Regional Operational Plan SF.1J.2015.06

Southeast Alaska Marine Boat Sport Fishery Harvest Studies, 2015-2016

by

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and

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April 2015

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

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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.2015.06

SOUTHEAST ALASKA MARINE BOAT SPORT FISHERY HARVEST STUDIES, 2015-2016

by

Mike Jaenicke, Diana Tersteeg, and Sarah J. H. Power

Alaska Department of Fish and Game, Division of Sport Fish, Douglas

Alaska Department of Fish and Game
Division of Sport Fish
April 2015

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SIGNATURE/TITLE PAGE

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Approval

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Chinook Salmon Research Initiative Approval

Title	Name	Signature	Date
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ABSTRACT

Marine boat sport anglers throughout Southeast Alaska target and harvest Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, Pacific halibut *Hippoglossus stenolepis*, lingcod *Ophiodon elongatus*, a variety of rockfish species *Sebastes spp*. and sablefish *Anoploploma fimbria*) primarily during April to September. Biweekly angler effort, catch and harvest data will be collected late April to early September from returning marine boat anglers at the following 10 ports: Yakutat, Elfin Cove, Gustavus, Juneau, Sitka, Petersburg, Wrangell, Ketchikan, Craig, and Klawock. Harvest sampling will be used to collect biological samples and associated data to estimate the age, length and genetic composition of the Chinook salmon harvest, and Chinook and coho salmon adipose fins will be inspected to recover heads with coded wire tags. Contributions of hatchery and wild coded wire tagged stocks (both Chinook and coho salmon) will be estimated for all sampled ports, and the wild mature component of the Chinook salmon harvest in Division of Commercial Fisheries Salmon District 108 (Petersburg-Wrangell) and District 111 (Juneau) will also be estimated. Biological data from harvested Pacific halibut (lengths), lingcod (lengths and sex) and rockfish (lengths) will be collected from guided and unguided marine boat anglers. The length data will be converted via established species-specific, length-weight relationships to estimate average weights by species and angler type.

Key words: Marine boat sport fishery, creel survey, angler effort and harvest, guided angler, unguided angler, age composition, length-at-age, length, weight-length conversion, average weight, coded wire tag, hatchery stocks, wild stocks, Salmon District 108, Salmon District 111, Chinook salmon, *Oncorhynchus tshawytscha*, coho salmon, *Oncorhynchus kisutch*, Pacific halibut, *Hippoglossus stenolepis*, lingcod, *Ophiodon elongatus*, sablefish, *Anoplopoma fimbria*, rockfish species, *Sebastes spp*., Yakutat, Elfin Cove, Gustavus, Juneau, Sitka, Petersburg, Wrangell, Ketchikan, Craig, Klawock.

PURPOSE

The purpose of this project is to characterize the harvest of multiple species of fish in the Southeast Alaska (SEAK) marine recreational (sport) fishery. This project, known as the Marine Harvest Studies project, provides preliminary estimates of the harvest of Chinook salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, Pacific halibut *Hippoglossus stenolepis*, rockfish *Sebastes spp.* and lingcod *Ophiodon elongata* for the marine boat sport fisheries in SEAK for 2015 and 2016. The Marine Harvest Studies project differs from the Statewide Harvest Study (SWHS) [1] and the Saltwater Charter Vessel Logbook (SCVL) programs in that it collects coded wire tag (CWT) information from Chinook and coho salmon and biological data from all focal species. It also allows for inseason and postseason preliminary estimates that are available sooner than provided through the SWHS or the SCVL. [2]

The information needed for managing these fisheries require on-site sampling of the select characteristics of each fishery, such as obtaining lengths of Pacific halibut, collecting CWTs from Chinook and coho salmon, and identifying rockfish species composition, to name a few. The 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. For example, relative to Chinook salmon the state has an obligation to estimate the contribution of Canadian stocks under the U.S.-Canada Pacific Salmon Treaty (Public Law 99-5) and identification of CWTs is critical to that activity. The sport charter harvest of Pacific halibut is managed under a catch sharing plan

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

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

(CSP) adopted by the North Pacific Fisheries Management Council (NPFMC) and port sampling provides essential data on individual sizes of harvested halibut needed for stock assessment, harvest accounting, and evaluation of regulatory alternatives for the charter fishery.

BACKGROUND

The Southeast Alaska sport 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 varies for each of the species across the region, often geographically and temporally.

In 2011 the survey procedures for the Marine Harvest Studies Project were redesigned for the major ports of Juneau, Ketchikan, and Sitka, along with some adaptations to survey procedures in the minor ports. The redesign was prompted not only to fit the project within budgetary constraints, but also to address the changing nature of the types of information needed for managing the marine boat sport fisheries in SEAK. The SWHS also underwent a redesign, which was similarly implemented during the 2011 season. The primary objectives of this project require obtaining preliminary SHWS estimates from the 2015 survey, which are subject to unknown error; this error cannot be evaluated until analyses are completed for at least five paired SWHS and on-site harvest sampling seasons under the two new designs, that will not be realized until after the 2015 season is completed. This operational plan documents the study design, sample size goals, sampling schedules, data collection and recording protocols to be implemented for the 2015 and 2016 survey associated with the Marine Harvest Studies project, with reference where necessary to the SWHS and SCVL because of interdependence between the programs. 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) are continued following the initiation of field activities in late April of 2015.

CHINOOK SALMON

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

A preliminary estimate of the annual SEAK Pacific Salmon Treaty Chinook sport harvest (hereafter referenced as ‘Pacific Salmon Treaty 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. Additionally, estimates are made of preliminary contributions by CWT for Alaska and non-Alaska hatcheries, as well as a few tagged wild stocks that are obtained by this project.

Data useful for management of Chinook stocks in specific areas of SEAK are also collected. For example, managers for the Taku River and Stikine River fisheries use inseason harvest information to monitor the return of Chinook salmon to these transboundary rivers. Accordingly, weekly estimates of the Pacific Salmon Treaty harvest will be estimated by this project for Alaska Department of Fish and Game (ADF&G), Division of Commercial Fisheries (DCF) Salmon District 108 in the Petersburg-Wrangell area associated with the Stikine River and District 111 in the Juneau area associated with the Taku River. Henceforth throughout this operational plan, these two districts will be referred to as DCF Salmon District 108 and 111, respectively.

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

The genetic stock identification of Chinook salmon harvested by the various sport and commercial fisheries in SEAK 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 from Chinook salmon harvested in the Sitka and Craig-Klawock area for otoliths related to this stock identification effort, and thereby continuing efforts initiated in 2011. After the genetic origin of these outer coast fish is determined, their scales are aged by each respective state/province fishery management agency.

A popular Juneau shoreline fishery for Chinook salmon in the spring, which occurs at False Outer Point, will be surveyed for biological data. Coded wire tags collected from this fishery provide additional data for stock composition and also yields additional recoveries of tagged wild Taku River stocks that refine stock assessment parameters such as marine harvest (by area and time) and escapement estimates that rely on mark-recapture efforts.

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 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 occurring at Auke Creek, Cowee Creek, and the Taku and Berners river drainages. Additional tagging projects occurring in the Hugh Smith drainage (southern SEAK, mainland) and Ford Arm drainage (northern SEAK, Chichagof Island) will likely include recovery of coho salmon from the Ketchikan and Sitka fisheries, given their proximity to these tagging locations.

HALIBUT

Sport charter harvest of Pacific halibut is managed under a CSP adopted by the NPFMC on October 2012 and went into effect on 13 January, 2014. Prior to this it was managed under a Guideline Harvest Level (GHL). Under the new CSP, charter businesses can lease commercial individual fishing quota (IFQ) as guided angler fish (GAF) to allow their guided anglers to harvest halibut under private regulations.

Average weights of Pacific halibut 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 incorporation into a 2015 Regional Operational Plan *Estimation and projection of statewide halibut harvest* (Meyer, *in prep*). 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 sportfish bottomfish coordinator for use in estimating total mortalities. The data will be utilized to help assess the performance of the reverse slot limit size restrictionswhile simultaneously addressing contemporary assumptions about halibut discard mortality rates in the SEAK halibut sport fishery. Finally, the proportion of unguided halibut harvest that occurs prior to the mean IPHC survey date is also provided as requested by the IPHC.

ROCKFISH

The recreational fishery for demersal shelf rockfish (DSR) is managed by ADF&G under allocations determined in regulation 5 AAC 28.160 as a percentage of the total allowable catch (TAC) approved by the NPFMC annually. Therefore, this project will estimate species composition and average weights of the sport harvest for the NPFMC using species-specific length-weight relationships. For demersal shelf rockfish (DSR), this project will calculate average weights of the sport fishery harvest for the NPFMC using species-specific length-weight relationships. 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 be also recorded by species. Estimates of species composition and average weight 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 removals of DSR for the sport fishery in outside waters of SEAK.

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 beginning with the 2013 sport fishing season. During the sampling season, the Marine Harvest Studies Project will assess what portion of *unguided* anglers currently utilize deepwater release devices when releasing rockfish. In addition to providing bottomfish managers and researchers with an estimate of current use, it will allow ADF&G personnel to provide anglers with information about the use of release devices.

LINGCOD

For lingcod, this project will calculate average weights and CPUE of the sport fishery. Sport harvests (in numbers) of lingcod will continue to be estimated by the SWHS, but stocks will be managed by the estimated total biomass of the sport harvest in relation to lingcod management area quotas. The average round weight of lingcod harvested in the following sport fisheries will be estimated: Craig-Klawock, Ketchikan, Sitka, Gustavus, Elfin Cove, and Yakutat will be estimated. 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. Once the final SWHS estimate is available, the finalized biomass estimate will be calculated and reported to the BOF and ADF&G, DCF

SABLEFISH

The sablefish sport harvest is relatively small compared to other species sport harvested in the region. However, some stocks of sablefish exploited by multiple SEAK fisheries may need to be managed conservatively. Accordingly, when sablefish are observed they will be measured for length and their harvest and released numbers recorded as an index of catch rates or sampling levels. When sample sizes are adequate, length data will be used to estimate average weight in the sport harvest. Average weight is needed to express sport harvest estimates in terms of biomass. These estimates are provided to the National Marine Fisheries Service for catch accounting and assessment.

RELEASED FISH

Documenting the number of fish released through an interview can sometimes produce statistics that are 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. Numbers of released Chinook (for both large and small categories), halibut, lingcod, and rockfish by species or by species grouping will be recorded.

OBJECTIVES

PRIMARY OBJECTIVES

Unless otherwise stated, the objectives identified below are for all ports for the stated duration, identified in Table 1. Ports, dates, and associated objectives for the Marine Harvest Studies project are summarized in Table 1.

Table 1.—Port location, survey duration, and list of primary objectives addressed by each port in Southeast Alaska for 2015 and 2016.

Port	2015 Start date	2015 End date	2016 Start date	2016 End date	Objectives addressed by port
Juneau	27 April	13 September	25 April	11 September	1–5, 7, and 8
Sitka, Ketchikan	27 April	13 September	25 April	11 September	1 and 3–8
Petersburg, Wrangell	27 April	30 August	25 April	28 August	1–5, 7, and 8
Yakutat	27 April	30 August	25 April	28 August	1 and 3–8
Craig-Klawock, Elfin Cove, Gustavus	4 May	30 August	2 May	28 August	1 and 3–8
Juneau-False Outer Point Shoreline	13 April	31 May	11 April	29 May	1, 8

The objectives for the 2015 and 2016 project include the following:

1. Estimate the preliminary yearly values[3] 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 such that the estimate of relative Alaska hatchery contribution for each port[4] is within 20% of the true value 90% of the time; and
    c. Pacific Salmon Treaty harvest;
2. Estimate the early season (late April to mid-July) Pacific Salmon Treaty Chinook harvest for DCF Salmon Districts 108 (Petersburg-Wrangell) and 111 (Juneau)[5].
3. Estimate the preliminary yearly 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 such that the estimates are within 20% of the true value 90% of the time for the relative contribution estimates by coded wire tag lot for each port[6].
4. Estimate the average net weight of the harvest of Pacific halibut by guided and unguided anglers at each port, such that the estimates are within 20% of the true value 90% of the time for each user group at each port.
5. Estimate the proportion of the Pacific halibut harvested by unguided anglers prior to the mean IPHC survey date[7], such that the estimates are within 20% of the true value 90% of the time.

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[3] Estimated yearly values are preliminary until final estimates are derived following the publication of the annual SWHS mail survey harvest estimates

[4] The 2011–2016 project involves 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 2011–2015 surveys, and the publication of the corresponding 2011–2015 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.

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

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

[7] 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 portions of charter and non-charter 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.

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. within 20% of the true value 80% of the time for the harvest by unguided anglers;
    b. within 10% of the true value 90% of the time for the harvest by guided anglers; and
    c. within 10% of the true value 90% of the time for the harvest by all anglers.
7. Estimate the preliminary values of the following characteristics of the rockfish harvest:
    a. biomass of total sport removals (harvest and release mortality) for demersal shelf rockfish from the Southeast Outside District (Craig-Klawock, Sitka, Gustavus, Elfin Cove, and Yakutat combined) for each user group (guided and unguided);[8]
    b. species composition for all rockfish harvested by guided and unguided anglers at each port; [9] and
    c. average weight by species for rockfish harvested by guided and unguided anglers at each port, such that the estimates are within 20% of the true value 90% of the time (for the estimate of average weight by species for each port).
8. Estimate the proportion of the catch of Chinook salmon (both <28 inches: small and ≥28 inches: large), rockfish (yelloweye, other DSR, slope, and pelagic rockfish), halibut, and lingcod that were released, by species or species grouping.[10]

SECONDARY OBJECTIVES

In addition to meeting the primary objectives listed above, there are a number of secondary objectives that will address additional management needs.

The secondary objectives for the 2015 and 2016 project include the following:

1. Collect genetic tissue samples (axillary appendage clips) and corresponding age structures (derived from 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, DCF Gene Conservation Laboratory. In addition, the corresponding heads from the sampled Chinook salmon will be collected in Sitka and Craig-Klawock (Craig and Klawock collectively comprise the Prince of Wales area) for stock identification purposes (via otoliths).
2. Report the observed HPUE of Chinook, coho, chum *O. keta*, and pink salmon *O. gorbuscha*, and Pacific halibut, postseason.

[8] The 2011–2016 project involves a relatively major redesign of survey procedures from previous years. It is anticipated that following the completion of the 2011–2015 surveys, and the publication of the corresponding 2011–2015 SWHS harvest estimates, that objective criteria for objective 7a will be determined.

[9] Precision needed for achieving objective 7a will be sufficient for this objective.

[10] 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.

3. Estimate the length composition of Pacific halibut harvested by guided and unguided anglers at all sampled ports to be reported to the IPHC as requested.
4. Estimate the proportion of released Pacific halibut in IPHC area 2C within each of the following length categories: (a) length ≤ L, (b) length > L and < U, or (c) length ≥ U, where L and U indicate the lower and upper limits of the reverse slot size limit.
5. Project the yearly preliminary harvest of lingcod by early August in the ports of Sitka, Ketchikan, Craig-Klawock, Gustavus, Elfin Cove, and Yakutat.[11]
6. Project the yearly preliminary harvest of yelloweye rockfish by early August in the ports of Sitka, Ketchikan, Craig-Klawock, Gustavus, Elfin Cove, and Yakutat.
7. Measure lengths from all sablefish observed during interviews 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 on unguided boat trips, if rockfish were released on the trip.

METHODS

The values for the estimates associated with the primary objectives for this project are expected to remain subject to unknown error that will not be evident until completion of analyses for at least five years of paired SWHS and on-site harvest sampling seasons under the two new designs implemented in 2011. It is anticipated that following the completion of at least five years of on-site surveys with the new design (the 2011–2015 surveys), and the publication of the corresponding SWHS harvest estimates, that the expansion factors 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[12].

The primary objectives for this project are generally aimed at obtaining the preliminary values of estimates of desired parameters, such as Pacific Salmon Treaty harvest, and others identified specifically in the Objectives. However, the final estimates of these parameters will be calculated using the information from the published harvest estimate from the SWHS for each year. Accordingly, the estimates of parameters such as relative Alaska hatchery contribution for Chinook salmon by port or average weight of lingcod harvested by port (to name a few, for descriptive purposes), 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, 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

[11] Preliminary estimates of the percent change in harvest of lingcod and yelloweye rockfish in the noted ports (Secondary Objectives 5 and 6), will be calculated by combining separate estimates for the guided and unguided components of the fishery, and utilized for inseason management purposes.

[12] 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 provision that the on-site sampling project at each port remains at relatively similar intensity and coverage overall years used for expansion factor calculation.

sampling effort due to time constraints and uncertainty about the change in the relationship between the revised SWHS design and the revised on-site marine creel survey. Sample size goals were accordingly set primarily to mirror the goals set in 2010. It is anticipated that when three or more years of paired values of final SWHS and on-site sampling data are analyzed, that goals for precision will be more directly aimed at the real parameters of interest (e.g., the Pacific Salmon Treaty harvest in total). 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.

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 survey areas. 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. The exclusion of the less frequently used access locations should have minimal influence on the inference to the total fishery, because they represent a small portion of the fishery. In some instances, locations of relatively minor use by the fishery were included for sampling, as these lower-use locations may be representative of components of the fishing public that may be otherwise unrepresented by sampling only the heavier-use locations (e.g., 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 revealed from historic creel or catch sampling surveys). Differing relative use by guided versus unguided segments of each fishery during 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), necessitate estimating all parameters of interest separately by each of these components of the fishery.

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 from intercepted boat parties at the sampled harbors and boat launches. At all ports, “creel samplers” conduct complete interviews, which include gathering information from each intercepted boat party on: effort, harvest and catch, logbook information (if fishing from a registered guide boat), and biological information. During all interviews, the creel samplers additionally gather and record information on the number of exiting boat parties which 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 (e.g., Primary Objective 1a: total sport harvest of Chinook salmon). The necessary information to address those needs is also incorporated into the study design (see Data Analysis section for further details).

In Ketchikan, 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 samplers in Sitka and Craig-Klawock will also concentrate on collecting Chinook otolith samples. 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 harvest and catch is a stratified 4-stage sample survey with days to sample across the time strata 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. Estimates will be calculated for each 2-week time period (called biweeks). Seasonwide estimates of harvest will be calculated as the sum of the biweekly estimates, giving consideration to estimated variance across all biweeks. Seasonwide estimates of averages and proportions will be calculated using seasonwide strata. To avoid potential for subsampling bias, whenever a boat party is contacted for sampling, for each species, either all or none of the entire bag (harvest) 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 for further details).

In order to obtain the "preliminary yearly 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. For some species, inseason logbook data will provide a more accurate preliminary value. The general approach used in this project 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 five 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 survey was redesigned in 2011, the most recent ratios available since 2011 will be used until there are five years available.

Once five years of data are available, then the average ratio of the five most recent years will be used. Years that use less than five years data will be expected to be more variable. The expansion factor ratio would then be applied to the observed yearly estimated averages or proportions of interest (e.g., relative Alaska hatchery contribution) to obtain the yearly preliminary values. Note that the expansion factors are developed separately for each SWHS Survey Area (Figure 1), 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 produce a regionwide total estimate (expanding up for SWHS Area F (Haines-Skagway)), a similarly derived 5-year average ratio of the total SEAK 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.

The following subsections include descriptions of the general estimation approach employed for specific objectives.

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

The total predicted harvest estimate for each port corresponding to each SWHS Area as obtained by the ratio expansion factor approach described above will comprise the estimates of the preliminary yearly total harvest of Chinook and coho salmon for each area. The expanded estimates for each SWHS area will be summed to reach a SEAK regional total.

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

Survey technicians will attempt to inspect all harvested Chinook and coho salmon for a missing adipose fin (indicating the possible presence of a CWT). The number of Chinook and coho salmon inspected for adipose fin clips will be recorded, and heads from Chinook and coho with adipose fin clips will be collected and identified with a uniquely numbered cinch strap. Cinch strapped heads from Chinook and coho 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 project as well as the coastwide CWT database will be used to estimate the contributions of Alaska hatchery Chinook and coho 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 met in the past (Table 2), thus the approximate allocation of sampling effort will be repeated, with the expectation that the samples sizes (fish scanned for hatchery origin) will be similar in 2015 and 2016 as observed in past years. Accordingly, similar levels of precision are expected in both years.

The relative contribution estimates for each species by each CWT grouping will be expanded by the corresponding predicted harvest estimate for the SWHS to obtain the current year's preliminary values for the corresponding total estimates of contributions by CWT grouping.

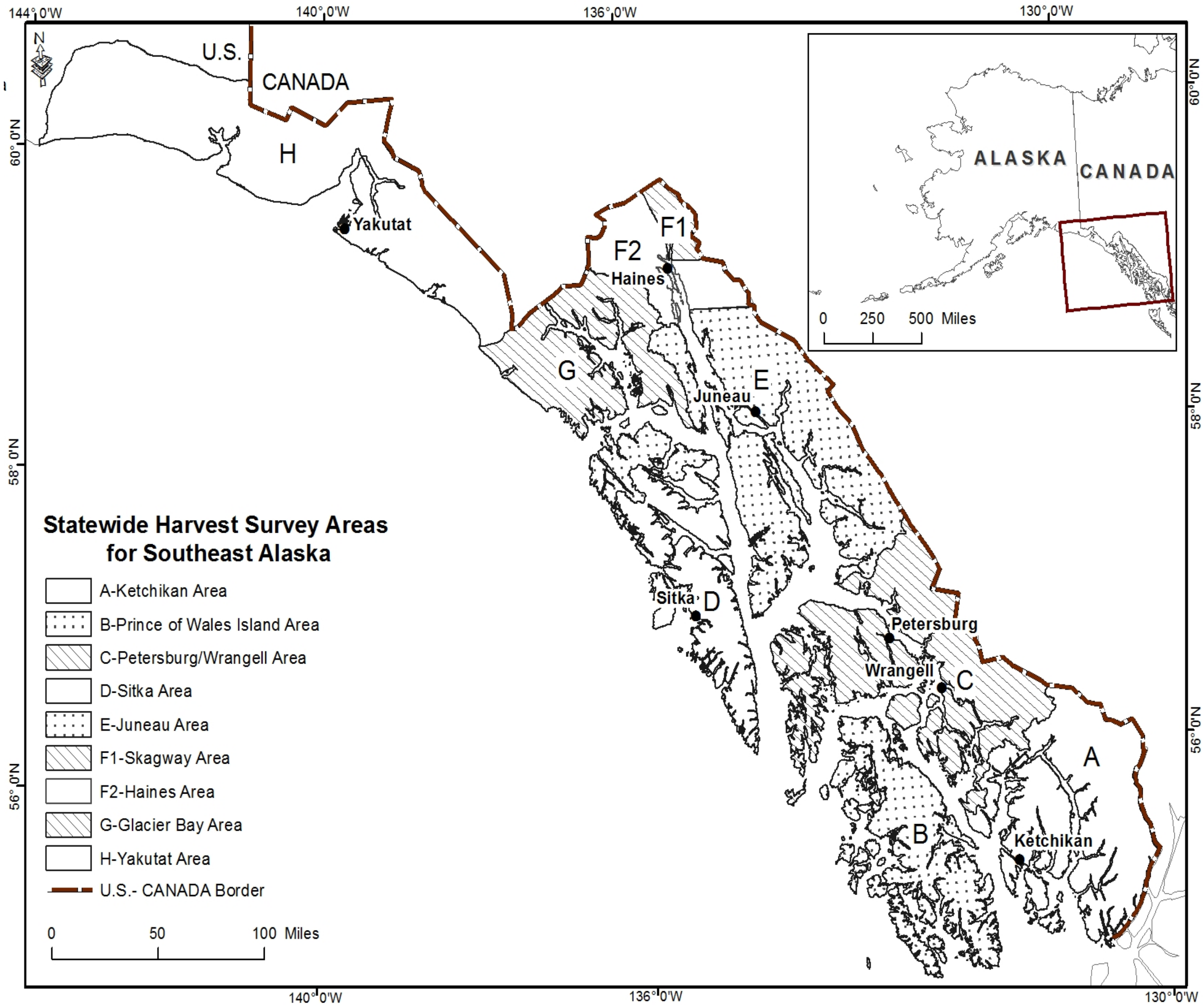

Figure 1.-Delineaiton of Statewide Harvest Survey (SWHS) areas in Southeast Alaska.

Table 2.–Relative precision of Alaska hatchery contribution estimates of Chinook and coho salmon obtained from creel survey and catch sampling projects in Southeast Alaska, 2010–2014.

		Alaska hatchery relative precision[a]	
Year	Location	Chinook	Coho
2010	Ketchikan	23%	6%
	Sitka	3%	5%
	Juneau	15%	5%
	Craig-Klawock	3%	3%
	Petersburg	11%	6%
	Wrangell	10%	46%
	Gustavus	14%	9%
	Elfin Cove	0%	15%
	Yakutat	28%	3%
2011	Ketchikan	9%	3%
	Sitka	2%	3%
	Juneau	14%	3%
	Craig-Klawock	3%	14%
	Petersburg	9%	6%
	Wrangell	19%	0%
	Gustavus	4%	7%
	Elfin Cove	6%	13%
	Yakutat	0%	1%
2012	Ketchikan	12%	5%
	Sitka	3%	5%
	Juneau	13%	3%
	Craig-Klawock	6%	4%
	Petersburg	13%	4%
	Wrangell	10%	70%
	Gustavus	7%	8%
	Elfin Cove	8%	11%
	Yakutat	0%	5%

--continued—

Table 2.-continued

Year	Location	Alaska hatchery relative precision[a] Chinook	Coho
2013	Ketchikan	13%	3%
	Sitka	4%	4%
	Juneau	14%	3%
	Craig-Klawock	5%	5%
	Petersburg	22%	10%
	Wrangell	0%	28%
	Gustavus	5%	4%
	Elfin Cove	3%	10%
	Yakutat	0%	1%
2014	Ketchikan	9%	4%
	Sitka	1%	3%
	Juneau	14%	3%
	Craig-Klawock	2%	4%
	Petersburg	19%	0%
	Wrangell	23%	29%
	Gustavus	3%	20%
	Elfin Cove	2%	10%
	Yakutat	4%	0%

[a] Current goal ≤20%, 90% confidence

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

Estimates of Pacific Salmon Treaty harvest are obtained by subtracting out the components of the harvest that do not count against the treaty (e.g., Alaskan hatchery harvest) from the total Chinook salmon preliminary harvest estimate. The early season estimate of Pacific Salmon Treaty harvest for DCF Salmon Districts 108 (Petersburg-Wrangell) and 111 (Juneau), will be obtained in similar manner using the corresponding components of the current year's preliminary harvest estimates combined with the past five 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. Survey technicians will assign halibut harvested under GAF a separate halibut code for harvest recording and biological sampling as GAF fish count towards the commercial halibut IFQ from which they are leased, but are still part of the sport HPUE. Measured halibut retained under a GAF permit will not be included in this calculation. Only boat-loads of halibut that can all be measured for length will be used, in order to avoid any potential for subsampling biases. All lengths collected will be measured to the nearest five millimeters (mm) using snout to fork (SNF). 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.

Periodically[13], the length composition of the halibut harvest by user group and port will be estimated using a 4-stage weighted average estimation approach with each harvested halibut encoded to series of 0s and 1s representing the various 10 cm length increments, so that the proportion of halibut in each length grouping can be reported.

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

The sampling weights from the 4-stage weighted average estimator used to calculate the average net weights by component of the fishery (guided versus unguided) are approximations of the number of halibut harvested. The mean IPHC survey date will be identified postseason and then used to post-stratify the estimates of harvest before and after that date. The proportion of the harvest before the mean IPHC survey date will then be calculated from these estimates.

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 current year's preliminary estimate of the harvest of lingcod (in numbers) for each user group[14] to obtain estimates of the preliminary biomass estimate of the harvest of lingcod at each port.

Sample size goals for 2015 and 2016 for lingcod average round weight were set in the same manner as described for the Pacific halibut net weight estimates. The means and standard deviations of lingcod weights were computed by port and user group from 2014 data. Stratum weights were based on group-specific harvests reported in the 2013 SWHS. The optimal sampling allocations resulted in minimum sample size guidelines for each port (Table 3). As with the halibut weight estimates, these minimum sample size goals are appropriate with 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.

[13] 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).

[14] The yearly preliminary 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).

Table 3.–Minimum target and expected sample sizes (in 2015 and 2016) of Pacific halibut and lingcod lengths to be collected for each of the sampled ports and user groups in Southeast Alaska, and expected sample sizes for rockfish species composition.

		Ketchikan		Craig-Klawock		Gustavus-Elfin Cove		Petersburg-Wrangell		Sitka		Juneau		Yakutat	
	User group	Target	Expected	Target	Expected	Target	Expected	Target	Expected	Target	Expected	Target	Expected	Target	Expected
Halibut	Noncharter	209	1,781	121	405	239	565	193	648	190	175	166	1,761	80	66
	Charter	110	1,426	220	554	540	1,401	140	206	240	1,289	60	240	230	752
	Total	319	3,207	341	959	779	1,966	333	854	430	1,464	226	2,001	310	818
Lingcod	Noncharter	28	83	40	105	25	33	ND	0	20	85	ND	6	10	3
	Charter	50	90	55	303	35	119	ND	0	30	318	ND	0	50	355
	Total	78	173	95	408	60	152	ND	0	50	403	ND	6	60	358
Rockfish	Noncharter	ND	1,486	ND	422	ND	302	ND	122	ND	490	ND	493	ND	8
	Charter	ND	1,474	ND	1,065	ND	1,502	ND	46	ND	1,896	ND	60	ND	428
	Total	ND	2,960	ND	1,487	ND	1,804	ND	168	ND	2,386	ND	553	ND	436

Note: Expected sample sizes identified for 2015 and 2016 equal the actual sample sizes in 2014.

Rockfish Species Composition, 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 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 and by user group using a length-weight relationship to estimate the average weight for each DSR species. The weights will be used to obtain the year's preliminary biomass estimate for the DSR rockfish species using the same approach outlined for Pacific halibut. If harvest by anglers in 2015 is similar to that occurring in 2014, then sample sizes for this objective this year are expected to meet or exceed those experienced last year (Table 3).

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 released Chinook salmon (both <28 in and ≥28 in, total length (TL)), rockfish (yelloweye, other DSR, slope, and pelagic rockfish), halibut, and lingcod by species (or species grouping for DSR, slope, and pelagic rockfish). 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. Halibut release data will be collected for size classes below, above, and within the reverse slot size limits. These data will be provided to the "Statewide Pacific halibut estimation" program allowing the project to estimate the average weight of released halibut and 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 was 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 Chinook, Coho, Chum and Pink Salmon, and Pacific Halibut (Secondary Objective 2)

All boat parties interviewed will be asked to report the number of targeted rod-hours directed at fishing for salmon and groundfish at each port. This information will be paired with the corresponding numbers of salmon or Pacific halibut harvested on a weekly basis to calculate a weekly HPUE for each species postseason, and will be posted on the Division of Sport Fish website in the spring of 2016. These HPUE estimates are only intended as a guideline for use by the public for their information as to the level of effort expended to harvest 1 fish by species on a weekly basis. 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. Halibut collected using a GAF permit will be included in the HPUE calculations.

Midseason Projected Preliminary Yearly 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 yearly total 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 the current year to past-year harvest estimates. The projected total harvest for the year will be estimated by the same ratio expansion approach used to estimate the preliminary yearly harvest estimates for Chinook and coho salmon described previously (Primary Objectives 1a and 3aa). In order to apply this approach midseason (by August), additional information on historic harvest timing from each port will be used to expand 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 troll, commercial driftnet, and sport) in SEAK is being analyzed by the ADF&G, DCF Gene Conservation 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. It will be placed in a pre-labeled vial filled with ethanol as the preserving agent, and/or stapled onto Whatman's paper and dried out.

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 4) 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 and boat ramps at the sampled ports in SEAK. The small (< 28" TL) Chinook salmon, which are only allowed to be harvested in the THAs for abbreviated time periods, will be sampled along with the large (≥ 28" 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 while addressing minimum sample size requirements. Stock contribution estimates using genetics will be obtained for these regions (Northern Inside, Outside, Petersburg-Wrangell, and Ketchikan) and DCF Salmon Districts 108 and 111 of SEAK (Table 5).

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 DCF Salmon Districts 108 and 111. In the Outside region, when possible, estimates will be further stratified by fish caught through biweek 13 versus those caught after biweek 13; in DCF Salmon Districts 108 and 111, when possible, estimates will be further stratified by fish caught through 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 objectives 1a and 2).

Results of this comparison will be reported to the DCF Gene Conservation Laboratory; 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 methods to weight the samples obtained (Sara Gilk-Baumer, Fisheries Geneticist II, ADF&G DCF Gene Conservation Laboratory, and Scott McPherson, Fishery Scientist I, ADF&G Division of Sport Fish, personal communication, December 9, 2010 meeting in Douglas).

Table 4.–Sampling goals for Chinook salmon genetics by port for the Southeast Alaska sport fisheries during the spring and summer of **2015 and 2016**.

Port	Goal
Juneau	650
Haines	25
Skagway	20
Glacier Bay	80
Sitka	1,500
Yakutat	80
Elfin Cove	80
Craig	500
Petersburg	400
Wrangell	200
Ketchikan	700
Total	4,235

Table 5.–Strata for which stock composition estimates for Chinook salmon caught in Southeast Alaska sport fisheries will be generated each year.

Southeast 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
DCF Salmon District 108	Petersburg, Wrangell	All season
DCF Salmon District 108	Petersburg, Wrangell	Through biweek 14
DCF Salmon District 108	Petersburg, Wrangell	After biweek 14
DCF Salmon District 111	Juneau	All season
DCF Salmon District 111	Juneau	Through biweek 14
DCF Salmon District 111	Juneau	After biweek 14

Note that all Chinook salmon that are genetically sampled will also be sampled for scales and mid-eye to fork (MEF) length at all ports. The genetic sampling requires documenting the age of the individually sampled fish, thus scales will be taken concurrently with genetic samples. Additionally, the genetics lab has requested sampling of otoliths from Chinook salmon sampled for genetics (and scales) at Sitka and Craig-Klawock; therefore, heads from genetically sampled fish at these ports will be collected for later otolith dissection.

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

During the 2015 sampling season (and continuing in 2016), the Marine Harvest Studies Project 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 response will be recorded as a yes-no answer. The ratio of the number of boat trips in which a release device was utilized to the total number of boat trips in which rockfish were released will be used to obtain an estimate of the percentage of unguided boat trips on which release devices were used. In addition, information pertaining to the merits of utilizing rockfish release devices and their proper use will be solicited 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' (i.e., interview samples) at Ketchikan, Sitka, Juneau, Petersburg, Craig-Klawock, Wrangell, Gustavus, Elfin Cove, and Yakutat. All ports will have survey technicians that complete 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 as release size category for halibut. Creel samplers will record the number of boats returning to the harbor as follows: 1) counted but not contacted, 2) contacted but not sport fishing, 3) sport fishing but not interviewed, and 4) sport fishing and interviewed. The samplers will record the logbook number of the charter operator, and whether or not 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 1.2) or electronically captured on handhelds.

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 fin-clipped 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 will 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, Chinook Salmon Advisor, ADF&G, Division of Sport Fish, Douglas, personnel communication). Lengths to the nearest 5 mm (MEF)[15] of these Chinook salmon will also be recorded on AWL forms to which the gum cards are then taped. In addition, Chinook salmon

[15] 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.

heads will be collected at the ports of Sitka and Craig-Klawock for the purpose of otolith 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).

The snout to fork (SNF) length to the nearest 5 mm of all Pacific halibut, rockfish, lingcod and sablefish sampled will also be recorded on AWL forms. Halibut, rockfish, lingcod, and sablefish will be measured only if all of the fish of a given species harvested by a given boat party can be examined, i.e., none of the harvest of the sampled species has been mutilated or discarded prior to sampling. All data recording procedures are outlined in detail in the current year's Southeast Alaska Marine Harvest Studies Creel Technician Manual (unpublished), which is provided to the field technicians annually.

Catch Samplers

Ketchikan, Sitka, and Craig-Klawock will each have one or more additional technician(s) who concentrate on CWT sampling of Chinook and coho salmon and collection of biological samples. As time allows they will also record SNF length to the nearest 5 mm of Pacific halibut, rockfish, lingcod and sablefish. Catch samplers in Sitka and Craig-Klawock will also sample Chinook salmon for otoliths. The catch samplers will complete AWL forms for each species in the same format as the creel samplers. Catch samplers will record the number of boats sampled and the number missed during their respective shifts. A boat number will be assigned for each boat exiting and recorded for all species sampled. All data recording procedures are outlined in detail in the current year's Southeast Alaska Marine Harvest Studies Creel Technician Manual (unpublished), which is provided to the field technicians annually.

DATA REDUCTION

There are two methods of data capturing while we switch form mark sense captured data to electronically captured data. Electronically captured data will be uploaded to a cloud website. From there it will be downloaded and read into a statistical analysis system dataset using SAS for Windows.

For mark sense captured data all technicians will first edit their data forms and then turn them in to the appropriate area office on a weekly basis. Each management area will edit, correct, collate and ship data forms to Juneau. In Juneau the mark-sense data forms will be grouped into batches, and optically scanned. 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 for Windows.

For both data collection methods 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 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 printouts of an Excel[16] file table of the AWL mark-sense forms data, and then typed into the Excel spreadsheet. The forms will be opscanned in Juneau, and then returned for editing and data analysis. Pacific halibut, rockfish, sablefish and lingcod lengths will also be recorded on AWL forms and then scanned similarly as was described for the Chinook salmon AWL forms.

DATA ANALYSIS

The data analysis procedures necessary to achieve the objectives for the 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, such as data gathered regarding the characteristics of intercepted boat parties and their harvest during creel or catch sampling, or data derived after laboratory follow-up activities (e.g., CWT analyses). The second step involves expanding these intrinsically-based estimates to the corresponding preliminary yearly projections of the parameter estimates calculated following publication of the final SWHS estimates of harvest for the corresponding species or species group. 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 "midseason" 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 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

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, which is then applied to the corresponding estimates from the SWHS. The on-site sample survey design is a stratified 4-stage sample survey with:

i) days to sample across the biweek representing the first-stage sampling units;

ii) the harbors and boat launches sampled within a selected day representing the second-stage sampling units;

iii) the boat parties exiting the fishery during each day at each exit location representing the third-stage sampling units; and

iv) each fish (by species) representing the fourth-stage or "terminal" sampling unit.

For ports where sampling occurs on every day of the biweek—such as Juneau and Craig-Klawock—this 4-stage sampling equation naturally collapses to a 3 stage sampling equation. The expansion for subsampling days then becomes 1 with a variance of 0, because all days are sampled. Where estimates reflect totals, such as the total number of fish harvested, the biweekly estimates and variances will be summed to produce seasonwide estimates and variances. Where

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

estimates are for proportions, such as average weight, a weighted average will be applied to calculate estimates. To avoid potential for subsampling bias, whenever a boat party is contacted for sampling, for each species, either all or none of the entire bag (harvest) 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, the creel samplers gather information from each intercepted boat party on the following parameters: effort, harvest and catch, logbook information and biological sampling of the catch. During these scheduled interviews, the creel samplers additionally gather and record information on the number of exiting boat parties used in the weighting estimation process described later. As noted previously, one or more technicians at the ports of Ketchikan, Sitka, and Craig-Klawock conduct shifts where only catch-sampling occurs. These catch samplers will collect and record a corresponding count of the number of exiting boat parties[17]. 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.[18]

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 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 done as a random

[17] 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.

[18] 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).

probability-based sample survey in the standard sense, the corresponding variance and SE estimates are considered approximations[19] 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 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 not an unbiased estimate of the harvest by user group at each port for the season in total[20]. The use of the corresponding estimate of harvest is for use in expanding up to the preliminary yearly values for the associated parameters corresponding to the values from the final SWHS harvest estimates, via the ratio estimation approach outlined in this operational 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 1bb, 1cc, and 3c0) 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 of the measurement for parameters of interest across all fish by species or species group within a sampled boat party:

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

where: n_{mhijk} is the number of fish sampled (where *m* stands for 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*

[19] 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 multistage 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 multistage sample survey without replacement.

[20] 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.

within stratum h[21]; 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:

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

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 as user group (guided vs unguided), as well as biweek for harvest information.

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):

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

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:

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

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)[22], 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

[21] Although strata are defined as the combination of major port, biweek 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).

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:

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

where N_{uhijk} is the number of fish on an interviewed boat that were not sampled for the parameter or proportion of interest[23]; z_{hij} is the number of all boats interviewed within each sampled access location within each sampled day (includes boats that were interviewed but for 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[24]).

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 that were determined to be sport fishing regardless of strata (i.e., guided plus unguided boats); and $\hat{B}_{ij}$ is the estimated number of sport fishing boat parties expanded for missed boats (note that counts of boat parties are not distinguished by user group, so no *h* subscript denoting guided versus unguided), calculated for creel technicians as:

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

where b_{ij} is the total number of boat parties known to be sport fishing (includes noncompliant and missed boats known to be sport fishing), a_{ij} is the total number of boat parties that were determined to be sport fishing or were 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

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22 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.

23 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.

24 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-represented in the weighting process. Accordingly, for the catch sampling data all $N_{hijk} = N_{mhijk}$ in equation 5.

fishing and nonsport fishing boats, as well as "missed" boats)[25]. The calculation of these indices of harvest (the $\hat{N}_{hij}$ terms) for use in later expansion to project the final SWHS corresponding estimates of harvest will be limited to using the data from creel samples only (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. For estimates involving averages or proportions that utilize catch sampling data, the equation below, which represents the number interviewed for sport fishing plus the number missed ($A_{ij} - b_{ij}$) multiplied by the average proportion sportfishing as calculated from creel data, will be used:

$$\hat{B}_{ij} = b_{ij} + \left(A_{ij} - b_{ij}\right)\left(\frac{\sum_{j=1}^{q}\frac{b_{ij}}{a_{ij}}}{q}\right) \tag{7b}$$

where b_{ij} is the number of sport fishing boats interviewed by the catch sampler on day i, location j, where j is not used for harvest calculations; A_{ij} is the total number of boats returning to harbor j (includes sport fishing boats and missed boats). 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:

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

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:

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

[25] Note that some boat parties at some access locations are known to never sport fish (see the Data Collection section and the 2014 SEAK Marine Harvest Studies Creel Technician Manual [unpublished] for details), these boat parties are not included in either the A_i or the a_i counts.

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:

$$\overline{\hat{N}}_{hi} = \frac{\sum_{j=1}^{q_i} \hat{N}_{hij}}{q_i} \qquad (11)$$

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 $\overline{\hat{N}}_{hi}$ 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:

$$\hat{N}_{hi} = Q_i \overline{\hat{N}}_{hi} \qquad (12)$$

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.[26] 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[27]:

$$\tilde{N}_{hij} = \frac{\hat{B}_{ij} \hat{b}_{hij}}{b_{ij}} \overline{N}_{hij} \qquad (13)$$

[26] 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).

[27] 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).

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:

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

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

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

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[28], 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).

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:

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

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

[28] 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).

Then the $\overline{\hat{N}}_h$ 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:

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

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 "midseason" period).

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

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

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

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

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)[29]:

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

[29] 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).

where: f_1, f_{2i}, and f_{3ij} are the sampling fractions for days, access locations, and boat parties, respectively (i.e., $f_1 = d/D; f_{2i} = q_i/Q_i; f_{3ij} \approx b_{ij}/\hat{B}_{ij}$)[30]; S^2_{1h}, S^2_{2hi}, and S^2_{3hij} 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:

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

where d' is the number of days in which S^2_{2hi} can be estimated (i.e., days with at least 2 access locations sampled); and q_i' is the number of locations in which S^2_{3hij} 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:

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

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

[30] 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 and 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.

zero); the s^2_{1h}, s^2_{2hi}, s^2_{3hij}, and s^2_{4hijk} 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:

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

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

d'' is the number of days in which s^2_{2hi} can be estimated (i.e., days with at least 2 access locations sampled); q''_i is the number of locations in which s^2_{3hij} 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^2_{4hijk} 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:

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

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 post-stratification. Because the guided versus unguided level of stratification is a post-stratification classification, these components are not independently sampled and as such they are not statistically independent as are the ‘pre-stratification’ 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[31] 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 for 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 design)[32]. 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[33]. 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[34]:

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

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 <u>creel sample only</u> from each biweek separately, and summing across the two

[31] 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.

[32] 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.

[33] 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.

[34] 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., <u>creel samples only</u>).

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 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 calculated the corresponding 2015 preliminary values 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 $\widehat{Cov}[\hat{r}_{tc}, \hat{r}_{tu}]$ 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:

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

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.

Yearly Preliminary Estimates

The approach to estimating the yearly preliminary values 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 SWHS published harvest estimates to the corresponding harvest values from this project. Because this year's project in SEAK 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 five years will be sampled in a restricted manner simulating the survey design implemented in 2011. Because the SWHS underwent a redesign prior to the 2011 sampling season, the ratios used for all ports this year will likely be subject to unknown error that will not be evident until completion of several paired SWHS and on-site harvest sampling data occurrences, with the two new designs.

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):

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

where z is the number of years to average over (set to 5 years[35]); the $\hat{\pi}_{hp}$ and $\hat{\pi}_p$ terms are the corresponding estimated ratios for each year p by user group, calculated as:

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

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 across for each 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[36] for each corresponding year (obtained from equation 32).

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

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

[35] The five most recent complete pairs of estimates from the on-site 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.

[36] Both in past years and for 2015, 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).

where $\hat{N}_h$ and $\hat{N}$ are from equations 27 and 32, respectively for this year's data. We are not in every site or at all ports within a SWHS area, although we assume we are getting a representative sample from each SWHS area.

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:

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

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 2015 preliminary harvest 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):

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

with the variance of $\hat{\delta}_{sh}$ calculated approximately as (adapted from Mood et al. 1974)[37]:

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

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

Midseason Projections

Midseason projections for the yearly end-of-season preliminary values are estimated in a similar manner as described for the Yearly **Preliminary Estimates**, with the additional step of expanding the data and estimates through the end of the appropriate midseason period by historic ratios for the midseason period to the total yearly estimate. So for example, if by July 31st historically *Y*% of the harvest of yelloweye rockfish 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 2015 preliminary value. Because these values are used for inseason management milestones at this time, the midseason estimates will be calculated without corresponding estimates of the variance.

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

The preliminary yearly total sport harvest of Chinook and coho salmon for SEAK 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 (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. Therefore the estimates for Petersburg and Wrangell will be combined to obtain 1 overall harvest index for SWHS Survey Area C; and Gustavus and

[37] 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.

Elfin Cove estimates will be combined for SWHS Survey Area G. The corresponding variances will also be summed.

4. Subsequently, 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)[38], 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.

   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 current year's 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 SEAK harvest estimates (SWHS Survey Areas A through H). So, for example, if the Area F harvest of Chinook represents Y% of the total SEAK harvest, then the total current year's preliminary 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 yearly 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 of the variance).

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

Estimates of the relative and total hatchery harvest contributions of hatchery and non-hatchery CWT-tagged stocks to the harvest for Chinook salmon (Primary Objective 1b) and coho salmon (Primary Objective 30) 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):

[38] The most recent expansion factors (π values) for the combination of ports representing the SWHS Survey Areas that will be sampled in 2015 and 2016 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 current year's 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 2015 and 2016, and as noted, revised factors will be calculated by mid July 2015).

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 30.

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

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

   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 the formula by Goodman (1960) for the variance of a product of random variables:

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

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

   where $\hat{V}[\hat{u}_c]$ and $\hat{V}\left[\hat{U}\right]$ are from equation 44; and $\hat{V}\left[\tilde{H}\right]$ 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 Yearly Total Sport Harvest, with variances obtained by summation.

Pacific Salmon Treaty Harvest (Primary Objectives 1c)

The Pacific Salmon Treaty harvest (Chinook salmon) will be estimated for SEAK in total (Primary Objective 1c) by first calculating the total Alaska hatchery contributions for each SWHS Survey Area as described above (**Hatchery and Non-hatchery Contributions-Chinook and Coho Salmon**). Then the following steps will be implemented to estimate the preliminary treaty harvest for SEAK for each year[39]:

1. The total contribution estimate of Alaska hatchery to the Chinook salmon harvest by SWHS Survey Area is subtracted from the current year's preliminary total harvest of Chinook salmon for each survey area. The resulting estimate is 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 are then 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)

[39] 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.

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 the SWHS Survey Areas with low Chinook salmon harvest which are Haines-Skagway and Yakutat. The expansion factor applied to the total regional harvest (excluding Haines-Skagway and Yakutat) was approximately 1.04 (derived from past SWHS estimates).
3. The final step will be to adjust the treaty harvest estimate upward to reflect the subtraction of the base catch and "risk adjustment factor" from the total Alaskan hatchery contribution estimate[40]. 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.

Justification and steps for calculating the early season (late April through mid-July) Pacific Salmon Treaty harvest for DCF Salmon Districts 108 (Petersburg/Wrangell) and 111 (Juneau), follows:

DCF Salmon District 108: 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") Chinook salmon being harvested in District 108 by both sport and commercial fishermen during late April to mid-July. Large Chinook salmon sport harvest in District 108 is sampled onsite at the ports of Petersburg (north end of District 108) and Wrangell (south end of District 108), and the onsite samplers summarize the District 108-specific information as part of their weekly paperwork. Recoveries of CWTs from large Chinook salmon in District 108 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.

DCF 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") Chinook salmon being harvested in District 111 by both sport and commercial fishermen during late April to early July. Large Chinook salmon harvested in District 111, which includes the majority of the Juneau-area marine waters, are sampled onsite 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 111. The District 111 harvest information is the majority of the entire harvest encountered by onsite personnel in Juneau, so the data are examined and any Chinook salmon information from outside of District 111 is excluded. Recoveries of CWTs from large Chinook salmon from District

[40] 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.

111 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 111.

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 by first converting each length measurement to net weight using the IPHC length-weight relationship:

$$\hat{W}_{hijko} = \alpha\, L_{hijko}^{\beta} \tag{56}$$

where $\widehat{W}_{hijko}$ is the estimated net weight in lb of 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 fork length in cm 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 $\alpha = 6.921 \times 10^{-6}$ and $\beta = 3.24$. 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, Quantitative Scientist, IPHC, Seattle WA, 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 ($\hat{W}_{hijko}$) 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 multistage 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):

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

where $\hat{p}_{u(d<\overline{D})}$ is the proportion of the halibut harvest index for the unguided component[41] 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 creel samples only 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):

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

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

The survey dates at each port are expected to cover the most, but not all, of the unguided halibut harvest. Accordingly, the proportions estimated by equation 57 may be slightly biased.

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 estimate 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 DCF (Dave Carlile, Herring/Groundfish Biometrician, ADF&G Juneau, personal communication, Jan 5, 2000). 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; 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 multistage 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 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:

$$\tilde{W}_h = \overline{w}_h \tilde{H}_h \quad \text{and} \quad \tilde{W} = \overline{w} \tilde{H} \quad (59)$$

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

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

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.

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

Species Composition of Rockfish

The species composition of rockfish ($\hat{p}_{sg}$)will be estimated as proportions of the rockfish 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.

Average Weight of Rockfish

The average weight for each rockfish species and species grouping by user group $\overline{w}_{sh}$will be estimated as described above for halibut and lingcod. The parameters for converting lengths to weight were developed for major species in the harvest from paired length and weight data (sexes combined) collected by this project during 2006 and 2007. Parameters for species or species groups with low sample sizes are obtained from the fisheries literature (Table 6).

Table 6.–Coefficients for estimating round weight in kilograms from total length in centimeters for rockfish species to be employed in Southeast Alaska rockfish weight evaluation from sport fisheries.

Species or groups with large sample sizes	α	β	Species or groups with small sample sizes	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	Yellowtail	0.000075	2.539
Copper	0.000011	3.099	Dark	0.000047	2.729
Dusky	0.000039	2.737	Other pelagic	0.000084	2.559
Quillback	0.000033	2.820	Other demersal	0.000025	2.892
Rougheye	0.000010	3.103	Other slope	0.000037	2.726
Shortraker	0.000048	2.724			
Yelloweye	0.000024	2.902			

Preliminary Biomass of Removals

Preliminary Estimation of Harvest Biomass

The preliminary harvest biomass of DSR by user group in the Southeast Outside District (Craig, Sitka, Gustavus, Elfin Cove, and Yakutat combined) and variances will be estimated 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 preliminary estimate of the harvest biomass of all DSR species will be calculated as the sum of the individual harvest biomass estimates of each DSR species within each user group and across the corresponding ports. The overall variance will similarly be obtained by summation across the species and port values.

Preliminary Estimation of Release Mortality Biomass

To achieve Primary Objective 7a, the biomass of the rockfish harvest and release mortality must be estimated. Release mortality rates are defined as the proportion of released fish that die in the short term as a result of injuries associated with capture, handling, and release. Like the preliminary estimate of the harvest biomass, preliminary estimates of release mortality biomass, or just simply release biomass $\widehat{RB}_{sh}$, 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, port and user group values.

Release mortality biomass is based on the product of the estimated average weight of a species by user group $\overline{w}_{sh}$, the estimated discard mortality rate $\hat{d}_{sh}$, and the estimated number of fish of that species released by user group $\hat{R}_{sh}$. The average weight by species by user group is estimated by this project using equations 26-34 from harvested fish and it is assumed that they represent released fish. Discard mortality rates are based on the fisheries literature. Rates differ by user group since all non-pelagic rockfish released by guided anglers are required to be released using a deep-water release (recompression) device. Non-guided anglers are currently not required to release rockfish using deep-water release devices and their release mortality rate is assumed to be 100%. The number of releases of a species is not observable by technicians and comparisons of creel and logbook data indicate that releases are not always captured in creel interviews. So for both guided and unguided anglers the release rate by species or species grouping ($\hat{r}_s$) will be the maximum of either the value from charter logbooks or creel data. The estimated number of releases will be determined by:

$$\hat{R}_{sh} = \hat{H}_{sh} \frac{\hat{r}_s}{1-\hat{r}_s} \tag{61}$$

This equation is derived by solving the equation for release rate (r) below for number of releases (R):

$$r = \frac{R}{H+R} \tag{62}$$

The variance of $\hat{R}_{sh}$ will be calculated as the product of variances via Goodman's equation (1960). The variance of $\frac{\hat{r}_s}{1-\hat{r}_s}$ will be simulated via bootstrapping as outline in Efron and Tibshirani (1993)

$$V(\hat{R}_{sh}) = (\hat{H}_{sh})^2 V\left(\frac{\hat{r}_s}{1-\hat{r}_s}\right) + V(\hat{H}_{sh})\left(\frac{\hat{r}_s}{1-\hat{r}_s}\right)^2 - V(\hat{H}_{sh})V\left(\frac{\hat{r}_s}{1-\hat{r}_s}\right) \tag{63}$$

Release mortality biomass $\widehat{RB}_{sh}$ by species or species grouping and user group may be estimated by:

$$\widehat{RB}_{sh} = \overline{w}_{sh}\hat{d}_{sh}\hat{R}_{sh} \tag{64}$$

Variance of $\widehat{RB}_{sh}$ may be found by iteratively using Goodman's equation (1960). First consider finding the variance of the $\overline{w}_{sh}\hat{d}_{sh}$ product:

$$V\left(\widehat{wd}_{sh}\right) = (\overline{w}_{sh})^2 V\left(\hat{d}_{sh}\right) + V(\overline{w}_{sh})\left(\hat{d}_{sh}\right)^2 - V(\overline{w}_{sh})V\left(\hat{d}_{sh}\right) \tag{65}$$

Finally find the release biomass variance $V\left(\widehat{RB}_{sh}\right)$ by finding the variance of the $\widehat{wd}_{sh}\hat{R}_{sh}$ product:

$$V\left(\widehat{RB}_{sh}\right) = V\left(\widehat{wd}_{sh}\hat{R}_{sh}\right) = \tag{66}$$

$$= \left(\widehat{wd}_{sh}\right)^2 V\left(\hat{R}_{sh}\right) + V\left(\widehat{wd}_{sh}\right)\left(\hat{R}_{sh}\right)^2 - V\left(\widehat{wd}_{sh}\right)V\left(\hat{R}_{sh}\right) \tag{67}$$

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 used in 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 for each species or species group that were <u>caught</u> (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. Logbook data is used to calculate release percentage for rockfish biomass estimates.

Weekly Harvest per Unit Effort of Chinook, Coho, Chum, and Pink Salmon, and Pacific Halibut (Secondary Objectives 2)

Values of the HPUE will be calculated as unweighted means, as the objectives are primarily directed at providing information as a measure of the hours necessary to harvest the species in question (Secondary Objective 2). This objective is directed at providing information to the stakeholders involved, which are the general angling public. The measures of HPUE are summarized as weekly values (Secondary Objective 2) and the impact from not weighting is expected to be relatively minor.[42] The calculation process for the unweighted HPUE values first involves obtaining the mean HPUE for all rods fished in each interviewed boat party (<u>creel samples only</u>):

$$\overline{HPUE}_{hijk} = \frac{N_{hijk}}{e_{hijk}v_{hijk}} \tag{68}$$

[42] The validity of this assumption will be evaluated during the postseason data analysis this year.

where N_{hijk} is as defined previously (see equation 5), e_{hijk} is the targeted[43] 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 will be obtained over all boat parties interviewed within each of the corresponding periods:

$$\overline{HPUE}_p = \frac{\sum_{h=1}^{L}\sum_{i=1}^{d_p}\sum_{j=1}^{q_i}\sum_{k=1}^{b_{hij}}\overline{HPUE}_{hijk}}{\sum_{h=1}^{L}\sum_{i=1}^{d_p}\sum_{j=1}^{q_i} b_{hij}} \quad (69)$$

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 informational purposes only, the mean HPUE estimates will be calculated without corresponding estimates of the variance.

Yearly Midseason Projection of Preliminary Lingcod and Yelloweye Rockfish Harvested (Secondary Objectives 5 and 6)

A midseason (through the beginning of August) projection of the annual yearly 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 **Midseason Projections** section above (see page 39 for the approach for making these projections). The weekly summaries of lingcod and yelloweye rockfish harvest will be summed through August 2 and compared to a similar sum from past years. This comparison will be used to evaluate 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 multistage study design at Ketchikan, Juneau, and Sitka was one where sample selection at the various stages in the multistage 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, and calculations were performed as if the data had been gathered as a simple random sample. The 2011 sampling design changes include using boat party counts to weight the information collected during interviews and catch samples in a multistage manner. In Ketchikan, Juneau and Sitka some sampling docks with little harvest were dropped. At all ports, the overall sample design is as described in the Study Design section of this 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.

[43] 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’.

At all locations the sampling will be grouped in biweekly periods. Biweeks for 2015 are as follows: 27 April–10 May, 11–24 May, 25 May–7 June, 8–21 June, 22 June–5 July, 6–19 July, 20 July–2 August, 3–16 August, 17–30 August, 31 August–13 September (note the start-end dates for each site differ as noted in Table 1. Holidays include the dates of 25 May, 3 July, and 7 September. Biweeks for 2016 are: 25 April–8 May, 9–22 May, 23 May–5 June, 6–19 June, 20 June–3 July, 4–17 July, 18-31 July, 1–14 August, 15–28 August, 29 August–11 September. Holidays include 30 May, 4 July, and 5 September.

At all locations, unless specifically stated below, the sampling technicians intercept anglers for 6.5 hours each scheduled day. All weekends and holidays will be worked, and technicians will get two consecutive standard days off (SDO) each week. The schedule was generated as follows: 1) two days off were set; 2) locations to sample from the access locations were selected at random without replacement (WOR). The scheduling of days and periods to sample within the entire survey were structurally different for derby versus nonderby periods.

Ketchikan, Sitka, and Craig/Klawock also have one or more catch samples to conduct additional CWT sampling of Chinook and coho salmon to increase the proportion of harvested Chinook and coho salmon inspected for adipose fin clips and to increase CWT recoveries of wild stock Chinook and coho salmon and the Alaskan hatchery contributions of Chinook salmon. The catch samplers will also conduct biological sampling of Chinook and groundfish species. These technicians can roam between additional access locations and/or locations not covered in a day by the creel samplers.

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 Southeast Alaska Marine Harvest Studies Creel Technician Manual (unpublished).

KETCHIKAN MARINE BOAT FISHERY

The Ketchikan marine boat sport fishery will be surveyed from 27 April 2015 through 13 September 2015 and 25 April 2016 through 11 September 2016, with the Ketchikan King Salmon Derby occurring in 2015 from 23 to 25 May, 30 to 31 May, and 6 to 7 June and in 2016 from 28 to 30 May, 4 to 5 June, and 11-12 June. Five access locations will be sampled by a total of 2 to 5 staff[44].

Within the two derby biweekly periods (biweeks 10 and 11 for 2015 and biweeks 11 and 12 for 2016), 4 technicians will conduct creel and catch sampling (Table 7a and 7b). Two of the four derby weigh-in stations (Mountain Point (south), Bar Harbor I (in town), and Clover Pass and Knudson Cove (north)) 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.

[44] Dependent upon the period of the survey.

Table 7a.–Summary of study design features for the 2015 onsite catch sampling survey of the Ketchikan marine boat sport fishery in Southeast Alaska.

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	27 April–10 May	10	4	2	0
10	11 May–22 May	8	4	2	0
DERBY	23, 24 May	2	4	3	2
11	26–29 May & 1–5 June	5	5	3	0
DERBY	25 May & 30-31 May, 6-7 June	5	5	3	2
12	8–21 June	10	5	3	0
13	22 June–5 July	10	5	3	0
14	6–19 July	10	5	3	0
15	20 July–2 August	10	5	3	0
16	3–16 August	10	5	3	0
17	17–30 August	10	5	3	0
18	31 August–13 September	10	5	3	0

Table 8b.–Summary of study design features for the 2016 onsite catch sampling survey of the Ketchikan marine boat sport fishery in Southeast Alaska.

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	25 April–8 May	10	4	2	0
10	9 May–22 May	10	4	2	0
11	23–27 May & 31May–3 June	5	5	3	0
DERBY	28-30 May & 3-4 June	5	5	3	2
12	6-10 June & 13-19 June	8	5	3	0
DERBY	11-12 June May	2	4	3	2
13	20 June–3 July	10	5	3	0
14	4–17 July	10	5	3	0
15	18-31 July	10	5	3	0
16	1–14 August	10	5	3	0
17	15-28 August	10	5	3	0
18	29 August–11 September	10	5	3	0

SITKA MARINE BOAT FISHERY SURVEY

The Sitka marine boat sport fishery will be surveyed from 27 April 2015 to 13 September 2015 and 25 April 2016 to 11 September 2016, with the Sitka Chinook Salmon Derby occurring in 2015 from 23 to 25 May and 30 to 31 May and in 2016 from 28 30 May and 4 to 5 June. Eight access locations in the Sitka marine boat fishery are to be sampled by 2 to 6 staff[44].

A similar procedure was used for scheduling sampling during the derby biweekly period. The number of sampling units scheduled for each year is summarized in Table 8a and Table 8b. A catch sampler will be stationed at the derby weigh-in station on Crescent Harbor. Additional derby entries will be sampled when the floating weigh-in station delivers to the processing plant.

Table 9a.–Summary of study design features for the 2015 onsite catch sampling survey of the Sitka marine boat sport fishery in Southeast Alaska.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh-in stations sampled
9	27 April–10 May	10	8	2	0
10	11 May–22 May	8	8	3	0
DERBY	23-24 May	2	8	3	1
11	26–29 May, 1–7 June	7	8	3	0
DERBY	25 May 30-31 May	3	8	3	1
12	8–21 June	10	8	3	0
13	22 June–5 July	10	8	3	0
14	6–19 July	10	8	3	0
15	20 July–2 August	10	8	3	0
16	3–16 August	10	8	3	0
17	17–30 August	10	8	3	0
18	31 August–13 September	10	8	2	0

Table 10b.–Summary of study design features for the 2016 onsite catch sampling survey of the Sitka marine boat sport fishery in Southeast Alaska .

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh-in stations sampled
9	25 April–8 May	10	8	2	0
10	9 May–22 May	10	8	3	0
11	23–27 May, 31 May-3 June	5	8	3	0
DERBY	28-30 May 4-5 June	5	8	3	1
12	6-19 June	10	8	3	0
13	20 June–3 July	10	8	3	0
14	4–17 July	10	8	3	0
15	18-31 July	10	8	3	0
16	1-14 August	10	8	3	0
17	15-28 August	10	8	3	0
18	29 August–11 September	10	8	2	0

JUNEAU MARINE BOAT AND ROADSIDE FISHERIES SURVEYS

The Juneau marine boat sport fishery will be surveyed from 27 April 2015 through 13 September2015 and 25 April 2016 to 11 September 2016, with the Golden North Salmon Derby occurring 14–16 August 2015 and mid-August 2016. Six access locations will be sampled by 3 to 5 staff with overlapping morning and evening shifts.

Similarly, within the derby biweekly period, 3–5 creel samplers will conduct creel sampling with additional personnel stationed at each of the derby weigh-in stations (Auke Bay Government, Douglas Harbor, Amalga Harbor, and the floating processor). In Juneau, the derby stations do not keep a count of the total number of entered fish; therefore, all derby entered Chinook and coho salmon will be counted and sampled for CWT at the weigh-in stations with a subsample of Chinook to be sampled for GSI[45]. The number of sampling units by stratum scheduled for 2015 and 2016 is outlined in Table 11a and Table 9b.

A shoreline fishery for Chinook salmon at False Outer Point (Picnic Cove) on the north end of Douglas Island will also be sampled and a harvest estimate for this shoreline fishery will be obtained from the SWHS. This fishery is believed to target almost entirely wild stocks headed for the Taku River (based on limited prior CWT sampling). Biological and CWT sampling will occur from mid-April through the end of May.

Table 11a.–Summary of study design features for the 2015 onsite catch sampling survey of the Juneau marine boat sport fishery in Southeast Alaska.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh in stations sampled
9	27 April–10 May	10	6	3	0
10	11 May–24 May	10	6	3–4	0
11	25 May–7 June	10	6	3–4	0
12	8–21 June	10	6	3–4	0
13	22 June–5 July	10	6	3–4	0
14	6–19 July	10	6	3–4	0
15	20 July –2 August	10	6	3–4	0
16	3–13 August	7	6	3–4	0
DERBY	14–16 August	3	6	3–4	3-4
17	17–30 August	10	6	3–4	0
18	31August –13 September	10	6	2	0

45 Because the total number of 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 nonderby portion of the Juneau fishery.

Table 12b.–Summary of study design features for the 2016 onsite catch sampling survey of the Juneau marine boat sport fishery in Southeast Alaska.

Biweekly periods	Dates	Number of days sampled	Number of access locations	Number of access locations sampled per day	Derby weigh in stations sampled
9	25 April–8 May	10	6	3	0
10	9 May–22 May	10	6	3–4	0
11	23 May–5 June	10	6	3–4	0
12	6-19 June	10	6	3–4	0
13	20 June–3 July	10	6	3–4	0
14	4-17 July	10	6	3–4	0
15	18-31 July	10	6	3–4	0
16	1-11 August	7	6	3–4	0
DERBY	12-14 August	3	6	3–4	3-4
17	15-28 August	10	6	3–4	0
18	29 August –11 September	10	6	2	0

CRAIG-KLAWOCK MARINE BOAT FISHERY SURVEY

The Craig-Klawock marine sport fishery will be sampled from 4 May 2015 to 30 August 2015 and 2 May 2016 to 28 August 2016. There are six access locations in Craig, and five access locations in the Klawock area sampled by 2-4 technicians.

Craig and Klawock will each be sampled every day of the biweek, with one technician to work in the office on Monday. This design should provide a consistent proportion of sampling effort throughout the season, and maximize the number of Chinook and coho salmon sampled.

Some lodges, at least two in Craig, will only allow biological sampling of their fish. Therefore the creel samplers will not collect effort information while at this dock. Data from this dock will be recorded on a catch sampling form.

PETERSBURG MARINE BOAT FISHERY SURVEY

The Petersburg marine boat fishery will be sampled from 27 April 2015 to 30 August 2015 and 25 April 2016 to 28 August 2016. One to two technicians will sample the harvest of boat anglers returning to three access locations. During the Petersburg Salmon Derby (22-25 May 2015 and 27-30 May 2016), additional staff will be stationed at the Middle Harbor weigh-in station for CWT and genetic sampling of Chinook salmon.

WRANGELL MARINE BOAT FISHERY SURVEY

The Wrangell marine boat fishery will be sampled from 27 April 2015 to 30 August 2015 and 25 April 2016 to 28 August 2016. One to two technicians will sample the harvest of boat anglers returning to three access locations in the Wrangell area. Wrangell has two shifts per sampling day with each access location randomly chosen with replacement. The time periods of the shifts vary between weekdays and weekend/holidays.

GUSTAVUS MARINE BOAT FISHERY SURVEY

The Gustavus marine boat fishery will be sampled from 4 May 2015 to 30 August 2015 and 2 May 2016 to 28 August 2016. One technician will sample the harvest of boat anglers returning to one access locations in the Gustavus area. In the spring, the Bartlett Cove access location may also be surveyed.

ELFIN COVE MARINE BOAT FISHERY SURVEY

The Elfin Cove marine boat fishery will be sampled from 4 May 2015 to 30 August 2015 and 2 May 2016 to 28 August 2016. One technician will sample the harvest of boat anglers returning to two access locations (an inner and outer harbor separated by a narrow channel at Elfin Cove), each with private-lodge docks and one public dock.

YAKUTAT MARINE BOAT FISHERY SURVEY

The Yakutat marine boat fishery will be sampled from 27 April 2015 to 30 August 2015 and 25 April 2016 to 28 August 2016. One technician will sample the harvest of boat anglers returning to two access locations. There is some uncertainty as to when the Yakutat Lodge dock will be operational; therefore, the technician will randomly chose 2 days per week to sample at the Yakutat Lodge dock when the dock is operational.

SCHEDULES AND REPORTS

Field activities associated with surveying the marine boat sport fisheries will be 27 April 2015 to 13 September 2015 and 25 April 2016 to 11 September 2016. The survey of the Juneau-False Outer Point Shoreline marine fishery will be 13 April 2015 to 31 May 2015 and 11 April 2016 to 29 May 2016. Weekly summaries of catch rates and harvests will be produced for the 2011–2016 seasons to be posted on the Division of Sport Fish website.

Data editing and analysis activities will be initiated in early May each year with mark-sense marine interview forms processed on a weekly basis. Projections of treaty Chinook salmon harvests will be made 2 times. The mid-season estimate of the treaty Chinook salmon harvest will be an inseason projection produced yearly by late June (covering the 27 April to 21 June time period) for use in helping manage the commercial fisheries to obtain the overall Pacific Salmon Treaty quota for Southeast Alaska.

During May–July 2015, staff will calculate the expansion factor values from this survey in 2014 to the 2014 SWHS for all ports to be used for 2015 estimates of preliminary values. This process will occur again in 2016 for the 2015 values. Development of SAS programming code to implement the changes in the data analysis procedures is still underway.

Final error correction, reduction, and analysis of each year’s survey data will be completed by the third week of October. Post-season preliminary estimates of the SEAK harvest of Chinook and coho salmon for the season will be produced by the end of October each year.

All cinch-strapped salmon heads will be submitted to the Tag Lab by the end of September each year. Final decoding of the tag recoveries for CWT-tagged salmon will be completed by mid-October each year. Contribution estimates to the fisheries will be completed by early November each year.

All Pacific halibut length data will be corrected by the first of October each year. Mean weight estimates and estimated proportion of unguided harvest prior to the mean IPHC survey date will be provided by the second week of October each year. Scales from Chinook salmon will be read by the following mid-January each year. Age composition and length-at-age estimates for Chinook salmon will be produced by the following mid-February each year.

All the Chinook salmon genetic samples collected during the creel survey season will be sent to the ADF&G, DCF Gene Conservation Laboratory by early October each year. Information on the age composition of the sampled Chinook salmon will be provided to the ADF&G, DCF Gene Conservation Laboratory by the following mid-February each year.

Report writing will be initiated in early December each year and a draft report will be provided by April each following year. The draft report will document the yearly preliminary values associated with each of the objectives for this project at that time. Following the completion of final estimates from the SWHS for each of the years, anticipated by June–August, a draft report for this project will be updated to include final estimates for each of this project's objectives. The final draft will be submitted for regional review by the following November 30 each year, followed by submission for publication as an ADF&G Fishery Data Series Report.

The deliverable products along with milestone dates are summarized in Table 13, with further details.

The computer files associated with analyzing the creel survey data (e.g., the SAS data and program files, and auxiliary files) will be archived and submitted to RTS in Anchorage when the report is finalized (see Appendix B1). A draft operational plan for the 2017 field season will be produced by 18 March 2017.

Table 13.–Yearly Deliverable product schedule for the Southeast Alaska Marine Boat Sport Fishery Harvest Studies project in 2015 – 2016.

When	Product	To whom	Title
May–early July	DCF Salmon Districts 108& 111 wild Chinook salmon harvest estimates	Ed Jones	Stikine & Taku Biologist
Late June	Projected Chinook salmon harvest prior to July 1, 2014 commercial troll opening	Pattie Skannes & Brian Frenette	Comm. Fish Troll Biologist & Region 1 Supervisor
Early August	Midseason preliminary projections of rockfish and lingcod harvest in outside districts	Bob Chadwick	Region 1 Management Coordinator
Mid October	Preliminary projected postseason Chinook harvest & CWT info	Pattie Skannes & Brian Frenette	Comm. Fish Troll Biologist & Region 1 Supervisor
Mid October	Preliminary projected inseason coho salmon harvest	Leon Shaul & Brian Frenette for PSC	Comm. Fish Coho Biologist & Region 1 Supervisor
Mid October	Average halibut weights, proportion of unguided harvest prior to mean IPHC survey date.	Scott Meyer & IPHC	Bottomfish Coordinator
October	Average DSR weights & total biomass removal estimates (harvest and release)	Bob Chadwick & Kristen Green	Region 1 Management Coordinator & Comm. Fish Groundfish manager
Mid November	Final projected post season Chinook salmon harvest & CWT info	Pattie Skannes & Brian Frenette for PSC	Comm. Fish Troll Biologist & Region 1 Supervisor
Mid November	Final projected inseason coho harvest	Leon Shaul & Brian Frenette for PSC	Comm. Fish Coho Biologist & Region 1 Supervisor
November	Biweekly sampling rate	Sara Gilk-Baumer	ADF&G, DCF Gene Conservation Laboratory coordinator
January (of following year)	Average lingcod weights & biomass harvest estimates	Bob Chadwick	Region 1 Management Coordinator
January (of following year)	Age composition of Chinook salmon stocks	Ed Jones	Taku & Stikine Biologist
April (of following year)	Draft report for project (with only information from on-site survey)	Internal Project Staff review	NA
November (of following year)	Draft report for project incorporating SWHS estimates	Jeff Nichols	Region 1 Regional Research Coordinator

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 of final report and provides inseason data to appropriate personnel. Provides support and advice to direct supervisors of the project personnel.

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 necessary to meet the annual reporting requirements of the program. Provides assistance with operational planning and report writing.

Brian Marston (Yakutat), Dan Teske (Juneau), Patrick Fowler (Petersburg-Wrangell), Craig Schwanke (Craig-Klawock), and Kelly Piazza (Ketchikan), Fishery Biologist III

Duties: Performs day-to-day oversight, supervision, and logistics of onsite creel sampling personnel at local port(s). Coordinates shipment of heads and data to Juneau office.

David Love (Juneau), Matt Catterson (Sitka), Fishery Biologist II

Duties: Performs day-to-day oversight, supervision, and logistics of onsite creel sampling personnel at Juneau, Gustavus, and Elfin Cove (Love) and Sitka (Catterson) coordinates shipment of heads and data to Juneau office.

Michael Wood, Fisheries Technician IV.

Duties: In Ketchikan performs day-to-day oversight, supervision, and logistics of onsite creel sampling personnel at Ketchikan. Coordinates shipment of heads and data to Juneau office.

Craig Monaco and Kirsten Baltz, Fisheries 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, Fisheries Technician III

Duties: Conduct catch sampling in remote locations as schedule dictates and provide summaries of data on a weekly basis. In addition notes potential sampling problems and advise possible solutions.

Fisheries Technician II’s and III’s

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

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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 SEAK. 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 project provides critical support to meet management objectives for a variety of species in SEAK.

Chinook Salmon

Chinook salmon are the species of fish most preferred and targeted by sport anglers fishing in SEAK (Schwan 1984). Although Chinook salmon are available year round in SEAK, 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 SEAK waters.

In 1992, the Alaska Board of Fisheries (BOF) allocated 17% of the combined commercial troll and sport U.S.-Canada Pacific Salmon Treaty (Public Law 99-5) catch quota for Chinook salmon to the SEAK 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 the current 20% in 1996. The BOF also passed a SEAK 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 inseason to achieve annual allocations. The annual allocation did not include harvests of Chinook salmon produced by SEAK hatcheries (except for a base period catch and a risk adjustment factor) as harvests of these fish do not count against the U.S.-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 inseason 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 U.S.-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 SEAK 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 SEAK King Salmon Management Plan. Under the version passed in 2000, inseason 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 inseason 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 SEAK 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 2014 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 2014 SEAK "treaty" Chinook sport harvest from onsite creel survey data is 70,962 treaty fish (10,391 fish under the 20% allocation) from a total harvest of 79,816 fish. Alaska hatchery stocks accounted for about 13% of the total Chinook harvest in 2014 in SEAK.

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 SEAK. 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 project. The EO increased opportunities for staff to sample adipose-finclipped fish (indicating the possible presence of a CWT during dockside sampling. Additionally, designated catch samplers boosted recoveries during 2014 in Sitka, Craig and Ketchikan with overall sampling at the following rates for Chinook salmon: Yakutat (42%), Sitka (20%), Glacier Bay (21%), Craig-Klawock (21%), Ketchikan (14%), Petersburg-Wrangell (19%), and Juneau (24%). 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 a redistribution of estimated sport harvests in the Glacier Bay SWHS area (increase) and in the Sitka area (reduction). 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, a catch sampling project in the Glacier Bay area in 2002 was initiated 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 project 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 1970’s 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 returning Taku River fish.

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 remained consistent (approximately 95%) over several years, the collection of the maturity data was dropped 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 areas. In addition, data on age composition of Chinook salmon taken in the spring in Juneau, Ketchikan, Petersburg, and Wrangell will be gathered and used for sibling models for the transboundary rivers.

The genetic stock identification of Chinook salmon being harvested by the various fisheries in SEAK 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 2014 the commercial net fisheries and sport fisheries were selected to be sampled as well.

An important shoreline fishery for Chinook salmon in the spring-a unique fishery which began in 1989 (Beers and Marshall, 1994)-occurs at False Outer Point near Juneau. Gathering CWTs from this fishery has provided additional baseline data for stock composition of this fishery as well as has provided 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 inseason management. Coho salmon harvest rates, as determined from the creel survey projects, 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. 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 to the following 2014 levels: Yakutat (8%), Sitka (19%), Ketchikan (15%), Glacier Bay (12%), Juneau (18%), Craig-Klawock (22%), 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 beginning 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. (see below). Furthermore, since 2011 the sport fish creel sampling at all ports were shortened by two weeks due to budget cuts, thus for Juneau, Sitka and Ketchikan sampling now ends in mid-September, while at all other ports the sampling ends at the end of August or early September. This has resulted in some decreased coverage/sampling of the coho sport fisheries in ports with strong coho fisheries and harvests into end of September, such as the port of Ketchikan.

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 project 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) approved a motion to adopt a guideline harvest level (GHL) for sport charter harvests of Pacific halibut. The GHL was implemented in September 2003 with a sport charter harvest guideline of about 1.4 million pounds in IPHC Area 2C (SEAK south of Cape Spencer), which was 125% of the average sport charter biomass harvest from 1995-1999. The GHL was designed to move downward in steplike fashion with halibut abundance, but was not considered a firm catch limit and didn’t necessarily trigger management action if exceeded. 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 for the directed commercial fishery by the National Marine Fisheries Service (NMFS) in 1995. In October 2012 the NPFMC approved a Catch Sharing Plan that established percentage allocations between the commercial and guided sport fisheries, included estimated discard mortality in each sector's allocation, established an annual process for review and modification of regulatory measures to keep the guided sector within its allocation, prohibited charter skipper and crew harvest, and allowed for leasing of IFQ halibut for use in the charter fishery to provide additional harvest opportunity beyond the charter allocation. The CSP was implemented by NMFS in 2014.

In February 2006, the BOF adopted a demersal shelf rockfish management plan titled "Demersal shelf rockfish delegation of authority and provisions for management" (5 AAC 47.065) . This plan allocates 84% of the Council-approved total allowable catch (TAC) to the commercial fishery and 16% to the sport fishery in the outside waters of SEAK. Allocations to each sector include bycatch and discard mortality. 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 Appendix A1.–Page 6 of 6.

rockfish species to harvest. Current regulations include bag limit of 2 or 3 non-pelagic rockfish (depending on location fished and residency of angler) of which only 1 may be a yelloweye. In 2014, only length data from rockfish will be collected and used with length-weight equations to obtain an estimate of weight. 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), nonpelagic rockfish (the DSR other than yelloweye and slope species), and pelagic rockfish. Nonpelagic species tend to remain close to or on the ocean bottom, usually in rocky or boulder-strewn habitat. Pelagic species are often found mid-water in schools, close to rocky substrate. Beginning in 2013, all chartered anglers were required to use a deep water release device for all nonpelagic rockfish. This project collected information on numbers of charter operators who were utilizing the device in 2012, and switched to recording the number of unguided boat trips on which release devices were used in 2013–2014.

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. 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 SEAK (especially the Sitka area) and the outer coast of southern SEAK. The lingcod bag limit for Alaska residents since 2011, was 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. For various areas of Southeast (excluding Yakutat) there were inseason closures for the years 2002-2011. Beginning in 2007, for nonresident anglers, a slot limit of 30-inch minimum and 35 inch maximum size was set in northern SEAK (excluding Yakutat). Since 2011, the slot limit for lingcod harvested by nonresident anglers in the Yakutat area has been 30-inch minimum and 45 inch maximum size. Beginning in 2009 for all areas of Southeast the slot limit for non-residents included retaining fish 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 SEAK. There was a 30-inch minimum and 40-inch maximum slot limit for nonresident anglers for Yakutat in 2010 and in the southern inside and southern outside 2011. In all of SEAK, the lingcod bag limit for Alaskan residents was 1 daily, 2 in possession with no size limit. The bag limit for nonresidents was 1 daily, 1 in possession with an annual limit of 2 lingcod. In all instances with a slot limit, one of the 2 annual limit lingcod must be within the 30–35 inch or 30–45 inch slot limits and the other had to be 55 inches or longer.

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, Ketchikan, Sitka, Glacier Bay, and Yakutat) were continued in 2014**.**

ADF&G, Division of Sport Fish review of the 2014 Regional Operational Plan:

ADF&G, Division of Sport Fish Area Management staff and the Southeast Region Regional Research Coordinator conducted an in-depth review of the 2014 Regional Operational Plan (ROP) related to this project, in an effort to streamline the 2015-2016 ROP (and all subsequent versions) leading to greater clarity and readability. Specific edits to ROP narrative throughout many sections of the 2014 ROP were generated and incorporated in the 2015-2016 plan. In addition, general comments to be considered for future plans were also presented to the project leaders. A summary of the comments and suggestions is paraphrased below:

A note from reviewers (March, 2015):
This project has a long history and it appears that multiple authors have contributed to individual sections of this document overtime. The result is that this document is difficult for the reader to understand. This operational plan could be improved by examining the text as a whole and revising language to clearly and concisely deliver information in a logical order. The following lists some specific structural edits:

1. Nonessential background information could be deleted, referenced in other publications, or better organized within an appendix.
2. The purpose section could be better developed, see comments on page 1.
3. Duplicated language occasionally occurs between sections of the document. Examples on pages (4,9,10,12,54) of the 2014 ROP.
4. Examining the organization of the text within the background, methods and objectives section would benefit the understanding of the reader.
5. In future versions of this ROP, consider breaking this single plan into 2 or 3 multiple plans, as follows:
    a. All salmon (Chinook and coho most notably) with reference to pink and chum where necessary;
    b. Pacific Halibut; and/or:
    c. All other groundfish (there may be reasons to group halibut and all other groundfish together).

APPENDIX B–EXAMPLE COMPUTER FILES

Appendix B1.–Computer data files and analysis programs developed for the 2014 Southeast Alaska marine boat sport fishery survey.

Effort, Catch, and Harvest Estimation Files (in KMC14EST.ZIP, JMC14EST.ZIP, PMC14SAM.ZIP, SMC14EST.ZIP, WMC14SAM.ZIP, CMC14SAM.ZIP, and KLAWOCK14.ZIP)	
c14KTN.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Ketchikan, 2014
c14KLW.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Klawock, 2014
c14CRG.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Craig, 2014
c14PTB.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Petersburg, 2014
c14WRG.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Wrangell, 2014
c14SIM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Sitka, 2014
c14JNM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Juneau, 2014
c14ECM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Elfin Cove, 2014
c14GVM.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Gustavus, 2014
c14YAK.dta	Data file (ASCII) containing interview information recorded on mark-sense interview forms (PORT SAMPLING INTERVIEW VERSION 1.2) recorded at Yakutat, 2014
AMS14.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 AMS14.SAS. Program operates on one species at a time within the program, as determined by an array of species codes and an internal input file named 'SPECLIST.DAT'. See above for explanation of 'a'.
Coded Wire Tag Contribution Estimation Files (in CWT14.ZIP)	
SPRT_EXPNS14.XLS	Data file from tag lab with sampling information for each biweekly period at each fishery.
SFCON14.XLS	Data file from tag lab with recovery information for each adipose finclipped coho and Chinook salmon sampled.
SEN14CWT.SAS	SAS program to do basic contribution estimates.
SEN14CO1.SAS	SAS program to summarize contributions across tag codes for main tables.
SEN14CWP.SAS	SAS program to list tags, contributions, and variances for appendices.
SEN14CW3.SAS	SAS program to summarize contributions at ports with catch sampling programs.

Note: 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.

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[46]:

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

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 $\overline{N}_{hij} / \overline{N}_{mhij}$ 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 $\overline{N}_{hij} / \overline{N}_{mhij}$ 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 "unpoststratified" 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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[46] 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., $w_{3hij} = \hat{N}_{hij} / \hat{\overline{N}}_{hi}$ $w_{3hij} = \hat{N}_{hij} / \hat{\overline{N}}_{hi}$) 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.