in 2010 (biweek 17). The coho season was not sampled in these 2 fisheries during 2001 and 2002 due to budget cuts combined with small numbers of coho (and Chinook) salmon encountered. The Petersburg and

Wrangell fisheries will again be sampled through August 28, 2011 to cover the coho salmon season as well as to sample the entire halibut season at these ports (see below).

Measures of sport HPUE may be somewhat biased because of the way data are reported during an interview and should be used with caution to implement management measures in a fishery. Nonetheless, HPUE can still be quite useful to both managers and to members of the public. Fishery manager's use sport HPUEs to compare general performance in a fishery to historical data. Members of the public may use measures of sport HPUE simply to plan a trip in pursuit of a desired species. With the changes to the program as of 2011, HPUE from 2011 and onward may not be directly comparable to prior years.

OTHER SPECIES

Harvests of other fish species occur within most of the surveyed fisheries and estimates of these harvests are also important for management and informational purposes. Some of the management needs for these other species are as follows.

In February 2000, the North Pacific Fisheries Management Council (NPFMC) adopted a guideline harvest level (GHL) for sport charter harvests of Pacific halibut. The GHL adopted would allow for a sport charter harvest of about 1.4 million pounds in International Pacific Halibut Commission (IPHC) Area 2C (Southeast Alaska excluding Yakutat) based on the average sport charter biomass harvest from 1994 to 1999. The NPFMC also initiated a regulatory amendment and approved the formation of an industry committee that would work to develop criteria and options for a sport charter Individual Fishing Quota (IFQ) system. The proposed system would dovetail with the existing commercial IFQ system implemented by the National Marine Fisheries Service (NMFS) in 1995. Both the GHL and the IFQ systems will probably require average weights of the sport harvest to apply to the number of halibut harvested by guided anglers estimated from either the SWHS or the Saltwater Charter Vessel Logbooks (yet to be determined). Harvest estimates for halibut will not be provided by this study in 2013 for the IPHC or the NPFM as the Statewide Harvest Study (SWHS) provides this.

In February 2006, the BOF adopted a demersal shelf rockfish management plan-titled "Demersal shelf rockfish delegation of authority and provisions for management" regulation (5 AAC 47.065)-that set a quota of total biomass removal (harvest and discard) of demersal shelf rockfish (DSR) for both the commercial and sport fisheries. There is a total allowable catch (TAC) quota, set by the NPFMC, for the DSR for the outer coast of Southeast Alaska, and the BOF allocated 84% to commercial fisheries and 16% to sport fisheries. The 7 DSR species are yelloweye (*Sebastes ruberrimus*), quillback (*S. maliger*) copper (*S. caurinus*), canary (*S. pinniger*), tiger (*S. nigrocinctus*), china (*S. nebulosus*), and rosethorn (*S. helvomaculatus*). Of the 7 DSR species, yelloweye rockfish grow the largest in size in terms of length and weight, are relatively abundant on the outer coast, are mistakenly identified as "red snapper", and are the most desired rockfish species to harvest. Analysis of available rockfish sport fish harvest data and estimated average weights from the sport fisheries in 2008 indicated that the sport fisheries in 2011 will exceed the 16% allocation of the TAC unless restrictions are placed on the sport fishery (5 AAC 47.065). Restrictions include maintaining the reduction of the daily bag limit at 2 or 3 DSR (depending on location fished and residency of angler) of which only 1 may be a yelloweye. In 2013, only length data from rockfish will be collected and used with length-weight equations to obtain an estimate of weight. Additionally, beginning in 2006 the ADF&G saltwater charter vessel logbook was modified to capture information on the harvest and release of yelloweye rockfish (the primary DSR species), non-pelagic rockfish (the DSR other than yelloweye and slope species), and pelagic rockfish. The DSR and slope rockfish species represented in the non-pelagic rockfish group are all rockfish species that tend to remain close to or on the ocean bottom, usually in rocky or boulder-strewn habitat. The pelagic rockfish are open-water species often found mid-water in schools, close to rocky substrate.

Harvests of lingcod in both the commercial and sport fisheries are now part of a new Lingcod Management Plan titled “Lingcod delegation of authority and provisions for management” regulation (5 AAC 47.060), adopted by the BOF in February 2000, and modified by the BOF in February 2009. Management measures for the sport fishery may include restrictions such as minimum size limits, slot limits, and annual limits for all anglers. They could also include further restrictions to those anglers fishing off of charter vessels, as well as nonresident anglers. In 2004, it was necessary to reduce lingcod harvests in a major portion of northern Southeast Alaska (especially the Sitka area) and the outer coast of southern Southeast Alaska. The lingcod bag limit for Alaska residents in 2011 is 1 fish per day and 2 in possession and for nonresident anglers is 1 fish per day and 1 fish in possession. The lingcod sport fishery season opens on May 16 and ends on November 30; however, for northern Southeast (excluding Yakutat) there will be as an in-season closure during July 1 to August 15. In addition, for nonresident anglers a slot limit of 30 inch minimum and 35-inch maximum size or 55 inches or greater was set in northern Southeast Alaska (excluding Yakutat). The slot limit for lingcod harvested by nonresident anglers in the Yakutat area in 2011 is 30 inch minimum and 45 inch maximum size or 55 inches or greater. In addition, for nonresident anglers an annual limit of 2 fish, with a harvest record being required, was also implemented in Southeast Alaska. There will be a 30-inch minimum and 40 inch maximum slot limit for nonresident anglers in the southern Southeast Alaska in 2011, with no in-season closure period.

Sport harvests (in numbers) of lingcod will continue to be monitored by the SWHS, but stocks will be managed by the estimated weight of the sport harvest in relation to lingcod management area quotas. Therefore, methods to estimate the average round weight of lingcod harvested in outer coast sport fisheries (Craig/Klawock and Sitka) will be continued in 2013**.**

APPENDIX B-EXAMPLE COMPUTER FILES

Appendix B1.–Example computer data files and analysis programs (2012) developed for the Southeast Alaska marine boat sport fishery survey. Data files (*.DTA) archived at Alaska Department of Fish and Game, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd., Anchorage, AK 99518-1599.

Effort, Catch, and Harvest Estimation Files (in KMC12EST.ZIP, JMC12EST.ZIP, PMC12SAM.ZIP, SMC12EST.ZIP, WMC12SAM.ZIP, CMC12SAM.ZIP, and KLAWOCK11.ZIP)	
c12KTN.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Ketchikan, 2011
c12KLW.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Klawock, 2011
c12CRG.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Craig, 2011
c12PTB.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Petersburg, 2011
c12WRG.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Wrangell, 2011
c12SIM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Sitka, 2011
c12JNM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Juneau, 2011
c12ECM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Elfin Cove, 2011
c12GVM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Gustavus, 2011
c12YAK.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.0) recorded at Yakutat, 2011
AMS12-New. SAS	SAS program to create basic interview SAS save files from mark-sense interview data files. 'a' stands for the letter of each site respectively: A_KTN for Ketchikan, C_PTB for Petersburg, C_WRG for Wrangell, D_SIT for Sitka, E_JNU for Juneau, B_CRG for Craig, B_KLW for Klawock, G_ELF for Elfin Cove, G_GUS for Gustavus. Creates revised interview SAS save files with stratification information added to them, have non-finfish (i.e., shellfish) data removed, and/or have multi-line interviews collapsed to one record per interview. Also creates SAS temporary files with only the sampling information associated with each sample for each survey location and day.
A_CHEst.SAS	SAS programs to estimate effort, catch, and harvest with associated variances using SAS save files created by aMC11.SAS. Program operates on one species at a time within the program, as determined by an array of species codes and an internal temporary input file named 'SPECLIST.DAT'. See above for explanation of 'a'.
Coded Wire Tag Contribution Estimation Files (in CWT11.ZIP)	
SPRT_EXPNS12.XLS	Data file from tag lab with sampling information for each biweekly period at each fishery.
SFCON21.XLS	Data file from tag lab with recovery information for each adipose finclipped coho and Chinook salmon sampled.
SEN12CWT.SAS	SAS program to do basic contribution estimates.
SEN12CO1.SAS	SAS program to summarize contributions across tag codes for main tables.
SEN12CWP.SAS	SAS program to list tags, contributions, and variances for appendices.
SEN12CW3.SAS	SAS program to summarize contributions at ports with catch sampling programs.

APPENDIX C-COVARIANCE CONSIDERATIONS

Appendix C1.–Covariances for across user group (guided versus private) average and proportional estimates.

The following procedure will be followed to evaluate the necessity of incorporating a covariance term into equation 34. The procedures were adapted from suggestions made in the final review memorandum for the 2011 operational plan:

Plugging equation 26 into the left hand equation in equation 33 and solving results in[49]:

$$\bar{y} = \frac{1}{\hat{N}} \frac{D}{d} \sum_{i=1}^{d} \left(\frac{Q_i}{q_i} \sum_{j=1}^{q_i} \left(\frac{\hat{B}_{ij}}{b_{ij}} \sum_{h=1}^{2} \left(\frac{\overline{N}_{hij}}{\overline{N}_{mhij}} \sum_{k=1}^{b_{hij}} \sum_{o=1}^{n_{mhijk}} y_{hijko} \right) \right) \right)$$

The ratio of the two $\overline{N}$ terms that contain *h* subscripts in the central parentheses prevents a simple solution (unbiased or minimally biased estimate of variance).

However, the sign of $\text{cov}(\bar{y}_1, \bar{y}_2)$ and its size relative to $\text{var}(\bar{y}_1)$ and $\text{var}(\bar{y}_2)$ (where subscripts “1” and “2” reference the private versus charter stratification distinction) can be determined by making an assumptions and working (based on the assumption) with a subset of the original data.

The assumption is that the ratio $\overline{N}_{hij} \big/ \overline{N}_{mhij}$ in the above equation is relatively constant. Namely, within a location/day, the probability that a boat’s catch is sampled for biological data, given that the boat is interviewed, is independent of whether the boat is guided or unguided – so that the expected value of the ratio is the same for guided and unguided boats. This will minimize, perhaps trivialize, the effects of the ratio on the variance and covariance terms.

So a new adjusted data set is derived from the original data. For the new data set, all data from boats that were both interviewed and had the catch sampled for biological parameters (the *y* observations) will be kept. All information from boats that were only interviewed (catch was not sampled) will be discarded, including whether these boats were guided or unguided – these boats will only be included in the estimate of sport fishing boat parties exiting the access location during each sampled day. Additionally, no information from catch sampling only surveyed boats will be included the adjusted data. After this adjustment is made, the ratio $\overline{N}_{hij} \big/ \overline{N}_{mhij}$ becomes 1.

With the adjusted data set, adjusted values for $\bar{y}_1$ and $\bar{y}_2$ and $\text{var}(\bar{y}_1)$ and $\text{var}(\bar{y}_2)$ can be calculated. Then the adjusted data is “un-post-stratified” and run through equations 26 and 30 to get an adjusted value for $\bar{y}$ and $\text{var}(\bar{y})$, and then solved for the covariance term by plugging the two strata variance estimates and the new unstratified variance estimate into the standby equation var(a+b) = var(a) + var(b) + 2cov(a,b). If the covariance term is trivial, this exercise will be used as justification to proceed with using equation 34 as a reasonable approximation for $\text{var}(\bar{y})$.

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[49] Note that in this derivation, the approximations that were made for the third-stage weighting term (as per equation 15) was not used, because in the adjusted data set described later in this appendix was restricted to the creel data only (no catch sampling data). Accordingly, the ‘correct’ weighting term (i.e., $w_{3hij} = \hat{N}_{hij} \big/ \hat{\bar{N}}_{hi}$ $w_{3hij} = \hat{N}_{hij} \big/ \hat{\bar{N}}_{hi}$) was used instead. Similarly, the second-stage weighting term was from equation 18a. Additionally, due to the restrictions placed on the adjusted data, the number of boats measured for the characteristic of interest is always equal to the number of boats intercepted for sampling (i.e., $b_{mhij} = b_{hij}$ $b_{mhij} = b_{hij}$), this also means that $\hat{b}_{hij} = b_{hij} \cdot \hat{b}_{hij} = b_{hij}$. Finally, by designed $N_{mhijk} = n_{mhijk}$ $N_{mhijk} = n_{mhijk}$ that is all fish in a boat are measured.