Regional Operational Plan ROP.SF.2A.2013.12

Assessment of Recreational Halibut and Groundfish Harvest in Southcentral Alaska, 2013–2015

by

Barbi Failor

June 2013

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN ROP.SF.2A.2013.12

ASSESSMENT OF RECREATIONAL HALIBUT AND GROUNDFISH HARVEST IN SOUTHCENTRAL ALASKA, 2013 - 2015

by

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June 2013

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Title	Name	Signature	Date
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PURPOSE

The Southcentral Region (Southcentral Alaska hereafter) stretches from Prince William Sound westward through the Alaska Peninsula and the Aleutians. Participation in marine sport fisheries in Southcentral Alaska has grown steadily, more than doubling in the last 20 years. Recreational effort for all finfishes in salt waters between Cape St. Elias and Adak grew from about 200,000 angler-days in 1980 to about 562,000 angler-days in 1995 (Mills 1979-1994, Howe et al. 1995-1996). Since 1995 the marine finfish effort has ranged from 373,000 to 585,000 angler-days (Howe et al. 2001a-2001d, Walker et al. 2003, Jennings et al. 2004, Jennings et al. 2006A and 2006B, Jennings et al. 2007, Jennings et al. 2009A and 2009B, Jennings et al. 2010A and 2010B, Jennings et al. 2011A and 2011B). The 2011 effort of about 396,000 angler-days represented 49% of the total statewide saltwater effort. A major portion of the marine fishing effort is directed at Pacific halibut *Hippoglossus stenolepis*, and state-managed groundfishes, including rockfishes *Sebastes sp.*, lingcod *Ophiodon elongatus*, and sharks.

Pacific halibut are the most popular groundfish harvested in the Southcentral Alaska marine recreational fishery. Harvest estimates from the sport fishery range from a low of 17,000 fish to over 401,000 in 2007. Harvest estimates have since declined to just over 309,000 fish in 2011. The Cook Inlet portion of the fishery, accessed out of the ports of Homer and Seldovia, and the tractor launch facilities at the Anchor Point and Deep Creek beach areas, has been responsible for 61 – 82% of the Southcentral Alaska sport halibut harvest since 1990.

The recreational fishery in Southcentral Alaska harvests about a dozen species of rockfish. Estimated sport harvest of all rockfishes has ranged from 22,000 fish in 1977 to a peak harvest of approximately 118,000 in 2010. The North Gulf Coast recreational fishery, accessed from the port of Seward, has accounted for 40 – 57% of the Southcentral Alaska sport rockfish harvest since 1990. In addition to the estimated harvest, there is an unknown but probably quite high level of mortality of released rockfish.

The status of nearshore rockfish stocks in Southcentral Alaska is unknown. Information needed to estimate sustainable harvest levels is extremely difficult and expensive to obtain. Available biological information indicates that most rockfish species exhibit very low annual surplus production, and the consequences of overharvest are extremely long lasting. Many fisheries developed on stocks, exhausting the standing stock before overharvest was detected or before effective management actions were taken. There is some anecdotal information to suggest that localized depletion has occurred or is occurring in Southcentral Alaska waters.

Because of the lack of information regarding rockfish stocks, there are no specific fishery objectives and the rockfish fishery is managed under conservative regulations. Annual monitoring of the recreational harvest composition is the cheapest and most cost-effective way of providing indications of major changes in stock status.

Lingcod are relatively less popular than halibut or rockfish. Harvest estimates for all of Southcentral Alaska are available only since 1991. The Southcentral Alaska harvest declined from a high of about 15,600 lingcod in 1992 to 7,100 fish in 1995, with most of the harvest and most of the decreases occurring in the North Gulf (Seward) area. Harvest climbed to a high of about 27,400 fish in 2007, dropping steadily to about 22,900 fish in 2009, and then increasing slightly to about 23,600 fish in 2011. The Kodiak, Cook Inlet, North Gulf, and Prince William Sound areas have all seen growth in recent years.

Reduced bag limits, a minimum size limit, closed seasons, and closed waters were enacted in 1993 for the sport lingcod fishery to protect and rebuild stocks throughout the northern Gulf of Alaska. Despite this goal, the status of lingcod stocks is still unclear. Long-term collection of age, size, and sex data from the sport harvest is needed to assess the impact of regulations on the fishery and monitor stock status and rebuilding in the Seward area, as well as to describe the harvest in other growing fisheries.

OBJECTIVES

The goal of this project is to provide information needed for management of recreational halibut and groundfish fisheries for sustained yield. Annual estimates of sport halibut harvest (by weight) are needed annually by the IPHC and NPFMC to set harvest quotas for the upcoming year and evaluate the position of the charter boat harvest relative to the guideline harvest level. The data are also used by the NPFMC for analysis to address halibut allocation issues. Estimates of rockfish species composition are needed by ADF&G to apportion annual harvests by species, and corresponding harvest composition data are used to assess relative stock status and formulate management alternatives for consideration by the Alaska Board of Fisheries. Harvest composition data from lingcod fisheries are needed to evaluate the effects of regulatory proposals and monitor relative changes in abundance and recruitment.

Objectives[1] for the 2013-2015 seasons are:

1. Estimate the mean net weight of halibut taken by each user group (charter/non-charter) in each subarea of Southcentral Alaska (Kodiak, Lower Cook Inlet, Central Cook Inlet, North Gulf, Eastern Prince William Sound, and Western Prince William Sound), such that the mean weight estimates for each user group in each subarea are within 20% of the true mean weight at least 90% of the time.
2. Estimate the length composition of the halibut harvest by subarea such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
3. Estimate the species composition by port of the rockfish harvest landed at Kodiak, Homer, Seward, Whittier, and Valdez during May through September such that the estimated proportions of each species are within 0.20 of the true proportions at least 95% of the time.
4. Estimate the age, length, and sex composition by port of the principal rockfishes landed at Kodiak, Homer, Seward, Whittier, and Valdez during May through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
5. Estimate the age, length, and sex composition by port of the lingcod harvest landed at Kodiak, Homer, Seward, Whittier, and Valdez during July through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.
6. Estimate the geographic distribution of bottomfish effort and harvest by user group (e.g., private and charter) at each port during May through September such that the estimated proportions are within 0.20 of the true proportions at least 95% of the time.

[1] Beginning in 2011, precision criterion were relaxed by a factor of 2 compared to previous years. Previously, sampling variances for mean weight and age/length/sex composition were estimated under the assumption of independently sampled fish. Recent work has shown this assumption to be incorrect, and that the true uncertainty about these quantities is perhaps twice as large as previously thought.

Additional Secondary objectives include:

1. Estimate the proportion of the halibut harvest that was cleaned (and carcasses discarded) at sea at each port. These estimates may be stratified estimates of mean weight or length composition (Objectives 1 and 2) at Homer. In addition, they provide information to evaluate potential bias of estimates at other ports due to cleaning at sea.
2. Estimate the proportions of released halibut that were caught on circle hooks versus non-circle hooks at each port. This information is needed to refine estimates of halibut release mortality in the sport fishery.
3. Gather data on the depths of capture for pelagic and non-pelagic rockfish that were released. This information will be collected on a trial basis for estimation of rockfish release mortality.
4. Estimate the proportions of released lingcod that were of sublegal (under 35 inches total length) and legal size (35 inches and greater) for ports with a minimum size limit regulation. These data will provide information on future recruitments and abundance indices such as catch-per-unit-effort of legal-size fish for future stock assessments.
5. Biological data will be collected from salmon sharks *Lamna ditropis,* Pacific sleeper sharks *Somniosus pacificus,* and spiny dogfish *Squalus acanthias* harvested in the recreational fishery in order to estimate the age, length, sex composition, and spatial distribution of harvest. No sampling objectives are established for sharks because harvests are too small to generate reliable estimates for any given year. It is expected that age, length, and sex data will be compiled across a number of years and combined with commercial harvest sampling and other research programs to estimate life history parameters.
6. In addition to recording the primary statistical area fished, interviews conducted at Seward will include recording whether the anglers fished inside or outside Resurrection Bay (north or south of a line from Cape Aialik to Cape Resurrection). This information will only be collected from anglers that report fishing a statistical area that overlaps the bay boundary. This information is needed for evaluation of lingcod catch rates to address potential regulatory proposals dealing with opening of Resurrection Bay to lingcod fishing.

BACKGROUND

HALIBUT

Pacific halibut make up the majority of the sport bottomfish harvest in Southcentral Alaska. Halibut harvest in the region has grown dramatically, increasing to a peak of 401,000 fish in 2007 (Figure 1). The 2011 harvest made up nearly 79% (in number of fish) of the statewide sport halibut harvest. Cook Inlet halibut fisheries based primarily in Homer, Ninilchik, Seldovia, and Anchor Point have accounted for 61-82% of the Southcentral Alaska harvest since 1990 (Figure 1).

The 1953 Halibut Convention, as amended by the 1979 Protocol, mandates that the International Pacific Halibut Commission (IPHC) manage the stock based on optimum yield (McCaughran and Hoag, 1992). The IPHC conducts research on halibut population dynamics throughout the range of the stock, establishes the harvest strategy, and sets allowable levels of harvest in each of the ten regulatory areas. Regulatory Area 3A stretches from the west end of Kodiak Island to Cape Spencer, and encompasses most of Southcentral and part of Southeast Alaska marine waters.

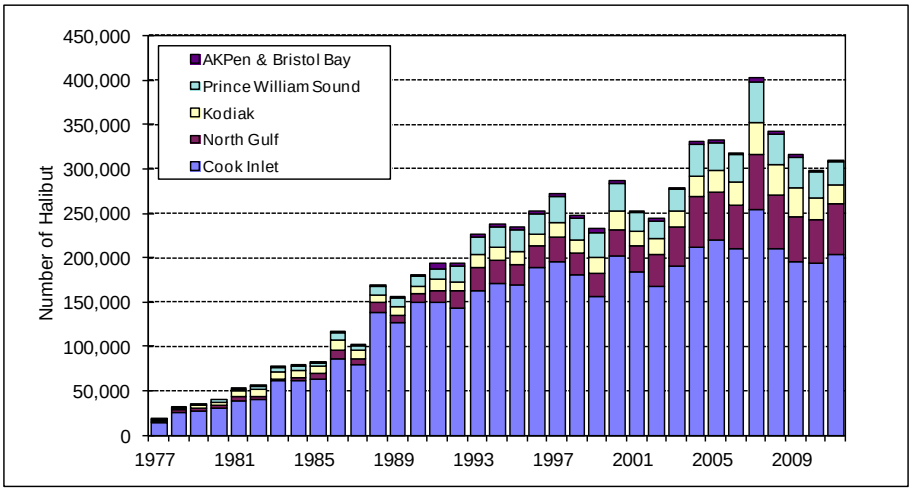

Figure 1.–Recreational halibut harvest in Southcentral Alaska, 1977-2011 (Mills 1979-1994, Howe et al. 1995-2001d, Walker et al. 2003, Jennings et al. 2004, Jennings et al. 2006a-b, Jennings et al. 2007, Jennings et al. 2009a-b, Jennings et al. 2010a–b, Jennings et al. 2011a–b).

From 1982 through 2006 the IPHC estimated stock size using an age-structured model. Each year the IPHC updates the time series of commercial catch, survey catch, age composition, and other data and re-assesses the stock. There have been numerous changes to the model since the mid-1990s, mostly dealing with specification of survey selectivity (based on length or age). The changes were made in response to a long term decline in growth rate that reduced vulnerability to harvest and caused underestimation of recruitment. With each succeeding year, changes in the assessment model have resulted in increased estimates of historical biomass. An entirely new model was developed for the 2003 assessment that modeled abundance by sex, parameterized selectivity differently, and accounted for changes in the ageing method (Clark and Hare 2006).

Based on recent tagging experiments that show that halibut are more migratory than previously assumed, the IPHC now assesses the stock using a coast-wide model. Total biomass is apportioned among regulatory areas based on relative catch rates in the longline survey and bottom habitat area (Clark and Hare 2007), corrected for hook competition by species other than halibut and adjusted for harvest taken prior to the mean survey date. Area 3A exploitable biomass was estimated at just over 70 M lb at the end of 2012 as apportioned under the current harvest policy or blue line approach (Webster and Stewart 2013). The exploitable biomass has been on a downward trajectory since the late 1990s, but is projected to level out in coming seasons due to recruitment of 1999 and 2000 year classes.

Over the years, sport harvest has grown unconstrained by catch quotas such as those placed on the commercial longline fishery. Individual fishing quotas (IFQs) were implemented for the commercial longline fishery in 1995, providing fishermen a percentage share of the longline quota. Sport harvest is currently taken off the top of the total allowable harvest before the commercial quota is set. As a result, long-term increases in the sport harvest have caused allocation conflicts between commercial and sport user groups. The Area 3A sport charter boat fishery is currently managed under a guideline harvest level (GHL) of 2.373 M lb. If the GHL is exceeded, the North Pacific Fishery Management Council (NPFMC) can initiate a process to identify and implement control measures. The GHL was exceeded from 2004 through 2007 by

amounts ranging from 0.5% - 9.6% and the Council approved an analysis of alternatives designed to bring the Area 3A charter fleet under the GHL in subsequent years. No management measures were implemented in 2008 or 2009 because the harvest was projected to be so close to the GHL, and contingent upon ADF&G issuing an emergency order (EO) to prohibit captain and crew retention. The final estimated charter harvest in area 3A was 74.9% of the GHL in 2009 and 73.9% of the GHL in 2010. Due to the downward trend in harvests in 3A from 2007 – 2010 no EO was issued in 2011. As final harvest estimates for 2011 indicated a harvest of approximately 77% of the GHL, no EO was issued and charter vessel skippers and crew were again allowed to harvest fish during the 2012 season. Preliminary harvest estimates for 2012, though under a lower GHL of 3.103 M lbs, indicate the charter sector harvested 77% of their GHL.

In April 2001 the NPFMC approved a motion to incorporate the charter fleets in Southcentral and Southeast Alaska into the existing IFQ program. This measure was intended to replace the GHL as a permanent solution to the issue of allocation between the longline and charter boat fleets. The NPFMC revisited that decision in December 2005, largely because of concerns over the age of the data that would be used to award quota shares. The NPFMC then passed a motion that replaced the IFQ program with a suite of alternatives for management of the charter fleet, including a moratorium, limited entry, direct allocation, and another IFQ program that incorporated recent fishery entrants. In March 2007 the NPFMC passed a motion to implement a moratorium (limited entry) on halibut charter boats. The moratorium proposed rule was published in April 2009 and the final rule signed in January of 2010. The moratorium permits or Charter Halibut Permits (CHPs) were required as of February 1, 2011 for charter vessel clients to catch and retain Pacific halibut.

The NPFMC is currently considering a Catch Sharing Plan (CSP) that would allocate halibut among the commercial and sport charter fleets, and include annual management measures implemented pre-season to keep the charter fishery within its allocation. The current plan would also allow charter operators to lease commercial IFQ within a season to provide additional fishing opportunity for clients, and these fish would count toward the commercial catch limit. The CSP, approved in October 2008, will allocate halibut between the commercial and sport charter sectors, establish bag and size limits annually, and provide for additional harvest opportunity for the sport charter fleet through use of commercial IFQ. This CSP is intended to replace the GHL. A proposed rule on the current CSP is expected to be published in 2013 and would be implemented in 2014 at the earliest.

Changes in halibut growth rates and exploitable biomass, changes in stock assessment procedures, and allocation conflicts all underscore the need for continuing recreational halibut harvest monitoring by the Alaska Department of Fish and Game (ADF&G).

ROCKFISHES

About a dozen species of rockfish are taken in sport fisheries in Southcentral Alaska. Estimated harvest of all rockfish species combined has been increasing since the late 1990s, ranging from 22,000 fish in 1977 to a peak harvest of about 118,000 fish in 2010 (Figure 2). The North Gulf Coast fishery based in Seward has accounted for 40-57% of the Southcentral harvest since 1990.

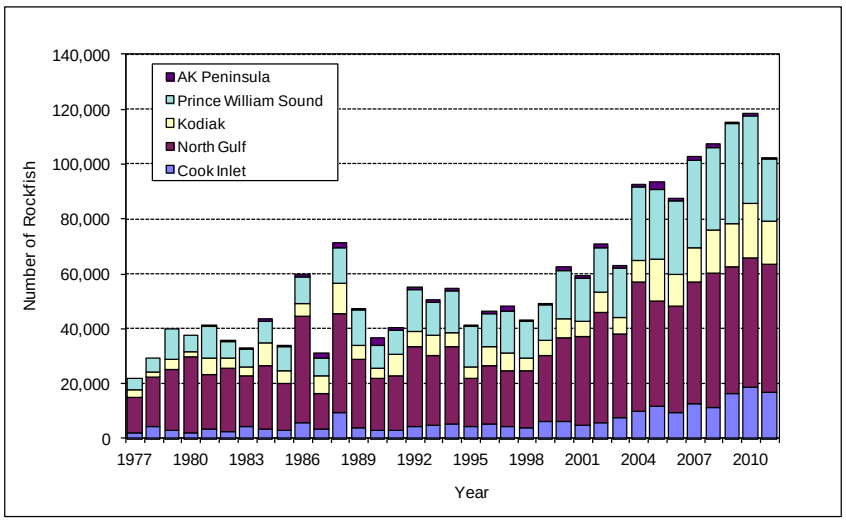

Figure 2.–Recreational rockfish harvest in Southcentral Alaska, 1977-2011 (Mills 1979-1994, Howe et al. 1995-2001d, Walker et al. 2003, Jennings et al. 2004, Jennings et al. 2006a –b, Jennings et al. 2007, Jennings et al. 2009a–b, Jennings et al. 2010a–b, Jennings et al. 2011a–b).

Harvest estimates alone do not fully account for fishery removals. Rockfish swim bladders are physoclistous, or unvented. As a result the fish suffer decompression trauma when brought to the surface from depths in excess of 20 m (Parker et all 2006, Hannah and Matteson 2007, Jarvis and Lowe 2008, Pribyl et al. 2009, Wilde 2009). Most species are believed to suffer mortality rates approaching 100% if caught below 30 m and released at the surface as is the general practice of most anglers. However, recent research by Hochhalter and Reed (2011) suggests that release at depth of capture (recompression) can substantially improve survival rates of yelloweye rockfish. An estimated 20,000 – 97,000 rockfish have been caught and subsequently released annually in Southcentral Alaska since 1990. This program has collected information on the depth and distribution of rockfish caught and released since 2007 though discard mortality has not yet been estimated. Even though the species composition and survival of released rockfish is currently unknown, it is safe to say that total removals have been substantially higher than harvest estimates.

The recreational harvest is a significant portion of total removals, especially in nearshore waters. Commercial rockfish harvest in state waters of the Cook Inlet and Prince William Sound areas (Cape Douglas to Cape Suckling) ranged from about 104,000 to 191,000 pounds during the recent ten-year period 2002-2011 (C. Trowbridge personal communication, E. Russ personal communication, and unpublished ADF&G data). Estimates of the corresponding sport harvest biomass ranged from about 292,000 to 501,000 pounds (preliminary unpublished estimates). The sport fishery, therefore, has accounted for 59-81% of the total documented removals in these areas over this period. Although sport harvest has grown in magnitude and as a percentage of the total, commercial harvest has declined in recent years. Rockfish harvest overall (excluding discard mortality) has remained relatively steady at 500,000-700,000 lb per year since 2000.

In the Kodiak area, the commercial fishery accounts for most of the rockfish removals. Commercial harvest of black rockfish *S. melanops* alone ranged from 84,000-246,000 lb during the period 2000-2010 (Ruccio et al. 2003, Mattes and Failor-Rounds 2005, Mattes and Stichert 2008, Sagalkin et al 2009, Stichert et al 2011), while sport harvest of all species (dominated by black rockfish) ranged from 25,000 to 93,000 pounds (unpublished ADF&G data).

Increasing harvest and the lack of stock assessment information have long caused concern for the long-term sustainability of rockfish stocks throughout the northern Gulf of Alaska. Commercial fisheries are managed using harvest guidelines based on historical harvest levels, and sport fisheries are managed using bag limits but without harvest objectives or target reference points. There is no available time series of fishery-independent indices of rockfish abundance for state-managed species. Available life history data (e.g. Francis 1985, Leaman 1991), as well as numerous case histories from Alaska, British Columbia, Washington, Oregon, and California point to the ease of overexploitation and the difficulty of managing for sustained yield (Bracken 1986, Bracken 1989, Parker et al. 2000, Yamanaka and Lacko 2001). Many rockfishes live long, attain harvestable size before reaching sexual maturity, and show a high degree of fidelity to reefs and other rocky habitats. Commercial and recreational fisheries typically develop rapidly, harvest in excess of the annual surplus production, and deplete the standing stock before it is evident in the available data. Vincent-Lang (1991) suggested that limited data from commercial test fishing and the recreational harvest near Resurrection Bay showed that the relative abundance of older black rockfish might have declined since the early 1980s. Current stock levels and virgin (unfished) biomass have not been estimated.

Because of the lack of information regarding rockfish stocks, the recreational fishery has been managed using only bag limits. Bag limits for the non-pelagic species have been set at the level of incidental catch, and set lower than for shorter-lived pelagic species. Harvest continues to increase in some fisheries due to increases in effort or declines in other target species. It is unknown whether the bag limits, combined with management measures for commercial and subsistence fisheries, are adequate to maintain these fisheries for the long term. The projected decline in halibut stocks and implementation of limited entry for charter halibut boats may result in increased targeting of rockfish by charter operators that do not qualify for permits.

No widely applicable fishery-independent methods have yet been applied to assess rockfish stocks exploited in nearshore waters of the Gulf of Alaska. Line transect counts from manned submersibles have been used in Southeast Alaska to assess the demersal rockfish fishery (Brylinsky et al. 2009) but these surveys are expensive and difficult to apply over large areas, and have high variance. ADF&G Commercial Fisheries Division staff are also conducting remote operated vehicle video strip-transects to estimate lingcod and yelloweye rockfish density and abundance in selected waters in southcentral Alaska (e.g., see Byerly 2007), but this method has not yet been applied over broad areas.. For the time being, annual monitoring of recreational and commercial harvest composition is the most cost-effective method of looking for changes in stock status.

LINGCOD

Estimates of recreational lingcod harvest have only been available for all of Southcentral Alaska since 1991. Since then, harvest declined from a high of about 15,600 fish in 1992 to about 7,100 fish in 1995. Harvest gradually climbed since the mid-1990s to a level of about 27,400 fish in 2007 (Figure 3). The Kodiak, Cook Inlet, North Gulf, and Prince William Sound areas have all seen growth in harvest in recent years.

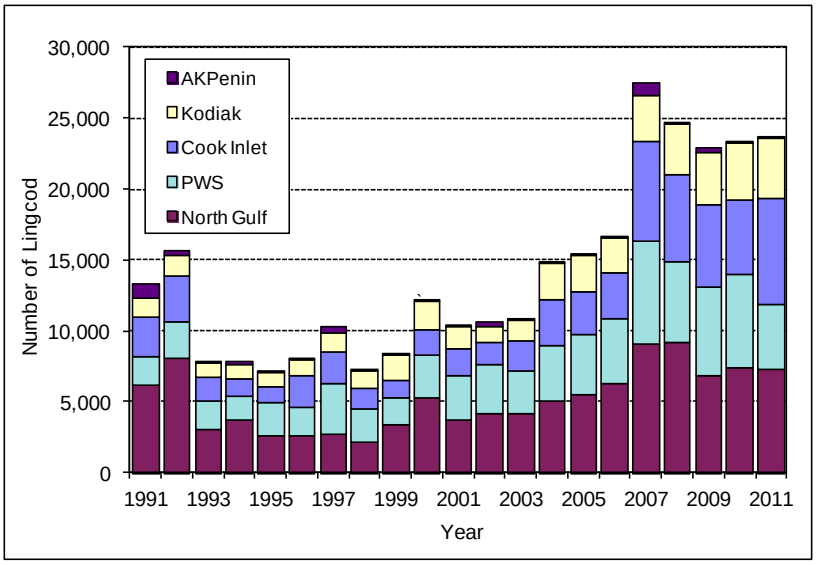

Figure 3.–Recreational lingcod harvest by area in Southcentral Alaska, 1991-2011 (Mills 1992-1994, Howe et al. 1995-2001d, Walker et al 2003, Jennings et al. 2004, Jennings et al. 2006A and 2006B, Jennings et al 2007, Jennings et al 2009A and 2009B, Jennings et et al. 2010A and 2010B, Jennings et al. 2011A and 2011B).

The sport fishery is the primary source of removals in nearshore waters. Preliminary estimates of recreational lingcod harvests in state and federal waters of the Cook Inlet and Prince William Sound areas (Cape Douglas to Cape Suckling) ranged from about 154,000 to 657,000 pounds during the period 1992-2011 (unpublished estimates). Commercial harvest in the same area and period ranged from 38,000 to 154,000 pounds (Trowbridge et al. 2008; Berceli et al. 2002; C. Trowbridge personal communication, E. Russ personal communication). The recreational fishery accounted for 83-91% of the combined sport and commercial harvest from 2002 to 2011. Sport harvest in Kodiak has been in the range 13,000-86,000 pounds per year since 1992. Commercial harvest in the Kodiak area has been extremely variable, with a peak of 136,000 pounds in 1988. Commercial harvest since 1992 ranged from 3,900 to 67,000 lb (Ruccio et al. 2003, Sagalkin et al 2009, Stichert et al 2011).

The North Gulf lingcod fishery based in Seward was historically the most important recreational lingcod fishery in the region. The North Gulf harvest increased from about 2,100 fish in 1987 (Vincent-Lang et al. 1988) to a high of 8,100 fish in 1992 (Figure 3). During this period, the department noted a lack of recruitment in the sport harvest. In addition, anecdotal reports of declining abundance in Resurrection Bay were substantiated with a department survey in 1992. The Alaska Board of Fisheries enacted reduced bag limits, a minimum size limit, closed seasons, and closed waters in 1993 for the Cook Inlet-Resurrection Bay area. Some of these regulations were extended to the Prince William Sound, Kodiak, and Aleutian Islands areas in subsequent years as a precautionary approach to provide long-term sustainability to these fisheries. Lingcod harvest has gradually grown since 1993, with increases in the North Gulf as well as Cook Inlet, Prince William Sound, and Kodiak.

The status of lingcod stocks throughout the region is unclear. There is no long-term survey to provide a fishery-independent index of abundance, only relative measures based on port sampling or charter logbook data. Current assessment efforts are focused on using historical age, size, and sex composition, along with catch rates from the fishery or catch rates from other

agency surveys to assess stock status. As with yelloweye rockfish, strip transect methods have been used to assess abundance in selected areas in Southcentral Alaska (Byerly 2007). The current management approach is to structure the regulations to maximize reproductive effort and protect males during the nest-guarding season. Regulations include a minimum size limit and seasonal closure during the nest-guarding season. As with rockfish, lingcod harvest could rise with implementation of restrictions on the halibut charter industry. Long-term collection of age, size, and sex data from the sport harvest is needed to assess the impact of new regulations and monitor stock status and rebuilding.

METHODS

Species, age, and size composition are among the primary tools used to monitor and manage fish stocks. Sampling the harvest is often more cost-effective than fishery-independent surveys or tagging studies, and can provide basic information for broad geographic areas. While not a substitute for fishery-independent surveys of stock size, relative changes in these data can indicate environmental or fishery-induced changes in the composition of fish stocks (e.g. Hand and Richards 1991, Morrison 1982, Stanley 1991).

This project monitors age, size, and sex characteristics of Pacific halibut, several rockfish species, lingcod, and a few other species landed by sport anglers at the major ports in Southcentral Alaska. Data will be combined with harvest and effort estimates from the ADF&G statewide Sport Fish Survey (e.g., Howe et al. 1996) to assess harvest trends, evaluate changes in stock status, and design regulations that protect stocks and provide for long-term sustained yield. Data will be shared with the International Pacific Halibut Commission, the National Marine Fisheries Service, the North Pacific Fisheries Management Council, the Alaska Board of Fisheries, and the public.

The need for data from the recreational fishery is underscored by increasing harvests, measured or perceived declines in abundance, and increased competition among user groups. Changes in management of commercial fisheries in state and federal waters are also expected to affect state-managed species. For example, under the halibut IFQ program, shareholders are able to take their quotas at any time during the extended open season and in any area. This was expected to cause a redistribution of commercial fishing effort from traditional offshore grounds in the Gulf of Alaska to waters closer to port that are currently fished primarily by the recreational fleet. Potential challenges for management include increased commercial harvest of other groundfishes such as rockfish and lingcod, competition between gear groups on the fishing grounds, and localized depletion of stocks, at least on a seasonal basis. All agencies and user groups involved in allocation conflicts and development of local area management plans will benefit from accurate data on these fisheries.

GENERAL SAMPLING ISSUES

Seven ports or beach launch areas are sampled to represent six major subareas within the central Gulf of Alaska:

Ports or Beach Areas	Subarea
Kodiak (city)	Kodiak/Afognak
Homer	Lower Cook Inlet (LCI)
Deep Creek and Anchor Point	Central Cook Inlet (CCI)
Seward	North Gulf
Whittier	Western Prince William Sound
Valdez	Eastern Prince William Sound

These ports generally account for over 90% of halibut, rockfish, and lingcod landings in Southcentral Alaska (Mills 1992-1994, Howe et al. 1995-2001d, Walker et al. 2003, Jennings et al. 2004, Jennings et al. 2006A and 2006B, Jennings et al. 2007, Jennings et al. 2009A and 2009B, Jennings et al. 2010A and 2010B, Jennings et al. 2011A and 2011B). A single technician will be assigned to each port. Sampling will be conducted at harbors, boat ramps, beach launching sites, and military recreation facilities. Data collection will begin in late-May at all ports. Sampling will end in late August (Deep Creek, Anchor Point, Kodiak, and Whittier) or early September (Homer, Seward, and Valdez).

Sampling consists of two primary components:

1. Biological sampling for species, size, age, etc. (objectives 1-5), and
2. Angler interviews to estimate the geographic distribution of effort and harvest at all ports (objective 6), the proportion of the charter-caught halibut harvest that was cleaned and discarded at sea at Homer (needed to address objectives 1 and 2), and other fishery information.

At all ports but Kodiak, biological and interview sampling will be conducted on separate days. This separation of data collection reduces the potential for bias (non-probabilistic sampling of vessels) and is more efficient for gathering each type of information. Biological sampling and interviews will be conducted simultaneously at Kodiak because effort and harvest are low compared to other ports so both tasks can be handled simultaneously. Whittier operated under this methodology through the 2008 season however effort has increased to the point that biological and interview days need to be separated for sampling efficiency.

A randomized work schedule is established to avoid bias of any parameters related to user group, and to avoid bias in estimation of the spatial distribution of effort and harvest. Five workdays per week will be selected at random subject to the constraint that two days off must be consecutive. At Homer, Seward, Whittier and Valdez, and in the Central Cook Inlet fishery, three biological sampling days and two interview days per week will be selected at random such that each type is distributed proportionally between weekends and weekdays. Holidays will be given no special treatment in terms of sampling effort, based on analyses done in 1997.

Ideally, sample sizes would be proportional to the total harvest over time by each user group, but samplers at most ports are saturated during most of the season and are only able to gather data from a very small proportion of the total harvest during peak harvest periods. In many instances, the numbers of fish available to the sampler are not proportional to the estimated harvest by each user group because some landing sites are not sampled, fish are cleaned and carcasses are dumped at sea or in the harbor, or fish are kept on the boat and taken home to be cleaned later.

Estimated mean weight of harvested halibut was often highly variable from month to month for each user group, and there was no consistent pattern from year to year during 2003-2005 (Meyer 2006). Possible explanations for the variability in mean weight by month include (1) small sample sizes, particularly in May and September, (2) sampling the harvest from too few boats, (3) variation in the availability or catchability of certain size groups, or (4) temporal changes in the spatial distribution of the harvest. The variability is likely due to a combination of these factors.

Variability in mean weight does not result in biased estimates if the sample size over time is proportional to the magnitude of harvest. However, if a temporal component of the harvest is

disproportionately sampled, and the mean weight during that period is especially high or low, estimates of mean weight for the season could be biased. Neither the statewide harvest survey nor on-site interviews from this project provide the information needed to estimate the temporal pattern of harvest by charter or private anglers. The charter logbook, however, does provide information on effort. The 2006 and 2007 operational plans (Meyer 2006, Meyer 2007) compared unstratified and stratified estimates (stratified by month using logbook data for stratum weights) and found no differences for 2002-2006.

In future years, if logbook data are entered and available soon after the season, it may be possible to use harvest numbers recorded in the logbooks to stratify estimates of mean weight for the purpose of improving accuracy.

The practice of cleaning fish at sea also poses a risk of bias in estimation of halibut statistics. This issue is more crucial when obtaining fish from the charter fleet because charters tend to clean and dispose of carcasses of a higher percentage of their catch at sea than unguided anglers do (Table 1). In the past, some charter operators have cleaned smaller halibut at sea and returned to the dock with only the larger fish for photos or derby weigh-in. At most of the ports, when charter operators do clean at sea, they tend to clean all of the fish as a matter of convenience (Table 2). Private anglers in Whittier also clean most of their fish at sea because they are on small boats and often make overnight or multi-day trips. When only smaller fish are cleaned at sea, sampling only the fish brought to shore would bias length and weight estimates toward larger fish, and could bias sex ratio estimates in favor of females. When all or nearly all fish are cleaned at sea, there would be little bias as long as anglers that clean their halibut in the harbor are no more likely to catch smaller or larger fish than anglers that clean at sea. Technicians at all ports will attempt to convince charter operators and other anglers that clean all fish at sea to return the carcasses to port for sampling.

Table 1. Estimated percentages of the Pacific halibut harvest cleaned at sea, by port and user group, during the period 2009-2012.

Port	User Group	Percentage of Halibut Harvest Cleaned at Sea			
		2009	2010	2011	2012
Kodiak	Charter	16%	3%	4%	1%
	Private	7%	5%	7%	4%
Deep Cr./Anchor Pt.	Charter	3%	10%	5%	15%
	Private	1%	7%	5%	10%
Homer	Charter	49%	55%	70%	58%
	Private	8%	27%	13%	19%
Seward	Charter	24%	20%	14%	18%
	Private	13%	12%	11%	10%
Whittier	Charter	72%	57%	52%	51%
	Private	50%	52%	80%	66%
Valdez	Charter	9%	4%	8%	5%
	Private	12%	7%	6%	9%

Table 2.–Estimated percentages of Pacific halibut cleaned at sea only among boat trips where cleaning at sea occurred, 2009-2012.

Port	User Group	Percentage of Halibut Harvest Cleaned at Sea			
		2009	2010	2011	2012
Kodiak	Charter	68%	48%	46%	49%
	Private	89%	93%	94%	86%
CCI	Charter	73%	96%	96%	97%
	Private	57%	94%	95%	94%
Homer	Charter	97%	98%	100%	98%
	Private	94%	96%	97%	100%
Seward	Charter	96%	97%	99%	92%
	Private	82%	81%	93%	82%
Whittier	Charter	100%	97%	97%	97%
	Private	99%	97%	99%	98%
Valdez	Charter	82%	68%	83%	79%
	Private	70%	77%	88%	89%

DESIGN SPECIFICS BY PORT

Kodiak

The city of Kodiak is the only population center with an appreciable level of recreational halibut or groundfish harvest in the Kodiak area. The port of Kodiak accounted for about 54% of the halibut harvest, 69% of the rockfish harvest, and 63% of the lingcod harvest by sport anglers in the Kodiak area in 2011 (SWHS data). The remainder came from outlying areas such as Larson Bay, Old Harbor, and Port Lions, places where it is impractical to implement a sampling program. Harvest landed at Kodiak is therefore assumed to represent the entire area.

Biological sampling and angler interviews will be conducted at St. Paul's Harbor, St. Herman's Harbor (Dog Bay), and the U.S. Coast Guard Base between 1530 hours and 2230 hours (Appendix B1). This period has captured the majority of returning anglers in past years. The distance between the three harbors is too great to intercept all returning anglers. Starting at approximately 1530 hrs, the technician will begin sampling at the initially assigned area then rotate systematically through the three sites in a pre-designated order. The technician will stay at each site long enough to interview returning anglers and sample available fish. Each site is visited 2-3 times per day on average using this scheme.

Many of the charter boats delivered their sport-caught fish directly to two processing facilities in recent years, making it difficult to obtain samples. Sampling was conducted at both processors from 2005 through 2007 and again from 2009 through 2011. In 2008 and 2012, only one processing facility processed sport-caught fish. The technician will interview the charter skipper in the harbor and may follow up with sampling later, at the convenience of the processor. This sampling is neither systematic nor random. Therefore, the technician will attempt to make the sample representative by allocating sampling effort among charters that do and do not use these processors in proportion to their share of the charter harvest.

Some charter services in Kodiak clean their halibut and dispose of carcasses at sea. The percentage of charter halibut harvest cleaned at sea has remained low since 2009 (Table 1), possibly because of increased use of fish processing plants. To minimize potential bias in estimation of age and length composition, charter services that clean at sea will be asked to voluntarily retain the carcasses of all fish cleaned at sea. No portion of the daily harvest of a species category (halibut, lingcod, rockfish, sharks) from any one boat will be sampled unless all fish or cleaned carcasses of that species are returned to port.

Homer

There are numerous exit points in the Lower Cook Inlet fishery, including the communities of Homer, Seldovia, Nanwalek, and Port Graham, as well as several hundred private docks along the south side of Kachemak Bay from Bear Cove to Kasitsna Bay (ADF&G 1993; page A-37). Because it would be cost-prohibitive to sample all these exit points, the fishery will be sampled only at the major access point, the city harbor on the Homer Spit.

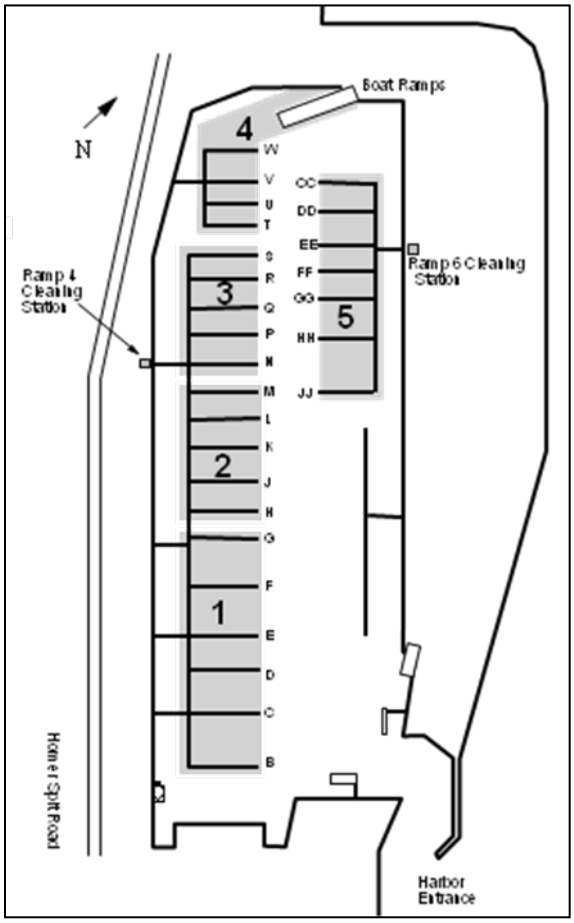

Figure 4.–Homer harbor interview areas used in 2012.

Biological sampling will generally start at 1400 hours, but the technician will be free to begin sampling earlier on weekends or bad weather days in order to intercept the majority of landings. The harbor and associated facilities cover a large area, making it difficult to distribute sampling effort in a representative manner across both user groups (charter and private). When sampling fish that are cleaned in port, the technician will spread sampling effort between the public fish

cleaning stations at Ramps 4 and 6 (Figure 4), boats cleaning fish on deck, the boat ramp, the fish-cleaning table near the salmon enhancement lagoon, and numerous charter cleaning facilities in an effort to allocate the sample from throughout the day's landings. Emphasis will be placed on obtaining data from private-caught fish because of their lower availability. Ideally, due to the high volume of charter-caught fish, approximately 4 to 5 charter boats would be randomly selected from a list of all known charter vessels for biological sampling each day. However, the reality of sampling in the dynamic atmosphere of a harbor makes this problematic as upon arriving at the dock, the sampler may find any of the following scenarios; none of those vessels have gone out that day, some have already returned and cleaned all or a portion of their load, or all return at once forcing a sampler to choose a single boat from amongst that list. Instead, the sampler will systematically move through the cleaning locations (cleaning tables, charter offices, and the vessels that clean fish on their decks) to obtain samples. Sampling will also be distributed between private and charter-caught fish throughout the shift to spread samples over time and avoid selecting for early or late-returning boats.

About sixty-one percent of the halibut caught by charter anglers during the last three years in Homer were cleaned at sea (Table 1). The mean weights of halibut cleaned at sea versus halibut cleaned in port were significantly different before 2000 and after 2003 (Table 3). Since there is a potential for differences in mean weight, halibut cleaned at sea will be sampled from Homer charter vessels that have indicated in past interviews that they clean fish at sea. On the day before each biological sampling day, the technician will select up to three charter boats from a randomized list of charter vessels that clean halibut at sea, and request the skipper to retain carcasses of fish cleaned at sea the following day. This arrangement should minimize inconveniences to the charter operations and provide adequate data to detect and correct for this potential bias.

Table 3. Results of t-tests comparing estimated mean weights of halibut cleaned at sea and cleaned in port at Homer, 1998-2012.

	Cleaned in Port		Cleaned at Sea				
Year	Mean Weight (lb)	n	Mean Weight (lb)	n	T value[1]	P value	df
1998	20.6	504	14.5	207	5.00	<0.001	687
1999	17.8	462	13.6	107	4.01	<0.001	218
2000	18.9	558	17.2	152	1.29	0.198	347
2001	21.2	511	19.3	161	1.74	0.084	418
2002	20.3	547	17.7	120	1.90	0.059	240
2003	21.7	643	21.8	147	-0.11	0.915	268
2004	21.0	1,224	16.7	169	5.54	<0.001	427
2005	18.8	1,078	14.1	158	5.36	<0.001	485
2006	18.3	906	16.3	165	2.60	0.010	404
2007	19.0	707	12.5	254	8.31	<0.001	939
2008[2]	17.6	430	13.6				
2009	18.6	236	11.1	95	6.19	<0.001	329
2010	17.9	345	12.5	108	4.21	<0.001	238
2011	17.1	940	13.8	193	4.16	<0.001	457
2012	14.7	869	10.0	271	6.63	<0.001	1036

[1] Satterthwaite approximate t used when variances were unequal.

[2] Cleaned at Sea (CAS) mean weight based on double exponential projection of 1994-2007 data due to no CAS samples obtained after June 2008.

Interviews will be conducted during the period 1200-1900 hours, which is the same schedule used in 2006 through 2011. Before 2006 interview shifts started at 1300 hours, and the distribution of interviews over time indicated that more boats were returning earlier than later in the shift. The change to an earlier shift in 2006 appeared to capture more boats returning earlier and resulted in a more symmetrical distribution of interviews over time.

The Homer harbor is too large and effort is too great to obtain interviews from all returning boats. The harbor is therefore divided into five areas, and interviews will be conducted for one hour in each area (Figure 4). The initial order of areas is assigned randomly then "rotated" systematically, repeating areas sampled each day in order to fill out a seven-hour shift (Appendix B2). Under this design, all areas and hours will receive equal sampling effort during the season. Because boats may offload in one area and tie up in another, the technician will contact and obtain interviews from boats tying up or offloading in the assigned area, unless previously interviewed.

Deep Creek and Anchor Point

The Central Cook Inlet fishery is primarily a halibut and salmon fishery, with any additional groundfish harvest consisting mostly of Pacific cod. The beaches near the mouths of Deep Creek and Anchor River are the primary access areas and account for the vast majority of halibut landings from the Central Cook Inlet fishery.

Because a single technician covers both of these access points, it is important to allocate sampling effort between Deep Creek and Anchor Point such that the resulting sample is representative of the size distribution and spatial distribution of the harvest in the Central Cook Inlet fishery. In the mid-1990s there were significant differences in the halibut mean weight between the two sites. Analyses of recent data (2007-2012) show there are usually no differences in mean weight or sex composition, but there was a significant difference every year in the spatial distribution of halibut harvest (Table 4). Even though the differences in spatial distribution were statistically significant, they were not functionally different.

Table 4. Tests for differences in mean weight and spatial distribution of halibut harvest between the Deep Creek and Anchor Point sampling sites, 2007-2012.

Test	Year	Charter			Private		
		Test statistic	DF	P value	Test statistic	DF	P value
T test for differences in mean weight	2007	-5.24	539	<0.01	-1.37	47	0.18
	2008	-1.64	571	0.10	-0.85	59	0.40
	2009	-0.46	507	0.64	0.12	205	0.91
	2010	-5.84	302	<0.01	1.50	105	0.14
	2011	-4.17	348	<0.01	-0.43	227	0.67
	2012	-4.27	164	<0.01	1.27	221	0.21
Chi-square contingency test for differences in spatial distribution (proportion by statistical area):	2007	29	6	<0.01	232	7	<0.01
	2008	519	7	<0.01	27	5	<0.01
	2009	179	7	<0.01	57	4	<0.01
	2010	103	5	<0.01	201	6	<0.01
	2011	360	10	<0.01	600	8	<0.01
	2012	450	7	<0.01	170	7	<0.01

The possibility of differences in either mean weight or spatial distribution of harvest, makes it prudent to distribute interview effort and biological sampling between the two sites such that the resulting harvest reported in interviews and biological sample sizes are proportional to harvest at the two sites. Determining the appropriate allocation of sampling effort is problematic because: (1) Estimates of neither the overall sport harvest (charter and private) nor private harvest are available for Deep Creek and Anchor Point separately, (2) sampling efficiency differs by site, and (3) sampling efficiency differs by technician, and (4) the distribution of harvest between sites is dynamic. In 2002 and 2003, staff observed that more of the Ninilchik-based charter operators that normally launch at Deep Creek were launching at Anchor Point to reduce running time on the water and save fuel. In addition, the Deep Creek boat launch was washed out by floods in 2002, which reduced access particularly for unguided boats. The loss of the Deep Creek boat ramp and a decrease in private boats launching off the beach south of the tractor launch allowed increased sampling on the tractor launch, increasing interview sampling efficiency at Deep Creek.

Because only charter harvest data is available for the two sites separately, allocation of sampling effort was based on relative levels of reported charter harvest. It is assumed that sampling efficiency for the charter and private fisheries is similar, and that a sample that is representative of charter harvest will represent the private harvest adequately. Charter harvest was reported in logbooks during the periods 1998-2001 and 2006-12. For the intervening years, charter harvest was estimated as the product of the number of bottomfish rods recorded in logbooks (as a proxy for angler-days) and the harvest per unit effort (HPUE) from port sampling interviews (Meyer 2004, page 16). For 2001 this estimate was within 3% of the harvest reported in logbooks.

The sampling allocation between Deep Creek and Anchor Point was last adjusted in 2004, using relative estimates of charter effort and harvest estimated from logbook data and harvest per angler from interviews. Logbook data for 2012 indicated 69% of the charter angler-days, 68% of charter rod-days and 69% of charter harvest (number of fish) was attributed to Deep Creek. By comparison, 81% of halibut harvest reported in interviews and 75% of the biological samples were from Deep Creek. Since 2006, the proportion of charter harvest reported in the logbook from Deep Creek averaged 71%, compared with 82% reported in interviews and 66% of the biological samples.

Therefore, 70% of interview effort will be allocated to Deep Creek. No adjustment will be made to the allocation of biological sampling (65% to Deep Creek), but staff will adjust sampling inseason to achieve about 70% allocation of the biological sample to Deep Creek.

As mentioned above, slightly more boats from the Ninilchik area have been launching at Anchor Point in recent years. In addition, some Ninilchik and Anchor Point based boats are launching at Homer. Fish sampled for biological data need to be attributed to the port of landing, regardless of where they are sampled. For example, when sampling a charter cleaning station in Ninilchik, the technician will inquire as to the port of landing, and then record the appropriate sublocation code. Data collected in the Ninilchik or Anchor Point area that is from fish landed in Homer will be transferred to the Homer technician and entered in that dataset.

Since 1994 the sampling design for this fishery has been based on data from 1993 that showed that the majority of boats exited the fishery during the six-hour period following high tide (Meyer 1994). In the mid-1990s, many of the boats launched off the beach or the boat ramps at high tide using personal vehicles. Since then the boat ramp at Deep Creek has washed out, and

commercial tractor launching facilities have become well developed at boat sites. The majority of charter as well as private boats now use the commercial tractor facilities and are able to launch on any tide stage. Although the pattern of use at these beaches is likely to have changed since the mid-1990s, there are no data available that describe the complete hourly pattern of boats exiting the fishery.

In 2005 the sampling schedule was changed effective July 7, based on information from charter operators and the tractor launch operator. The changes were made in the hope of intercepting a greater proportion of returning vessels. The schedule now takes into account (1) seasonal changes in hours of operation of the tractor launches, (2) the approximate 1.5 hour delay between the published tide times and actual slack tide in the center of Cook Inlet, and (3) the changed pattern of use at Anchor Point.

The work shift at Anchor Point will be 1200-1800 hours, regardless of tide. Biological sampling and interviews at Deep Creek will still be structured around tides, but based on the following rules that correspond with hours of operation of the tractor launch: sampling will target high slack tide if it falls within the hours 0330-1630 hours before July 24, or 0430-1630 hours from July 24 to August 6, or 0530-1630 hours after August 6. If high slack tide does not meet these criteria, sampling will target low slack tide. If the tide is before 0630 hours, the shift will start at 0900 hours. If the tide is after 1430 hours, the shift starts at 1600 hours except after August 6 when shifts begin no later than 1500. For all other tides, if the tide is in the first half of the hour, the shift starts two hours after the hour of the tide. If the tide is in the last half of the hour, the shift starts three hours after the hour of the tide. All shifts are listed in Appendix B3.

Biological sampling will be conducted on the beaches and at other areas. The first portion of each shift will be spent on the beach obtaining data from private-caught fish or finding out where they will be transporting their fish for cleaning. They usually leave the beach immediately to clean fish at charter facilities or other sites located away from the beach. Sampling harvest at the tractor-launch facilities is impractical because it detains boats and disrupts the flow of traffic. Sampling at the boat ramps also requires climbing aboard large boats on trailers, and fish are often in totes or holds and cannot be laid out for sampling. Most of the sampling, therefore, will be at charter cleaning facilities, RV parks, and campgrounds where private-caught fish are cleaned. The technician will select charter facilities to sample each day from a list of charter businesses in the Ninilchik-Anchor Point area, and the length distributions and mean weight of fish sampled at these businesses will be assumed to be representative of the overall charter harvest in the fishery.

The interview sampling design will vary by location. At Anchor Point, all charter and private vessels exit the beach at a single access point. The technician will therefore attempt to intercept and interview all fishing parties exiting the fishery during each sampling shift. The Deep Creek beach, however, is too large for one technician to intercept all returning boats for interviews during most of the season. The beach will be divided into two areas: (1) the tractor launch and beach north of the contractor's office, and (2) the tractor launch and beach south of the office. At the start of the shift, the technician will make a determination of whether all boats exiting the fishery can be interviewed, based on the number of trailers on the beach. If possible, all returning boats will be interviewed. If that is not possible, then interviews will be conducted in each area for three hours, in alternating order each interview day. Under this scheme, both areas will receive equal sampling effort.

Seward

Biological sampling will be conducted at the Seward harbor and at the Army recreation camp. Biological sampling shifts will start at 1500 hours but may be adjusted inseason to maximize sampling efficiency. The proportion of halibut cleaned at sea is very low (Table 1), and when they are cleaned at sea, all or nearly all fish are cleaned (Table 2). Therefore, no specific procedures are needed to collect data from halibut cleaned at sea. Charter operators that regularly clean halibut at sea will be asked to retain carcasses for sampling. No portion of the daily harvest of a species category (halibut, lingcod, rockfish, and sharks) will be sampled from any boat unless all fish or cleaned carcasses of that species are returned to port.

Figure 5.–Seward harbor interview areas used in 2012.

Technicians will disperse sampling effort between the public fish cleaning stations, boat ramps, and Army camp cleaning facilities such that data are drawn from throughout the day's landings. Emphasis will be placed on contacting and obtaining data from private vessels because of their lower success rates and generally smaller catches per boat-trip. Sampling will be alternated between cleaning sites throughout the shift to spread samples over time and avoid selecting for early- or late-returning boats.

Angler interviews will utilize a design and schedule similar to that used in Homer. Interviews will be conducted in the Seward harbor during the period 1400-2100 hours. This period has proved adequate in past years. The harbor will be divided into four areas for the 2013 season due to the recent harbor expansion (Figure 5). Interviews will be conducted for approximately one hour (minus travel time) in each area. The order in which areas are sampled is assigned randomly and shifted systematically to apportion sampling effort equally among areas (Appendix B4). The technicians will contact and obtain interviews from boats tying up or offloading in the assigned area (including the fuel station), unless previously interviewed.

In 2004 the Alaska Board of Fisheries rejected a proposal to open Resurrection Bay to lingcod fishing. Interview information from this project indicated that lingcod catch rates inside the bay were still too low to justify opening the fishery. Because managers anticipate additional proposals to open the bay, this information will again be collected in 2013 as outlined in the "Angler Interviews" section on page 21.

Whittier

All interview and biological sampling will take place in the Whittier harbor and adjacent private marina. The technician will attempt to allocate interviews and biological samples between these locations in proportion to effort and harvest. Very little information was collected from the marina in 2005 and 2006. Prior to 2009 biological sampling and interviews were conducted concurrently. Beginning in 2009, interview and biological sampling were conducted on separate days. Days off are selected at random (Appendix B5). Fishing effort is increasing in Whittier, as evidenced by boat launch counts provided by the Whittier harbormaster. The number of single launches increased from 998 in 2000 to a high of 3,809 in 2011. Single launch passes sold in 2012 dropped slightly to 3,549. The number of season passes sold has been variable from a low of 58 in 2001 to a high of 318 in 2010. There were 198 season passes sold in 2012. The city has obtained permits to conduct a geographic survey at the head of Passage Canal while the Army Corp of Engineers is studying the feasibility of establishing a new marina in that area. This fishery will be monitored over the next few seasons and the sampling design will be changed to accommodate sampling if construction of a tractor launch or new marina is completed.

Interviews and biological sampling will be conducted during the period 1500 – 2200 hours. Interviews will be conducted throughout the Whittier harbor on scheduled interview days only. The technician will attempt to interview all returning vessels during this period. During lingcod season, lingcod samples will be collected on both biological and interview days. To optimize the amount of data collected, the technician may have to focus on gathering interview data and store fish carcasses during this period. For example, carcass buckets may be assigned to specific vessels, or fish will be labeled with stat area and user group information for biological sampling later in the shift.

The proportion of halibut harvest that is cleaned (and carcasses disposed of) at sea by charter and private vessels is relatively high (Table 1), but when halibut are cleaned at sea nearly all of the fish are processed at sea (Table 2). Baseline data collected during the 2011 and 2012 seasons indicate that rockfish and lingcod are also cleaned at sea in relatively high proportions. Many private boats go out on overnight or multiple-day trips and clean or eat their catch before returning to the harbor. Fish cleaning tables were installed in the harbor in 2002, but they are inadequate to handle the demand and there are sometimes long waits for tables. Beginning in 2006 seasonal technicians repeatedly noted that charter halibut sampling goals were easily obtained, but that it was more difficult to attain the desired sample size for the private fleet and for other species. Various technicians also noted success in getting charter operators to retain rockfish and lingcod carcasses for sampling, but this is rarely possible to set up with private anglers. In order to address the potential bias associated with not sampling fish cleaned at sea, the Department will be issuing a News Release (NR) for the 2013 season requesting the retention of groundfish carcasses. In addition, no portion of the daily harvest of a species category (halibut, lingcod, rockfish, and sharks) will be sampled from any boat unless all fish or cleaned carcasses of that species category are returned to port and available to the sampler.

Valdez

All interview and biological sampling will take place in the Valdez harbor because this is virtually the only access point. Biological sampling and interviews will be conducted on separate days with days off selected at random (Appendix B6). Biological sampling at Valdez will be conducted primarily during the period 1500-2200 hrs. Fish will be sampled by roving among the fish cleaning stations to spread samples over time and avoid selecting for early or late-returning boats.

Only about 5% of charter-caught halibut and 9% of private-caught halibut were cleaned at sea in 2012 (Table 1). Therefore, no specific program will be implemented to collect data from halibut cleaned at sea. The technician, however, will solicit cooperation with charter operators and private anglers to return fish carcasses, and no portion of the daily harvest of a species category (halibut, lingcod, rockfish, and sharks) will be sampled from any boat unless all fish or cleaned carcasses of that species category are returned to port.

Interviews will be conducted throughout the Valdez harbor during the period 1500-2200 hours on scheduled interview days only. The technician will attempt to interview all returning vessels during this period.

SAMPLE SIZES

Variance estimates for the parameters estimated by this project are in the process of being revised (see DATA ANALYSIS). The original variance estimates erroneously assumed independent multinomial samples across the days within the season and boats within days. When methods are used that do not make these assumptions, the resulting standard errors can be two or more times greater than the original estimates.

Prior to 2011, sample size goals were established under multinomial sampling assumptions. With the revised variance estimates, meeting the original precision goals would require large (approximately four-fold) increases in sample size. Such increases are unattainable with current budget and staffing levels, given that samplers are saturated during most of the season.

During the process of developing new variance estimators, it became evident that some parameters can be subject to substantial variation among boats sampled on the same day. Thus there is potential for bias in the event that boats are selected for sampling in a non-representative manner. For this reason it is desirable to minimize, to the extent possible, subjectivity in boat sample selection. Because one potential source of subjectivity is the incentive to meet sample size goals (boats with higher catches being more desirable), such goals will receive less emphasis in 2013. Instead, we use sample sizes from previous years as a gauge for what should be attainable by port (Table 5). The average sample sizes are based on the past three seasons for which we have a full complement of data (2010, 2011 and 2012). Sample sizes in Table 5 are not intended as goals, but rather as a preseason reference for what to expect. E.g. if the value in Table 5 is exceeded before the end of the season, sampling will *not* be discontinued. The primary consideration with respect to sample selection should be to obtain a representative sample, rather than to achieve a sample size target.

Unfortunately, with the bootstrap variance estimator, it is not possible to predict exactly what sample sizes are necessary to meet the precision objectives, as was done with multinomial variance estimators. However, since relative precision objectives have been doubled to match the expected increase in standard errors, and sample sizes are likely to be similar, we expect that the precision objectives will continue to be met.

Table 5.–Average historical sample sizes by port for biological sampling.

Port	User Group	Average Sample Sizes		
		Halibut	Rockfish	Lingcod
Kodiak	Charter	279	160	50
	Private	246	98	31
	Total	525	257	81
Deep Cr./Anchor Pt.	Charter	693	20	8
	Private	267	--	--
	Total	960	20	8
Homer	Charter	--	561	146
	(Cleaned at sea)	191	--	--
	(Cleaned in port)	719	--	--
	Private	756	164	18
	Total	1,666	725	164
Seward	Charter	1,167	1,288	246
	Private	428	576	58
	Total	1,595	1,864	304
Whittier	Charter	316	181	60
	Private	318	268	41
	Total	633	449	101
Valdez	Charter	596	431	262
	Private	448	260	47
	Total	1,044	691	310

DATA COLLECTION AND REDUCTION

Biological Sampling

Fish landed by recreational anglers are usually filleted with viscera and skin intact, but may also be whole or gutted and bled. Rockfish will be identified to species in the field using Kramer and O'Connell (1995) or Orr et al. (1998). Difficult fish may be keyed out using Mecklenburg et al. (2002). Since 2004 a distinction has been made between dusky rockfish *S. variabilis* and dark rockfish *S. ciliatus* (Orr and Blackburn 2004). The user type (charter, private, military, etc.) and unique identifier for each vessel (vessel name for charters, unique alpha-numeric code p1, p2, etc by vessel for private vessels) and ADF&G groundfish statistical area of capture will be recorded for all fish when known. Sex of all bony fish will be determined by examination of gonads. Sex of sharks will be determined by external appearance of the urogenital area (Castro 1983; Appendix C1). Lengths will be measured as outlined in Table 6.

Only rockfish and lingcod will be weighed. Rockfish will be weighed using brass spring scales (12.5 x 0.1 kg checked for accuracy and calibrated pre- and mid-season) and weights will be recorded to the nearest 0.1 kg. Lingcod will be weighed using aluminum spring scales (35 x 0.5 kg) with weights recorded to the nearest 0.5 kg. All biological data will be recorded in the field on pre-stamped coin envelopes (halibut, rockfish, lingcod) or on Write-In-Rain® data sheets inserted in locking plastic bags (sharks) with the age structure. Data will be entered by technicians into protected Excel templates containing data validation fields.

A variety of age structures will be collected, depending on the species. The left (ventral) otolith (saggitus) will be removed from halibut. Both otoliths will be removed from all rockfish and lingcod. Halibut and rockfish otoliths will be hand-cleaned in water and stored in labeled coin

envelopes. The 4th-8th rays of the posterior lobe of the dorsal fin of lingcod will be removed and stored flat in labeled, weatherproof paper envelopes. Each day's collection of lingcod fins will be frozen in individual sealable plastic bags to minimize dehydration. A 15-20 cm section of vertebrae will be removed from the gill area of salmon sharks and frozen for later age estimation (Appendix C1). The posterior dorsal fin spine will be removed from spiny dogfish and stored in a labeled coin envelope.

The subsistence fishery for halibut began in May 2003. Subsistence fishing for halibut is allowed in all federal waters and all state waters that are outside of non-subsistence areas. Technicians may encounter subsistence-caught halibut and other bottomfish taken as bycatch in the subsistence fishery. Technicians will determine whether the halibut or other species were harvested by subsistence or recreational fishing. No halibut, rockfish, lingcod, or sharks caught by subsistence users will be sampled in this project. Technicians will be advised of subsistence halibut regulations and may be asked to monitor and report bycatch of state-managed groundfish in the subsistence fishery to the project leader, appropriate Commercial Fisheries Division staff, and enforcement personnel with the Bureau of Wildlife Enforcement.

Because this project covers a wide area, project personnel are in a unique position to assist other agencies and ADF&G research projects. In addition to data required for this project, staff will also collect tissue samples for analysis of methyl-mercury and other contaminants by the Department of Environmental Conservation.

Table 6.–Type and precision of length measurements by species.

Species	Measurement(s)	Precision
Halibut	Tip of the snout to the central lobe of the caudal fin	Nearest cm
Lingcod	Maximum total length (Anderson and Gutreuter 1983)	Nearest cm
All rockfishes	Maximum total length (Anderson and Gutreuter 1983)	Nearest cm
Salmon shark	(1) Total length, (2) fork length, and (3) pre-caudal length	Nearest cm
Pacific sleeper shark	Total length	Nearest cm
Spiny dogfish	Total length	Nearest cm

Angler Interviews

Technicians will attempt to contact all boats returning to the harbor or assigned area. Because of the seasonal preponderance of recreational salmon fishing and subsistence fishing, the initial step in each contact will be to determine whether the vessel was sport fishing and whether anglers targeted or caught any halibut, rockfish, lingcod, or sharks (Appendix D1). Vessel-parties that were sport fishing and targeted these species, or caught (including release) them while targeting other species will be interviewed, regardless of fishing success.

Once it is established that a vessel is eligible for and consents to an interview, the following information will be recorded for each boat-trip (Appendix D2)**:**

1. Date and time,
2. Boat name (if charter trip),
3. Logbook number (if charter trip, or individual boat designator if private trip),
4. Whether trip is first or second trip of the day,
5. Duration of trip in days,

6. User group (e.g. charter, private),
7. Target species category,
8. The primary ADF&G groundfish statistical area(s) fished (or accounts for majority of harvest),
9. Specific location of the interview (harbor or harbor area),
10. Whether anglers fished inside Resurrection Bay, outside the bay, or both (Seward only),
11. Number of angler-days of effort for entire trip (recorded separately as client and crew days),
12. The number of hours fished by persons on board from the start of fishing at the first spot to the end of fishing activity at the last spot, including time spent searching for fish or moving between spots,
13. Numbers of halibut kept, and the number of those that were cleaned (and carcasses disposed of) at sea,
14. Whether halibut harvest was counted (validated) or not,
15. The numbers of halibut released that were caught on circle hooks and on all other hook types,
16. Numbers of pelagic, yelloweye, and other non-pelagic rockfish kept, released, and cleaned at sea,
17. Whether pelagic, yelloweye and other non-pelagic rockfish harvest was counted (validated) or not,
18. The most common depth of capture (in feet) for pelagic, non-pelagic and yelloweye rockfish that were released,
19. Number of pelagic, yelloweye, and other non-pelagic rockfish released, by release method (whether at the surface, using a venting for fizzing tool, or with a deep-water release mechanism),
20. Numbers of lingcod kept and cleaned at sea,
21. Numbers of lingcod released that were under 35 inches in length and number released 35 inches or greater in length,
22. Whether lingcod harvest was counted (validated) or not,
23. Numbers of Pacific cod kept and released, cleaned at sea, and whether harvest was counted (validated) or not,
24. Numbers of sablefish kept and released, cleaned at sea, and whether harvest was counted (validated) or not,
25. Numbers of pollock kept and released, cleaned at sea, and whether harvest was counted (validated) or not,
26. Numbers of sharks kept and released (by species), cleaned at sea, and whether harvest was counted (validated) or not.

Charter boat skippers, rather than crew or clients, will be interviewed to obtain accurate reporting of statistical areas and species. Whenever possible, technicians will observe and count all harvested halibut, rockfish, lingcod, and sharks and record the appropriate variables to indicate that these fish were counted. They will also have to check to ensure that the fish they are counting represent the entire harvest for that trip (i.e., no fish have been filleted or stored elsewhere on vessel). Some common situations that would preclude counting the actual harvested fish include (1) some of the fish were filleted and carcasses tossed at sea, (2) some of the fish were consumed at sea, (3) some of the fish have already been offloaded and carried away, (4) returning boat traffic is extremely heavy and the technician needs to conduct other

interviews, or (5) taking the time to count fish will interfere with other boat launching operations and cause congestion at the boat launch or beach. When the number of fish recorded harvested is based on the charter skipper's word, rather than an actual count, the verification field response should be no.

Interview data will be recorded on Allegro CX field computers using DataPlus Professional data capture software, as outlined in Appendix D2. The DataPlus software contains numerous data validation routines that should catch most errors at the point of data entry. Port samplers will create a new data file each interview day and back it up to a desktop computer at the end of each shift.

Logbook Outreach

Following completion of interviews, and as time allows, technicians will offer to review charter logbooks and answer any questions about how they should be filled out. The goal of this outreach is to ensure compliance with all reporting requirements, so emphasis will be placed on doing this early in the season. As technicians review logbooks, they should be keeping track of recurring questions or problems related to logbook design, incomplete or vague instructions, or situations that are not covered by the logbook instructions. These should be noted and sent to the project leader, who will forward them to logbook staff to consider for the following year.

The purpose of the outreach effort is not evaluating data accuracy. Those evaluations will be done post-season through postcard surveys of charter anglers and comparisons of logbook and interview data. Technicians will note major omissions or discrepancies, however, and report these immediately to the project leader or local Trooper for enforcement action. If a technician notes a minor difference between numbers of fish recorded and the number of fish they just counted, they should ask follow-up questions to make sure that their counts were accurate. If it becomes clear during a discussion that the charter operator made a minor mistake and wants to amend the number of fish recorded in the logbook, the technician must fix the interview data by deleting the variable showing that those fish were counted. This must be done so that amended logbook data are not included in the post-season comparison of logbook and interview data.

Data Reduction

Halibut otoliths will be stored dry in individually labeled coin envelopes and sent to the IPHC for age analysis upon their request. Rockfish otoliths will be read using transverse burned or baked sections and reflected light (MacLellan 1997). Lingcod fin rays will be dried, cross-sectioned, mounted on labeled microscope slides, and read under transmitted light (Beamish and Chilton 1977). Prior to recording ages, reference sets from previous years will be read until a high proportion of assigned ages agree and differences are unbiased and independent of age (Appendix E1). These performance standards, in place verbally since the beginning of the program, were documented in an age-reader performance standards memo distributed to ageing staff early in 2009 (Appendix E1). Salmon shark vertebrae will be frozen upon collection, then cleaned, soaked in alcohol, sectioned, and mounted on glass slides following procedures described by Goldman (2005). A subsample (random 20%) of rockfish, lingcod, and salmon shark age structures will be read twice to assess within-reader error over time. Otoliths and fin rays will be archived at ADF&G in Homer.

Interview data files and Excel workbooks containing biological data will be emailed to the field supervisor (Failor) weekly for error checking and compilation of sampling summaries. At the

end of the season, all interview files will be converted to SAS datasets for analysis and ASCII files for archival. The file structure of ASCII files will be documented. Excel workbooks will be converted to SAS datasets for analysis and to standard Mark Sense AWL format (ASCII files) for archiving. All files will be named using conventions established by RTS.

Initial editing of biological data files will include checks of frequency listings for impossible or unlikely data, and will ensure correspondence with collected age structures (e.g., there should be a coin envelope containing data and an age structure for each record). After aging is complete and age data are entered, data files will be checked using a program developed to spot insidious data entry errors and outliers not detectable with frequency listings. The program includes checks of data against length-weight and length-age relationships and outputs a list of suspect records that will then be compared to the original data (coin envelopes). Troubleshooting of errors will also involve established relationships between fish length and otolith length or weight for selected species.

Interview files will also be checked with a program that finds insidious data entry errors and outliers not detectable with simple range checks or frequency listings. Hopefully, most of these errors will be identified and corrected at the time of data entry.

Copies of edited biological and interview files will be stored on the Homer LAN server, project leader's computer, and backed up on an external hard drive. Historic archived files and original files can be found in the same locations.

DATA ANALYSIS

Halibut Mean Weight (Objective 1)

Most sampled halibut are filleted or gutted. Since most fish cannot be weighed, the IPHC length-weight relationship is employed to estimate the mean net weight of all measured halibut. Mean net weight will be estimated for each user group *g* in each subarea *a* as the mean of the predicted weights over all n_{ga} sampled fish (Nielsen and Schoch 1980):

$$\overline{w}_{ga} = \frac{\sum_{k=1}^{n_{ga}} \alpha L_{gak}^{\beta}}{n_{ga}}, \qquad (1)$$

where L_{gak} = the observed length of fish k (to the nearest cm), $\alpha = 6.921 \text{ X } 10^{-6}$ for net weight in pounds, and $\beta = 3.24$ (Clark 1992). These parameters were estimated from a log-log regression of length and weight data from a sample size of 5,184 halibut taken between British Columbia and the eastern Aleutians. No correction will be made for log transformation bias because the length-weight relationship was based on a large sample and the residual variance is extremely small (William Clark, IPHC, personal communication). Mean weight estimates are presented in pounds rather than kilograms because that is the standard unit used by halibut management agencies.

Variances of the mean predicted weights will be estimated through a bootstrap procedure[2]. A 2-stage bootstrap will be conducted for each port, where the first stage is the sampling date, and the second stage is the vessel. The bootstrap routine resamples days within a year, and boat trips

[2] Methodology used to estimate variances of the mean predicted weights may continue to evolve. Closed-form variance estimates for multistage designs are currently being developed for similar programs in southeast Alaska.

within a day. All sampling is conducted "with replacement", and the number of resampled data points is equal to the original sample size. Mean weight is calculated across all re-sampled fish, and the process is repeated 500 times. The standard deviation of the 500 bootstrap values of mean weight is the standard error[3] for the mean weight estimate in Equation 2.

Homer

Charter halibut data from Homer will be further designated "cleaned in port" or "cleaned at sea." There was a significant difference in the mean net weight of charter halibut harvested cleaned at sea and cleaned in port in four of the last five years (Table 3). Therefore, we will continue to separate these groups during data collection. The mean weight and variance for the charter sector ($\hat{\overline{w}}_C$) will be estimated by:

$$\hat{\overline{w}}_C = \left(\overline{w}_{CS}\,\hat{p}_{CS}\right) + \left(\overline{w}_{CP}\,\hat{p}_{CP}\right), \tag{2a}$$

$$= \left(\overline{w}_{CS}\,\hat{p}_{CS}\right) + \left(\overline{w}_{CP}\left(1-\hat{p}_{CS}\right)\right), \tag{2b}$$

$$= \left(\overline{w}_{CS}\,\hat{p}_{CS}\right) + \overline{w}_{CP} - \left(\overline{w}_{CP}\,\hat{p}_{CS}\right), \tag{2c}$$

where

$\overline{w}_{CS}$ = the sample mean weight of charter-caught fish cleaned at sea,

$\hat{p}_{CS}$ = the estimated proportion of charter-caught fish cleaned at sea,

$\overline{w}_{CP}$ = the sample mean weight of charter-caught fish cleaned in port, and

$\hat{p}_{CP}$ = the estimated proportion of charter-caught fish cleaned in port.

The proportion $\hat{p}_{CS}$ (Task 1) is estimated using completed-trip interview data as

$$\hat{p}_{CS} = \frac{n_{CS}}{n}, \text{ and} \tag{3}$$

$$v\left(\hat{p}_{CS}\right) = \frac{\hat{p}_{CS}\left(1-\hat{p}_{CS}\right)}{n-1}, \tag{4}$$

where n_{CS} = the number of halibut cleaned at sea on interviewed charter vessels, and n = the number of halibut kept by interviewed charter vessels. The variance of the mean weight for charter-caught halibut will be estimated by (Goodman 1960):

$$v\left(\hat{\overline{w}}_C\right) = v\left(\overline{w}_{CS}\,\hat{p}_{CS}\right) + v\left(\overline{w}_{CP}\right) + v\left(\overline{w}_{CP}\,\hat{p}_{CS}\right) - 2Cov\left(\overline{w}_{CS}\,\hat{p}_{CS}, \overline{w}_{CP}\,\hat{p}_{CS}\right)$$
$$- 2Cov\left(\overline{w}_{CP}, \overline{w}_{CP}\,\hat{p}_{CS}\right) \tag{5}$$

where

[3] Standard errors produced from this method are approximate, and could be biased high or low. For instance, the sampling schedule has a systematic (weekly) periodicity, yet the resampling algorithm assumes independent selection of dates within a year, which would tend to over-estimate the standard error. On the other hand, on some occasions only a single boat is sampled per day, leading the 2-stage resampling procedure to miss the second-stage component of variance entirely and under-estimate the standard error.

$$v(\overline{w}_{CS}\,\hat{p}_{CS}) = \left[\overline{w}_{CS}^2 v(\hat{p}_{CS}) + v(\overline{w}_{CS})\hat{p}_{CS}^2 - v(\overline{w}_{CS})v(\hat{p}_{CS})\right],$$

$$v(\overline{w}_{CP}\,\hat{p}_{CS}) = \left[\overline{w}_{CP}^2 v(\hat{p}_{CS}) + v(\overline{w}_{CP})\hat{p}_{CS}^2 - v(\overline{w}_{CP})v(\hat{p}_{CS})\right],$$

$$Cov(\overline{w}_{CS}\,\hat{p}_{CS}, \overline{w}_{CP}\,\hat{p}_{CS}) = \overline{w}_{CS}\;\overline{w}_{CP} v(\hat{p}_{CS}),$$

$$Cov(\overline{w}_{CP}, \overline{w}_{CP}\,\hat{p}_{CS}) = \hat{p}_{CS}\hat{v}(\overline{w}_{CP}),$$

and where $v(\overline{w}_{CS})$ and $v(\overline{w}_{CP})$ are obtained through the 2-stage bootstrap described above.

Whittier and Valdez

Waters fished by the Whittier and Valdez halibut fleets overlap spatially, especially in the charter boat fishery. There are substantial differences in the harvest characteristics between these ports, however. The SWHS now provides harvest estimates for trips ending in Whittier or western PWS, Valdez, or Cordova or eastern PWS. The SWHS estimates for Whittier and western PWS will be applied to the mean weight estimates from Whittier to estimate harvest biomass. Since there is no port sampling in Cordova, SWHS harvest estimates for eastern PWS will be applied to the mean weight estimated from Valdez data to estimate harvest biomass for eastern PWS.

Age, Length, and Sex Composition (Objectives 2, 4, and 5)

Estimates of age, length, and sex composition will be expressed as $\hat{p}_i$, the proportion of the harvest in each group *i*, where the group variable is age, length, or sex (Thompson 1992; page 36). Estimates will be stratified by user group to minimize bias.

Age composition is estimated as follows:

$$\hat{p}_{ij} = \frac{\widehat{H}_{ij}}{\widehat{H}_i} \tag{6}$$

where

$\widehat{H}_{ij}$ = the estimated number of age *j* fish in the harvest of species *i*, and

$\widehat{H}_i$ = the estimated number of species *i* fish harvested.

The number of age *j* fish in the harvest of species *i* was estimated as

$$\widehat{H}_{ij} = \hat{p}_{ijG}\widehat{H}_{iG} + \hat{p}_{ijU}\widehat{H}_{iU} \tag{7}$$

where

$\hat{p}_{ijG}$ = the observed proportion of age *j* in the guided harvest of species *i*,

$\hat{p}_{ijU}$ = the observed proportion of age *j* in the unguided harvest of species *i*,

$\widehat{H}_{iG}$ = the estimated harvest of species *i* by guided anglers,

$\widehat{H}_{iU}$ = the estimated harvest of species *i* by unguided anglers (from SWHS).

The variance of $\hat{p}_{ij}$ was then estimated as

$$\hat{v}(\hat{p}_{ij}) = \frac{1}{\hat{H}_i^2}\left[\frac{\hat{v}(\hat{H}_{iG})\left(\hat{p}_{ijG}\hat{H}_{iU} - \hat{H}_{ijU}\right)^2}{\hat{H}_i^2} + \frac{\hat{v}(\hat{H}_{iU})\left(\hat{p}_{ijU}\hat{H}_{iG} - \hat{H}_{ijG}\right)^2}{\hat{H}_i^2} + \hat{v}(\hat{p}_{ijG})\hat{H}_{iG}^2 + \hat{v}(\hat{p}_{ijU})\hat{H}_{iU}^2\right] \quad (8)$$

where

$$\hat{H}_{iG} = \hat{p}_{iG}\hat{H}_G, \quad (9)$$

$$\hat{v}(\hat{H}_{iG}) = \hat{p}_{iG}^2\,\hat{v}(\hat{H}_G) + \hat{v}(\hat{p}_{iG})\hat{H}_G^2 - \hat{v}(\hat{p}_{iG})\hat{v}(\hat{H}_G), \quad (10)$$

$$\hat{H}_{iU} = \hat{p}_{iU}\hat{H}_U, \quad (11)$$

$$\hat{v}(\hat{H}_{iU}) = \hat{p}_{iU}^2 v(\hat{H}_U) + \hat{v}(\hat{p}_{iU})\hat{H}_U^2 - v(\hat{p}_{iU})v(\hat{p}_{iU}), \text{ and} \quad (12)$$

$$\hat{H}_i = \hat{H}_{iG} + \hat{H}_{iU}. \quad (13)$$

Length and sex composition are estimated using equations 6-13, substituting length or sex for age.

As mentioned earlier, this project employs a two stage sampling design with random sampling of days of the week at the first stage and cluster sampling of the catch from nonrandomly selected vessels at the second stage. Sampling is designed to minimize bias in the point estimates, but variances of all estimates of species, age, length, and sex composition are likely underestimated because the variance formulas are based on simple random sampling.

If necessary, halibut length composition estimates for Homer may be stratified by three user groups: (1) private harvest, (2) charter harvest cleaned in port, and (3) charter harvest cleaned at sea. The stratified estimator in this case is:

$$\hat{p}_{i_{ST}} = \hat{h}_p\,\hat{p}_{i(p)} + \hat{h}_c\left[\hat{h}_{port}\,\hat{p}_{i(port)} + \hat{h}_{sea}\,\hat{p}_{i(sea)}\right] \quad (14)$$

where

$\hat{h}_p$ = the estimated proportion of the total subarea harvest taken by private anglers,

$\hat{p}_{i(p)}$ = the estimated proportion of private-caught halibut in length group *i*,

$\hat{h}_c$ = the estimated proportion of the total subarea harvest taken by charter anglers,

$\hat{h}_{port}$ = the estimated proportion of charter-caught halibut that were cleaned in port,

$\hat{h}_{sea}$ = the estimated proportion of charter-caught halibut that were cleaned at sea.

$\hat{p}_{i(port)}$ = the estimated proportion of charter-caught halibut cleaned in port in length group *i*, and

$\hat{p}_{i(sea)}$ = the estimated proportion of charter-caught halibut cleaned at sea in length group *i*.

The stratum weights are based on large sample sizes, and therefore considered constants. Variances of the proportions will be estimated by:

$$v\left[\hat{p}_{i_{ST}}\right] = h_p^2 v\left[\hat{p}_{i(p)}\right] + h_c^2 \left\{v\left[\hat{h}_{port}\hat{p}_{i(port)} + \hat{h}_{sea}\hat{p}_{i(sea)}\right]\right\} \quad (15)$$

$$= h_p^2 v\left[\hat{p}_{i(p)}\right] + h_c^2 \left\{v\left[\hat{h}_{port}\hat{p}_{i(port)}\right] + v\left[\hat{h}_{sea}\hat{p}_{i(sea)}\right]\right\}$$

where

$$v\left[\hat{h}_{port}\hat{p}_{i(port)}\right] = v\left[\hat{h}_{port}\right]\hat{p}^2_{i(port)} + \hat{h}^2_{port} v\left[\hat{p}_{i(port)}\right] - v\left[\hat{h}_{port}\right] v\left[\hat{p}_{i(port)}\right]$$

$$v\left[\hat{h}_{sea}\hat{p}_{i(sea)}\right] = v\left[\hat{h}_{sea}\right]\hat{p}^2_{i(sea)} + h^2_{sea} v\left[\hat{p}_{i(sea)}\right] - v\left[\hat{h}_{sea}\right] v\left[\hat{p}_{i(sea)}\right]$$

The variables $\hat{h}_{sea}$ and $\hat{h}_{port}$ will be estimated from angler interviews. For example,

$$\hat{h}_{sea} = \frac{n_{sea}}{n} \quad (16)$$

where

n_{sea} = the number of halibut cleaned at sea on charter boats contacted for interviews, and

n = the total number of halibut kept by interviewed anglers.

The variances of $\hat{h}_{sea}$ and $\hat{h}_{port}$ will be obtained through the 2-stage bootstrap described above.

Rockfish Species Composition (Objective 3)

There is potential for bias in estimation of any summary statistic if the statistic varies by user group and sample size is not proportional to harvest by each user group. Estimates of species composition are stratified by user group to avoid potential bias that could result from sample sizes that are not proportional to guided and unguided harvest. The proportion of harvest consisting of species *i* is estimated as

$$\hat{p}_i = \frac{\hat{H}_i}{\hat{H}} \quad (17)$$

where

$\hat{H}_i$ = the estimated number of rockfish of species *i* harvested, and

$\hat{H}$ = the estimated number of rockfish (all species) harvested (from SWHS).

The harvest of species *i* (in number of fish) is estimated as

$$\widehat{H}_i = \hat{p}_{iG}\widehat{H}_G + \hat{p}_{iU}\widehat{H}_U \tag{18}$$

where

$\hat{p}_{iG} =$ the observed proportion of species *i* in the guided harvest, or n_{iG}/n_G,

$\hat{p}_{iU} =$ the observed proportion of species *i* in the unguided harvest, or n_{iU}/n_U,

$\widehat{H}_G =$ the estimated rockfish harvest by guided anglers (from SWHS), and

$\widehat{H}_U =$ the estimated rockfish harvest by unguided anglers (from SWHS).

The variance of $\hat{p}_i$ is estimated as

$$\hat{v}(\hat{p}_i) = \frac{1}{\widehat{H}^2}\left[\frac{\hat{v}(\widehat{H}_G)\left(\hat{p}_{iG}\widehat{H}_U - \widehat{H}_{iU}\right)^2}{\widehat{H}^2} + \frac{\hat{v}(\widehat{H}_U)\left(\hat{p}_{iU}\widehat{H}_G - \widehat{H}_{iG}\right)^2}{\widehat{H}^2} + \hat{v}(\hat{p}_{iG})\widehat{H}_G^2 + \hat{v}(\hat{p}_{iU})\widehat{H}_U^2\right] \tag{19}$$

where

$\hat{v}(\hat{p}_{iG}) = \hat{p}_{iG}(1 - \hat{p}_{iG})/(n_G - 1)$, and (20)

$$\hat{v}(\hat{p}_{iU}) = \hat{p}_{iU}(1 - \hat{p}_{iU})/(n_U - 1). \tag{21}$$

Estimated variances for the guided and unguided rockfish harvest are provided by Division of Sport Fish, Research and Technical Services (unpublished).

Spatial Distribution of Effort and Harvest (Objective 6)

The proportions of bottomfish fishing effort (in angler-days) and harvest by species (in numbers of fish, by species or species group) in each ADF&G groundfish statistical (stat) area *a* will be estimated separately for each user group *j* using data from vessel-trip interviews:

$\hat{p}_{aj} = n_{aj}/n_j$ and (22)

$$\hat{v}(\hat{p}_{aj}) = \hat{p}_{aj}(1 - \hat{p}_{aj})/(n_j - 1), \tag{23}$$

where

$n_{aj} =$ the reported bottomfish fishing effort (angler-days) or bottomfish harvest (by species or species group) from stat area *a* by user group *j*, and

$n_j =$ the total reported effort or harvest by user group *j*.

Defining effort by species (e.g. lingcod) or species group (e.g. rockfish) can be problematic as anglers often target a variety of species during the day. For example, anglers will very rarely report rockfish as the sole target species of their trip. More often, anglers that harvested rockfish reported that they were fishing for halibut, bottomfish, or a combination of species. Depending on the terminal gear and locations fished, effort targeted on one species (including salmon) can also be effective for another. Effort for a given species will therefore be expressed as the number of angler-days spent targeting that species or a category that includes that species for any portion

of a day. For example, halibut effort includes all effort for which the target category was "halibut," "bottomfish," or "bottomfish and salmon." Harvest distributions will be calculated using the number of a species taken while targeting any species. When a trip covers more than one statistical area, effort and harvest will be broken out by area if possible. Otherwise, the primary stat area fished will be recorded. In effort calculations, an angler-day will be tallied for each area in which an angler spends any portion of the day fishing. Harvest from multiple statistical areas that are not separable will be apportioned to stat areas based on the distribution of harvest that was separable.

Estimates of the spatial distribution of effort and harvest apply only to the fleets returning to the sampled ports, not to particular waters or areas. For example, the spatial distributions of harvest and effort will be estimated for the guided and unguided fleets based in Kodiak city, not for the entire Kodiak area. Similarly, the distribution of harvest and effort will not be estimated for all fishing in PWS, but rather estimated separately for fleets fishing out of Seward, Whittier, and Valdez. As a result, there may be overlap in the spatial distribution of effort or harvest associated with multiple ports.

SCHEDULE AND DELIVERABLES

Project activities are scheduled as follows:

Year	Dates	Activity
2013	May 16-early June	Begin data collection at ports.
	Sep 6	Data collection completed at all ports. Begin data reduction, data validation, and age determination.
	Oct	Analysis and preliminary estimates of halibut mean weight and harvest biomass - memo to the International Pacific Halibut Commission
	As needed	Preliminary data summaries to the North Pacific Fishery Management Council, Alaska Board of Fisheries, other agencies and public.
2013-2014	Fall-winter	Analysis and report preparation for previous years' data.

Preliminary estimates of halibut harvest will be reported to the IPHC in October 2013, and final estimates will be reported in an ADF&G, Sport Fish Division Special Publication following publication of the statewide harvest survey estimates. Halibut data summaries will be provided to the NPFMC as needed for analyses of management alternatives, and to NMFS regulators, the Alaska Board of Fisheries, Fish and Game Advisory Committees, or individuals as requested. The 2013 season data will be presented when SWHS estimates become available in 2014. Interim estimates will also be incorporated in Fishery Management Reports and may be presented to the Alaska Board of Fisheries pending action on regulatory proposals.

RESPONSIBILITIES

Barbi Failor, Fishery Biologist II:

As research project leader, oversees all aspects of the project. Formulates research objectives to meet regional management goals, writes operational plan, oversees budgets, supervises all staff, analyzes results, and writes research reports and Federal Aid Progress Reports, summarizes research for other agencies, attends Alaska Board of Fisheries meetings, NPFMC meetings, and IPHC annual meetings, formulates and comments on regulatory proposals, and provides information to the public. Submits invoices and manages budget, and prepares budget requests, analyzes data and writes research reports.

William Dunne, Fishery Biologist I:

Supervises day-to-day aspects of project, including hiring, training, and supervising technicians. Supervises age readers, and designs and analyzes tests of age reader precision. Ensures quality of field data, purchases and distributes sampling equipment, collects weekly sampling reports and writes weekly fishing updates. Provides information to the public.

Fish and Wildlife Technicians (6):

Collect biological and fishery data following procedures outlined in the operational plan and other instructions, complete data forms in an accurate and timely manner, identify sampling needs and problems, provide fishery information to the regional office for weekly fishing reports, explain the sampling program to the general public, maintain state vehicles and other equipment in good working order, and submit all necessary paperwork in a neat and timely manner. Some technicians will be responsible for enforcing sport fishing regulations, computer data entry, simple statistical analyses, or preparation and reading of age structures.

Scott Meyer, Fishery Biologist IV:

Assists project leader with sample design, formulation of operational plan, data analysis, and editing of annual data reports. Compiles statewide halibut harvest estimates and projections. Presents ADF&G research at IPHC annual meeting and NPFMC meetings dealing with halibut and groundfish issues, and coordinates data collection and sharing with other federal and state agencies.

Adam Craig, Biometrician III:

Assists project leader with sample design, formulation of operational plan, data analysis, and editing of annual data reports.

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APPENDICES

Appendix A 1. Detailed line item budget (final FY14 requests for 11220029-11220029). Note that salaries are also contained in the FY14 request for 11220000-11222821.

Line 100: Personnel

Name (Location)	PCN	Title	Months	OT Hours	Swing Hours	Total $K (incl. benefits)
Failor (Homer)	4289	FB II	1.5		75	13.7
Dunne (Homer)	4089	FB I	4.0	24	75	32.9
Bacon (Seward)	4157	FWT III	3.8	25	375	22.6
Milburn (Homer)	4154	FWT III	4.5	25	225	31.1
Buitrago (Kodiak)	4142	FWT II	3.5	25	375	20.7
Johnson (Valdez)	4122	FWT II	3.8	25	375	22.4
Ames (Whittier)	5328	FWT II	3.5	25	375	19.1
			24.6			162.6

Line 200: Travel

Item	Cost
72200/72300 - Field Travel	3.9

Line 300: Contractual

Item	Cost
73399 – SF Vacancy Factor	6.5
73400 – Phones	1.5
73400 – Transportation	10.9
73600 - Rents and leases	4.7
	23.6

Line 400: Commodities

Item	Cost
74400 - Operating supplies	0.0

Appendix A 2**.** Detailed line item budget (final FY14 requests for 11220000-11222821). Note that salaries are also contained in the FY14 request for 11220000-11220029.

Line 100: Personnel

Name (Location)	PCN	Title	Months	OT Hours	Swing Hours	Total $K (incl. benefits)
Failor (Homer)	4289	FB II	10.5		83	90.1
Dunne (Homer)	4089	FB I	6.0	15	83	48.1
Ford (Homer)	4121	FWT III	4.5	15	300	29.8
Ford (Homer)	4171	FWT III	3.5			22.6
			24.5			190.6

Line 200: Travel

Item	Cost
72200/72300 - Travel	10.5

Line 300: Contractual

Item	Cost
73154 – Software licensing (SAS)	0.8
73228 – Postage	0.1
73400 – Phones	0.4
73800 - Rents and leases	0.4
73913 – Employee Tuition	0.5
	2.2

Line 400: Commodities

Item	Cost
74200 - Office supplies	1.8
74400 - Operating supplies	1.1
74500 - Scientific supplies	2.4
74600-74800 - Other operating supplies (vehicle fuel, safety)	0.2
	5.5

Appendix B 1.– Kodiak work schedule, 2013. Duty code B+I indicates concurrent biological and interview sampling. Paperwork c odes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks. Hours for all shifts are 1530-2230 hours.

Date	Day	Duty	Int Areas	Paperwork Due	Comments
16-May	Thu	B+I	132		SEASON BEGINS
17-May	Fri	B+I	321		
18-May	Sat	B+I	213		
19-May	Sun	B+I	132	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
20-May	Mon	--Off--			
21-May	Tue	--Off--			
22-May	Wed	B+I	321		
23-May	Thu	B+I	213		
24-May	Fri	B+I	132		
25-May	Sat	B+I	321		
26-May	Sun	B+I	213		
27-May	Mon	B+I	132	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B+I	321		PAYROLL
29-May	Wed	B+I	213		
30-May	Thu	B+I	132		
31-May	Fri	B+I	321	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--			
2-Jun	Sun	--Off--			
3-Jun	Mon	B+I	213	WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B+I	132		
5-Jun	Wed	--Off--			
6-Jun	Thu	--Off--			
7-Jun	Fri	B+I	321		
8-Jun	Sat	B+I	213		
9-Jun	Sun	B+I	132		
10-Jun	Mon	B+I	321	WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	B+I	213		
12-Jun	Wed	B+I	132		PAYROLL
13-Jun	Thu	B+I	321	**TIMESHEET DUE!**	
14-Jun	Fri	--Off--			
15-Jun	Sat	--Off--			
16-Jun	Sun	B+I	213		
17-Jun	Mon	B+I	132	WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	B+I	321		
19-Jun	Wed	B+I	213		
20-Jun	Thu	B+I	132		
21-Jun	Fri	B+I	321	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jun	Sat	--Off--			
23-Jun	Sun	--Off--			
24-Jun	Mon	--Off--			
25-Jun	Tue	--Off--			
26-Jun	Wed	B+I	213		PAYROLL
27-Jun	Thu	B+I	132		
28-Jun	Fri	B+I	321		
29-Jun	Sat	B+I	213		
30-Jun	Sun	B+I	132	**TIMESHEET DUE!**	
1-Jul	Mon	B+I	321	WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	B+I	213		
3-Jul	Wed	--Off--			
4-Jul	Thu	--Off--			
5-Jul	Fri	B+I	132		Observed Holiday, worked
6-Jul	Sat	B+I	321		
7-Jul	Sun	B+I	213		
8-Jul	Mon	B+I	132	WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	B+I	321		
10-Jul	Wed	B+I	213		
11-Jul	Thu	B+I	132		PAYROLL
12-Jul	Fri	--Off--			
13-Jul	Sat	--Off--			
14-Jul	Sun	B+I	321		

-continued-

Appendix B1. Kodiak work schedule, 2013 (continued).

Date	Day	Duty	Int Areas	Paperwork Due	Comments
15-Jul	Mon	B+I	213	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B+I	132		
17-Jul	Wed	--Off--			
18-Jul	Thu	--Off--			
19-Jul	Fri	B+I	321		
20-Jul	Sat	B+I	213		
21-Jul	Sun	B+I	132		
22-Jul	Mon	B+I	321	WSR, FR, AWL, INTERVIEWS	
23-Jul	Tue	--Off--			
24-Jul	Wed	--Off--			
25-Jul	Thu	B+I	213		PAYROLL
26-Jul	Fri	B+I	132		
27-Jul	Sat	B+I	321		
28-Jul	Sun	B+I	213		
29-Jul	Mon	B+I	132	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
30-Jul	Tue	--Off--			
31-Jul	Wed	--Off--			
1-Aug	Thu	B+I	321		
2-Aug	Fri	B+I	213		
3-Aug	Sat	B+I	132		
4-Aug	Sun	B+I	321		
5-Aug	Mon	B+I	213	WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	B+I	132		
7-Aug	Wed	B+I	321		
8-Aug	Thu	--Off--			
9-Aug	Fri	--Off--			
10-Aug	Sat	B+I	213		
11-Aug	Sun	B+I	132		
12-Aug	Mon	B+I	321	WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	B+I	213		
14-Aug	Wed	B+I	132		
15-Aug	Thu	B+I	321	**TIMESHEET DUE!**	
16-Aug	Fri	B+I	213		
17-Aug	Sat	--Off--			
18-Aug	Sun	--Off--			
19-Aug	Mon	B+I	132	WSR, FR, AWL, INTERVIEWS	
20-Aug	Tue	B+I	321		
21-Aug	Wed	B+I	213		
22-Aug	Thu	--Off--			
23-Aug	Fri	--Off--			
24-Aug	Sat	B+I	132		
25-Aug	Sun	B+I	321		
26-Aug	Mon	B+I	213	WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B+I	132		
28-Aug	Wed	B+I	321		PAYROLL
29-Aug	Thu	B+I	213		
30-Aug	Fri	B+I	132	**TIMESHEET DUE!**	
31-Aug	Sat	--Off--			
1-Sep	Sun	--Off--			

Appendix B 2. Homer work schedule, 2013. Duty codes include: B = biological sampling for all species, I = interview sampling, and I+L = interviews with lingcod sampling). Paperwork codes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks. Interview shifts are 1200 – 1900, biological shifts are 1400 – 2100.

Date	Day	Duty	Int Areas	Paperwork Due	Comments
16-May	Thu				Season Begins – Training
17-May	Fri	B			
18-May	Sat	B			
19-May	Sun	I	2413524		
20-May	Mon	B		WSR, FR, AWL, INTERVIEWS	
21-May	Tue	--Off--			
22-May	Wed	--Off--			
23-May	Thu	I	4135241		
24-May	Fri	I	1352413		
25-May	Sat	B			
26-May	Sun	B			
27-May	Mon	I	3524135	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B			PAYROLL
29-May	Wed	B			
30-May	Thu	B			
31-May	Fri	I	5241352	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--			
2-Jun	Sun	--Off--			
3-Jun	Mon	B		WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B			
5-Jun	Wed	--Off--			
6-Jun	Thu	--Off--			
7-Jun	Fri	I	2413524		
8-Jun	Sat	B			
9-Jun	Sun	I	4135241		
10-Jun	Mon	B		WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	I	1352413		PAYROLL
12-Jun	Wed	B			
13-Jun	Thu	B		**TIMESHEET DUE!**	
14-Jun	Fri	--Off--			
15-Jun	Sat	--Off--			
16-Jun	Sun	I	3524135		
17-Jun	Mon	B		WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	I	5241352		
19-Jun	Wed	B			
20-Jun	Thu	B			
21-Jun	Fri	I	2413524	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jun	Sat	--Off--			
23-Jun	Sun	--Off--			
24-Jun	Mon	--Off--			
25-Jun	Tue	--Off--			PAYROLL
26-Jun	Wed	I	4135241		
27-Jun	Thu	B			
28-Jun	Fri	I	1352413		
29-Jun	Sat	B			
30-Jun	Sun	B		**TIMESHEET DUE!**	
1-Jul	Mon	B		WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	I	3524135		
3-Jul	Wed	--Off--			
4-Jul	Thu	--Off--			
5-Jul	Fri	B			Observed Holiday, worked
6-Jul	Sat	I	5241352		
7-Jul	Sun	B			
8-Jul	Mon	B		WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	I	2413524		
10-Jul	Wed	I	4135241		
11-Jul	Thu	B			PAYROLL
12-Jul	Fri	--Off--			
13-Jul	Sat	--Off--			
14-Jul	Sun	B			

Appendix B2. Homer work schedule, 2013 (continued).

Date	Day	Duty	Int Areas	Paperwork Due	Comments
15-Jul	Mon	B		**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B			
17-Jul	Wed	--Off--			
18-Jul	Thu	--Off--			
19-Jul	Fri	I	1352413		
20-Jul	Sat	I	3524135		
21-Jul	Sun	B		WSR, FR, AWL, INTERVIEWS	
22-Jul	Mon	--Off--			
23-Jul	Tue	--Off--			
24-Jul	Wed	B			
25-Jul	Thu	B			PAYROLL
26-Jul	Fri	I	5241352		
27-Jul	Sat	B			
28-Jul	Sun	I	2413524		
29-Jul	Mon	B		**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
30-Jul	Tue	--Off--			
31-Jul	Wed	--Off--			
1-Aug	Thu	I	4135241		
2-Aug	Fri	I	1352413		
3-Aug	Sat	B			
4-Aug	Sun	B			
5-Aug	Mon	B		WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	I	3524135		
7-Aug	Wed	B			
8-Aug	Thu	--Off--			
9-Aug	Fri	--Off--			
10-Aug	Sat	I	5241352		
11-Aug	Sun	B			
12-Aug	Mon	B		WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	I	2413524		
14-Aug	Wed	B			
15-Aug	Thu	I	4135241	**TIMESHEET DUE!**	
16-Aug	Fri	B			
17-Aug	Sat	--Off--			
18-Aug	Sun	--Off--			
19-Aug	Mon	B		WSR, FR, AWL, INTERVIEWS	
20-Aug	Tue	I	1352413		
21-Aug	Wed	B			
22-Aug	Thu	--Off--			
23-Aug	Fri	--Off--			
24-Aug	Sat	I	3524135		
25-Aug	Sun	B			
26-Aug	Mon	B		WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B			
28-Aug	Wed	I	5241352		PAYROLL
29-Aug	Thu	--Off--			
30-Aug	Fri	--Off--			
31-Aug	Sat	B		**TIMESHEET DUE!**	
1-Sep	Sun	I	2413524		
2-Sep	Mon	B		Last day of field sampling, WSR, FR, AWL, INTERVIEWS	Holiday worked

Appendix B 3.–Central Cook Inlet work schedule, 2013. Duty codes include: B = biological sampling for all species, I = interview sampling). High tides are for Cape Ninilchik. Paperwork codes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks.

Date	Day	Duty	Loc	Shift	Paperwork Due	Comments
16-May	Thu					Training
17-May	Fri	B	Deep Cr.	1000-1600		
18-May	Sat	B	Deep Cr.	1200-1800		
19-May	Sun	I	Anchor Pt.	1200-1800		
20-May	Mon	B	Deep Cr.	1400-2000	WSR, FR, AWL, INTERVIEWS	
21-May	Tue	--Off--				
22-May	Wed	--Off--				
23-May	Thu	I	Deep Cr.	1600-2200		
24-May	Fri	I	Deep Cr.	1600-2200		
25-May	Sat	B	Anchor Pt.	1200-1800		
26-May	Sun	B	Deep Cr.	900-1500		
27-May	Mon	I	Anchor Pt.	1200-1800	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B	Anchor Pt.	1200-1800		PAYROLL
29-May	Wed	B	Deep Cr.	900-1500		
30-May	Thu	B	Anchor Pt.	1200-1800		
31-May	Fri	I	Deep Cr.	1100-1700	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--				
2-Jun	Sun	--Off--				
3-Jun	Mon	B	Deep Cr.	1500-2100	WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B	Anchor Pt.	1200-1800		
5-Jun	Wed	--Off--				
6-Jun	Thu	--Off--				
7-Jun	Fri	I	Deep Cr.	1600-2200		
8-Jun	Sat	B	Anchor Pt.	1200-1800		
9-Jun	Sun	I	Anchor Pt.	1200-1800		
10-Jun	Mon	B	Deep Cr.	900-1500	WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	I	Deep Cr.	900-1500		
12-Jun	Wed	B	Anchor Pt.	1200-1800		PAYROLL
13-Jun	Thu	B	Anchor Pt.	1200-1800	**TIMESHEET DUE!**	
14-Jun	Fri	--Off--				
15-Jun	Sat	--Off--				
16-Jun	Sun	I	Anchor Pt.	1200-1800		
17-Jun	Mon	B	Deep Cr.	1200-1800	WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	I	Deep Cr.	1300-1900		
19-Jun	Wed	B	Deep Cr.	1500-2100		
20-Jun	Thu	B	Deep Cr.	1600-2200		
21-Jun	Fri	I	Deep Cr.	1600-2200	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jun	Sat	--Off--				
23-Jun	Sun	--Off--				
24-Jun	Mon	--Off--				
25-Jun	Tue	--Off--				
26-Jun	Wed	I	Deep Cr.	900-1500		PAYROLL
27-Jun	Thu	B	Deep Cr.	900-1500		
28-Jun	Fri	I	Deep Cr.	900-1500		
29-Jun	Sat	B	Anchor Pt.	1200-1800		
30-Jun	Sun	B	Deep Cr.	1100-1700	**TIMESHEET DUE!**	
1-Jul	Mon	B	Anchor Pt.	1200-1800	WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	I	Anchor Pt.	1200-1800		
3-Jul	Wed	--Off--				
4-Jul	Thu	--Off--				
5-Jul	Fri	B	Anchor Pt.	1200-1800		Observed Holiday, worked
6-Jul	Sat	I	Anchor Pt.	1200-1800		
7-Jul	Sun	B	Anchor Pt.	1200-1800		

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Appendix B3. Central Cook Inlet work schedule, 2013 (continued).

Date	Day	Duty	Loc	Shift	Paperwork Due	Comments
8-Jul	Mon	B	Deep Cr.	900-1500	WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	I	Deep Cr.	900-1500		
10-Jul	Wed	I	Deep Cr.	900-1500		
11-Jul	Thu	B	Deep Cr.	900-1500		PAYROLL
12-Jul	Fri	--Off--				
13-Jul	Sat	--Off--				
14-Jul	Sun	B	Deep Cr.	1000-1600		
15-Jul	Mon	B	Anchor Pt.	1200-1800	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B	Deep Cr.	1200-1800		
17-Jul	Wed	--Off--				
18-Jul	Thu	--Off--				
19-Jul	Fri	I	Deep Cr.	1500-2100		
20-Jul	Sat	I	Deep Cr.	1600-2200		
21-Jul	Sun	B	Anchor Pt.	1200-1800	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jul	Mon	--Off--				
23-Jul	Tue	--Off--				
24-Jul	Wed	B	Deep Cr.	900-1500		
25-Jul	Thu	B	Deep Cr.	900-1500		PAYROLL
26-Jul	Fri	I	Deep Cr.	900-1500		
27-Jul	Sat	B	Deep Cr.	900-1500		
28-Jul	Sun	I	Anchor Pt.	1200-1800		
29-Jul	Mon	B	Deep Cr.	1100-1700	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
30-Jul	Tue	--Off--				
31-Jul	Wed	--Off--				
1-Aug	Thu	I	Deep Cr.	1500-2100		
2-Aug	Fri	I	Deep Cr.	1600-2200		
3-Aug	Sat	B	Anchor Pt.	1200-1800		
4-Aug	Sun	B	Deep Cr.	1600-2200		
5-Aug	Mon	B	Deep Cr.	1600-2200	WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	I	Anchor Pt.	1200-1800		
7-Aug	Wed	B	Deep Cr.	1300-1900		
8-Aug	Thu	--Off--				
9-Aug	Fri	--Off--				
10-Aug	Sat	I	Deep Cr.	900-1500		
11-Aug	Sun	B	Deep Cr.	900-1500		
12-Aug	Mon	B	Anchor Pt.	1200-1800	WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	I	Deep Cr.	1000-1600		
14-Aug	Wed	B	Anchor Pt.	1200-1800		
15-Aug	Thu	I	Deep Cr.	1300-1900	**TIMESHEET DUE!**	
16-Aug	Fri	B	Deep Cr.	1400-2000		
17-Aug	Sat	--Off--				
18-Aug	Sun	--Off--				
19-Aug	Mon	B	Deep Cr.	1500-2100	WSR, FR, AWL, INTERVIEWS	
20-Aug	Tue	I	Deep Cr.	1500-2100		
21-Aug	Wed	B	Deep Cr.	1200-1800		
22-Aug	Thu	--Off--				
23-Aug	Fri	--Off--				
24-Aug	Sat	I	Deep Cr.	900-1500		
25-Aug	Sun	B	Deep Cr.	900-1500		
26-Aug	Mon	B	Deep Cr.	900-1500	WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B	Deep Cr.	1000-1600		
28-Aug	Wed	I	Deep Cr.	1100-1700		PAYROLL
29-Aug	Thu	B	Anchor Pt.	1200-1800		
30-Aug	Fri	I	Anchor Pt.	1200-1800	**TIMESHEET DUE!**	

Appendix B 4.–Seward work schedule, 2013. Duty codes include: B = biological sampling for all species, L = lingcod sampling only, I = interview sampling). Paperwork codes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks. Bio shifts are 1500 – 2200 hours.

Date	Day	Duty	Int Areas	Int Hours	Paperwork Due	Comments
16-May	Thu	I	3412341	1400-2100		
17-May	Fri	B				
18-May	Sat	B				
19-May	Sun	I	4123412	1400-2100		
20-May	Mon	B			WSR, FR, AWL, INTERVIEWS	
21-May	Tue	--Off--				
22-May	Wed	--Off--				
23-May	Thu	B				
24-May	Fri	I	1234123	1400-2100		
25-May	Sat	I	2341234	1400-2100		
26-May	Sun	B				
27-May	Mon	I	3412341	1400-2100	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B				PAYROLL
29-May	Wed	B				
30-May	Thu	B				
31-May	Fri	I	4123412	1400-2100	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--				
2-Jun	Sun	--Off--				
3-Jun	Mon	B			WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B				
5-Jun	Wed	--Off--				
6-Jun	Thu	--Off--				
7-Jun	Fri	I	1234123	1400-2100		
8-Jun	Sat	B				
9-Jun	Sun	I	2341234	1400-2100		
10-Jun	Mon	B			WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	I	3412341	1400-2100		
12-Jun	Wed	B				PAYROLL
13-Jun	Thu	B			**TIMESHEET DUE!**	
14-Jun	Fri	--Off--				
15-Jun	Sat	--Off--				
16-Jun	Sun	I	4123412	1400-2100		
17-Jun	Mon	B			WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	I	1234123	1400-2100		
19-Jun	Wed	B				
20-Jun	Thu	B				
21-Jun	Fri	I	2341234	1400-2100		
22-Jun	Sat	--Off--				
23-Jun	Sun	--Off--				
24-Jun	Mon	B			WSR, FR, AWL, INTERVIEWS	
25-Jun	Tue	I	3412341	1400-2100		
26-Jun	Wed	B				PAYROLL
27-Jun	Thu	--Off--				
28-Jun	Fri	--Off--				
29-Jun	Sat	I	4123412	1400-2100		
30-Jun	Sun	B			**TIMESHEET DUE!**	
1-Jul	Mon	B			WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	I	1234123	1400-2100		
3-Jul	Wed	--Off--				
4-Jul	Thu	--Off--				
5-Jul	Fri	B				Observed Holiday, worked
6-Jul	Sat	I	2341234	1400-2100		
7-Jul	Sun	B				
8-Jul	Mon	B			WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	I	3412341	1400-2100		
10-Jul	Wed	I	4123412	1400-2100		
11-Jul	Thu	B				PAYROLL
12-Jul	Fri	--Off--				
13-Jul	Sat	--Off--				
14-Jul	Sun	B				

Appendix B4.–Seward work schedule, 2013 (continued).

Date	Day	Duty	Int Areas	Int Hours	Paperwork Due	Comments
15-Jul	Mon	B			**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B				
17-Jul	Wed	--Off--				
18-Jul	Thu	--Off--				
19-Jul	Fri	I	1234123	1400-2100		
20-Jul	Sat	I	2341234	1400-2100		
21-Jul	Sun	B			SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jul	Mon	--Off--				
23-Jul	Tue	--Off--				
24-Jul	Wed	B				
25-Jul	Thu	B				PAYROLL
26-Jul	Fri	I	3412341	1400-2100		
27-Jul	Sat	B				
28-Jul	Sun	I	4123412	1400-2100		
29-Jul	Mon	B			**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
30-Jul	Tue	--Off--				
31-Jul	Wed	--Off--				
1-Aug	Thu	I	1234123	1400-2100		
2-Aug	Fri	I	2341234	1400-2100		
3-Aug	Sat	B				
4-Aug	Sun	B				
5-Aug	Mon	B			WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	I	3412341	1400-2100		
7-Aug	Wed	B				
8-Aug	Thu	--Off--				
9-Aug	Fri	--Off--				
10-Aug	Sat	I	4123412	1400-2100		
11-Aug	Sun	B				
12-Aug	Mon	B			WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	I	1234123	1400-2100		
14-Aug	Wed	B				
15-Aug	Thu	I	2341234	1400-2100	**TIMESHEET DUE!**	
16-Aug	Fri	B			SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
17-Aug	Sat	--Off--				
18-Aug	Sun	--Off--				
19-Aug	Mon	--Off--				
20-Aug	Tue	--Off--				
21-Aug	Wed	I	3412341	1400-2100		
22-Aug	Thu	B				
23-Aug	Fri	I	4123412	1400-2100		
24-Aug	Sat	B				
25-Aug	Sun	B				
26-Aug	Mon	B			WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B				
28-Aug	Wed	I	1234123	1400-2100		PAYROLL
29-Aug	Thu	--Off--				
30-Aug	Fri	--Off--				
31-Aug	Sat	B			**TIMESHEET DUE!**	
1-Sep	Sun	I	2341234	1400-2100		
2-Sep	Mon	B			WSR, FR, AWL, INTERVIEWS	Holiday worked
3-Sep	Tue				Closing Port.	

Appendix B 5.–Whittier work schedule, 2013. Duty code B+I indicates concurrent biological and interview sampling. Paperwork codes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks. Hours for all shifts are 1500-2200 hours.

Date	Day	Duty	Paperwork Due	Comments
22-May	Wed	B		
23-May	Thu	B		
24-May	Fri	I		
25-May	Sat	B		
26-May	Sun	I		
27-May	Mon	I	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B		PAYROLL
29-May	Wed	B		
30-May	Thu	B		
31-May	Fri	I	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--		
2-Jun	Sun	--Off--		
3-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B		
5-Jun	Wed	--Off--		
6-Jun	Thu	--Off--		
7-Jun	Fri	I		
8-Jun	Sat	B		
9-Jun	Sun	I		
10-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	I		
12-Jun	Wed	B		PAYROLL
13-Jun	Thu	B	**TIMESHEET DUE!**	
14-Jun	Fri	--Off--		
15-Jun	Sat	--Off--		
16-Jun	Sun	I		
17-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	--Off--		
19-Jun	Wed	--Off--		
20-Jun	Thu	B		
21-Jun	Fri	I		
22-Jun	Sat	I		
23-Jun	Sun	B		
24-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
25-Jun	Tue	--Off--		
26-Jun	Wed	--Off--		PAYROLL
27-Jun	Thu	I		
28-Jun	Fri	I		
29-Jun	Sat	B		
30-Jun	Sun	B	**TIMESHEET DUE!**	
1-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	I + L		
3-Jul	Wed	--Off--		
4-Jul	Thu	--Off--		
5-Jul	Fri	B		Observed Holiday, worked
6-Jul	Sat	I + L		
7-Jul	Sun	B		
8-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	I + L		
10-Jul	Wed	I + L		
11-Jul	Thu	B		PAYROLL
12-Jul	Fri	--Off--		
13-Jul	Sat	--Off--		
14-Jul	Sun	B		
15-Jul	Mon	B	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B		
17-Jul	Wed	--Off--		
18-Jul	Thu	--Off--		
19-Jul	Fri	I + L		
20-Jul	Sat	I + L		
21-Jul	Sun	B		

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Appendix B5.–Whittier work schedule, 2013 (continued).

Date	Day	Duty	Paperwork Due	Comments
22-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	
23-Jul	Tue	I + L		
24-Jul	Wed	B		
25-Jul	Thu	B		PAYROLL
26-Jul	Fri	I + L	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
27-Jul	Sat	--Off--		
28-Jul	Sun	--Off--		
29-Jul	Mon	--Off--		
30-Jul	Tue	--Off--		
31-Jul	Wed	I + L	**TIMESHEET DUE!**	
1-Aug	Thu	B		
2-Aug	Fri	I + L		
3-Aug	Sat	B		
4-Aug	Sun	B		
5-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	I + L		
7-Aug	Wed	B		
8-Aug	Thu	--Off--		
9-Aug	Fri	--Off--		
10-Aug	Sat	I + L		
11-Aug	Sun	B		
12-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	I + L		
14-Aug	Wed	B		
15-Aug	Thu	I + L	**TIMESHEET DUE!**	
16-Aug	Fri	B		
17-Aug	Sat	--Off--		
18-Aug	Sun	--Off--		
19-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
20-Aug	Tue	I + L		
21-Aug	Wed	B		
22-Aug	Thu	--Off--		
23-Aug	Fri	--Off--		
24-Aug	Sat	I + L		
25-Aug	Sun	B		
26-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B		
28-Aug	Wed	I + L		PAYROLL
29-Aug	Thu	B		
30-Aug	Fri	I	**TIMESHEET DUE! PORT CLOSING**	
31-Aug	Sat	--Off--		
1-Sep	Sun	--Off--		

Appendix B 6.–Valdez work schedule, 2013. Duty codes include: B = biological sampling for all species, L = lingcod sampling only, I = interview sampling, and I+L = interviews with lingcod sampling.). Paperwork codes include: WSR = weekly sampling report and WFR = fishing report. Horizontal lines delineate workweeks. Hours for all shifts are 1500-2200 hours.

Date	Day	Duty	Paperwork Due	Comments
22-May	Wed	B		
23-May	Thu	B		
24-May	Fri	I		
25-May	Sat	B		
26-May	Sun	I		
27-May	Mon	I	WSR, FR, AWL, INTERVIEWS	Holiday worked
28-May	Tue	B		PAYROLL
29-May	Wed	B		
30-May	Thu	B		
31-May	Fri	I	**TIMESHEET DUE!**	
1-Jun	Sat	--Off--		
2-Jun	Sun	--Off--		
3-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
4-Jun	Tue	B		
5-Jun	Wed	--Off--		
6-Jun	Thu	--Off--		
7-Jun	Fri	I		
8-Jun	Sat	B		
9-Jun	Sun	I		
10-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
11-Jun	Tue	I		
12-Jun	Wed	B		PAYROLL
13-Jun	Thu	B	**TIMESHEET DUE!**	
14-Jun	Fri	--Off--		
15-Jun	Sat	--Off--		
16-Jun	Sun	I		
17-Jun	Mon	B	WSR, FR, AWL, INTERVIEWS	
18-Jun	Tue	I		
19-Jun	Wed	B		
20-Jun	Thu	B		
21-Jun	Fri	I	SUBMIT WSR, FR, AWL, INTERVIEWS EARLY	
22-Jun	Sat	--Off--		
23-Jun	Sun	--Off--		
24-Jun	Mon	--Off--		
25-Jun	Tue	--Off--		
26-Jun	Wed	I		PAYROLL
27-Jun	Thu	B		
28-Jun	Fri	I		
29-Jun	Sat	B		
30-Jun	Sun	B	**TIMESHEET DUE!**	
1-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	**LINGCOD SEASON OPENS**
2-Jul	Tue	I + L		
3-Jul	Wed	--Off--		
4-Jul	Thu	--Off--		
5-Jul	Fri	B		Observed Holiday, worked
6-Jul	Sat	I + L		
7-Jul	Sun	B		
8-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	
9-Jul	Tue	I + L		
10-Jul	Wed	I + L		
11-Jul	Thu	B		PAYROLL
12-Jul	Fri	--Off--		
13-Jul	Sat	--Off--		
14-Jul	Sun	B		
15-Jul	Mon	B	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
16-Jul	Tue	B		
17-Jul	Wed	--Off--		
18-Jul	Thu	--Off--		
19-Jul	Fri	I + L		
20-Jul	Sat	I + L		
21-Jul	Sun	B		

Appendix B6. Valdez work schedule, 2013 (continued).

Date	Day	Duty	Paperwork Due	Comments
22-Jul	Mon	B	WSR, FR, AWL, INTERVIEWS	
23-Jul	Tue	--Off--		
24-Jul	Wed	--Off--		
25-Jul	Thu	B		PAYROLL
26-Jul	Fri	I + L		
27-Jul	Sat	I + L		
28-Jul	Sun	B		
29-Jul	Mon	B	**WSR, FR, AWL, INTERVIEWS TIMESHEET DUE!**	
30-Jul	Tue	--Off--		
31-Jul	Wed	--Off--		
1-Aug	Thu	I + L		
2-Aug	Fri	I + L		
3-Aug	Sat	B		
4-Aug	Sun	B		
5-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
6-Aug	Tue	I + L		
7-Aug	Wed	B		
8-Aug	Thu	--Off--		
9-Aug	Fri	--Off--		
10-Aug	Sat	I + L		
11-Aug	Sun	B		
12-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	PAYROLL
13-Aug	Tue	I + L		
14-Aug	Wed	B		
15-Aug	Thu	I + L	**TIMESHEET DUE!**	
16-Aug	Fri	B		
17-Aug	Sat	--Off--		
18-Aug	Sun	--Off--		
19-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
20-Aug	Tue	I + L		
21-Aug	Wed	B		
22-Aug	Thu	--Off--		
23-Aug	Fri	--Off--		
24-Aug	Sat	I + L		
25-Aug	Sun	B		
26-Aug	Mon	B	WSR, FR, AWL, INTERVIEWS	
27-Aug	Tue	B		
28-Aug	Wed	I + L		PAYROLL
29-Aug	Thu	--Off--		
30-Aug	Fri	--Off--		
31-Aug	Sat	B	**TIMESHEET DUE!**	
1-Sep	Sun	I		
2-Sep	Mon	B	WSR, FR, AWL, INTERVIEWS	Holiday worked
3-Sep	Tue	B		
4-Sep	Wed		clean up gear, close down port	

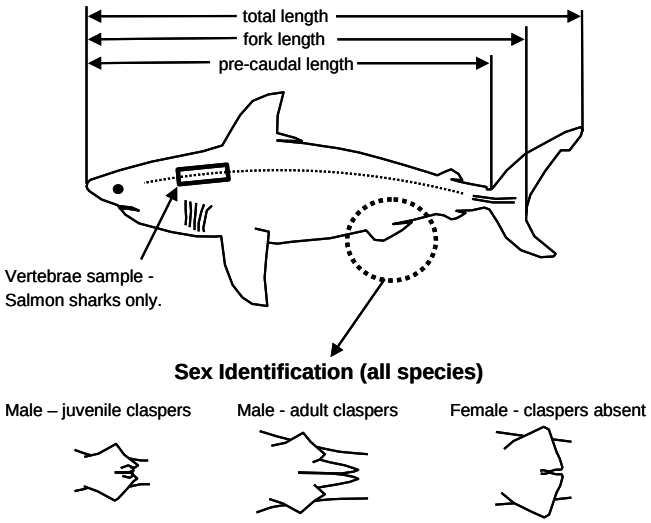
Appendix C 1. Shark data collection procedures, 2013.

Alaska Department of Fish and Game
Division of Sport Fish

Shark Data Collection

Salmon shark:

1. Record the following data on data form:
   - Port, Date, User Group (private/charter).
   - Total, fork, and pre-caudal lengths (cm)
   - Sex (see below) and male clasper lengths of salmon sharks
   - Lat / long (preferred) or stat area of capture
2. Remove a 6-inch long piece of vertebrae and freeze in ziplock with data form.



Spiny dogfish:

1. Record the following data on small coin envelope:
   - Port, Date, User Group (private/charter).
   - Total length (cm) and Round Wt (kg)
   - Sex (see above)
   - Lat / long (preferred) or stat area of capture
2. Remove the posterior dorsal fin spine and place in coin envelope.

Sleeper and other sharks:

Record the following data on small coin envelope:
- Species
- Port, Date, User Group (private/charter).
- Total length (cm)
- Sex (see above)
- Lat / long (preferred) or stat area of capture

Appendix D 1**.** Standardized procedures and questions for angler interviews, 2013.

1) Introduction and background:

Example Question	Background Info
"Hi, I'm XXX with the Alaska Department of Fish and Game. Would you be willing to provide some information about your fishing trip today to assist the department with fishery monitoring?	Introduce yourself as a department employee gathering information for fishery monitoring. If they refuse to participate, thank them and move on to the next interview. You can skip the intro once you have established a rapport with a charter operator.

2) Establish whether you should complete the interview: you will interview anyone who fishes for halibut, other bottomfish, or sharks, or catches one of these species while targeting salmon.

Example Question	Background Info
"What species were you fishing for today?"	1. If they targeted halibut, rockfish, lingcod or other bottomfish (including sharks), record the appropriate target species category and continue with the interview. Ask follow up questions to correctly classify the target. For example, if their initial response is "halibut," ask if they targeted any other species for a portion of the trip. 2. If they were NOT targeting one of the species listed, proceed with the next question.
"Did you catch any halibut, rockfish, lingcod, or sharks while targeting salmon?"	1. If "yes," record the target and complete the interview. 2. If "no," abort the interview and thank them for cooperating.

3) Collect user, effort, and area information:

Example Question	Background Info
"Was this a charter (guided) or private fishing trip?"	Remember that when guides take friends or other people fishing for free, it's a private trip. If any of the anglers are paying clients, consider it a charter trip and validate the halibut harvest if you can.
"What is your boat name?"	Charter boats only – no need to record boat names of private boats.
"What is your logbook number?	Charter boats only - Record the 6-digit number stamped in the upper right corner of the logbook (valid numbers are 130000-133200)
"Is this your first trip of the day?"	Record whether this was the boat's first or second trip of the day (some charter boats make 2 trips per day).
"Were you out for more than one day?"	If they were out for portions of more than one calendar day, record the number of days where fishing occurred. For example, if the boat was out for a week but people only fished 3 days, enter three days.
"In which stat area were most of your fish caught?"	Show them the stat area map and help identify landmarks, particularly the 3-nautical-mile line. If necessary follow up with more specific questions regarding location and depth to get the correct stat area. Reassure reluctant people that the information is confidential, and that we're not looking for specific spots, but rather only stat areas.

-Continued-

Appendix D1. (Continued)

"Were you fishing north or south of a line connecting Cape Resurrection and Cape Aialik?"	**Seward only** – This question needs to be asked if the anglers report fishing in stat areas 495932 or 495938. Record the response as either (1) Inside Res. Bay, (2) Outside Res. Bay, or (3) Both. All other interviews should be coded as Outside.
"How many clients or comps were fishing?" ("Comps" are people that fished for free)	Record the number of **angler-days, not anglers.** An angler-day is defined as an angler fishing any portion of a day. If the boat was only out for one day, the number of anglers is the number of angler-days. If the boat was out for more than one day, sum the number of people that fished each day to get the total angler-days. Count anyone on board the vessel, including people that fished for free, if they fished for at least 30 minutes or caught any fish.
"Did the skipper or deckhands fish also?"	Record the number of angler-days for captain and crew as above. Captain and crew are allowed to fish in 2013.
"What time did you start fishing at your first spot?…What time did you stop fishing at your last spot?"	Use the answers to determine the time spent fishing and moving between fishing spots. If a multi-day trip, record the total for all days. Do not include large chunks of time spent in other activities when no gear was in the water. Record fishing time to the nearest 15 minutes (0.25 hours).

4) Collect catch and harvest information: Start by asking whether they caught anything at all. Once you start into these questions, periodically ask if they caught any other fish in order to expedite the interview. Probe for additional information until you are sure they accurately identified the fish they caught. For multi-day trips record the totals for the entire trip.

Example Question	Background Info
"How many halibut did you keep (harvest)?"	Record total harvest for the boat-party, including fish cleaned or eaten at sea. Enter the sum for the entire trip, even if it lasted more than 1 day. If all of the halibut that were harvested are available and in sight, count them and enter a "Y" in the HA_KPT_VER field to indicate that the halibut harvest was verified, otherwise enter "N." The harvest should not exceed 2 times the number of client or comp angler-days. Proxy fishing is not allowed for halibut.
"Of the halibut you kept, how many did you clean at sea?"	The question is asked assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of halibut kept.
"How many halibut did you release that were caught on circle hooks?" *"How many halibut did you release that were caught on all other hook types?"*	These questions may be difficult for private anglers and charter skippers to recall. Ask them to estimate as close as possible. The questions about hook use will be used in the estimation of release mortality.

-Continued-

Appendix D1. (Continued)

"How many pelagic rockfish did you keep?"	Pelagic assemblage includes primarily black, dusky, and yellowtail rockfish ("black bass"). -If all of the pelagic rockfish that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the pelagic rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of pelagic rockfish kept.
"How many pelagic rockfish were released at the surface?"	Include all pelagic rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many pelagic rockfish did you release at depth?"	Include all pelagic rockfish released at depth with a deepwater release mechanism, even dead fish.
"How many pelagic rockfish were vented or fizzed?"	Include all pelagic rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the pelagic rockfish you released?"	Reiterate that this is the depth of capture for pelagic rockfish released, not kept. This may be difficult for anglers and charter operators to estimate, but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many yelloweye rockfish did you keep?"	If all the yelloweye rockfish that were harvested are available and in sight, count them and enter a "Y" in the validation field.
"Of the yelloweye rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of yelloweye rockfish kept.
"How many yelloweye rockfish were released at the surface?"	Include all yelloweye rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many yelloweye rockfish did you release at depth?"	Include all yelloweye rockfish released at depth with a deepwater release mechanism, even dead fish.
"How many yelloweye rockfish were vented or fizzed?"	Include all yelloweye rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the yelloweye rockfish you released?"	Reiterate that this is the depth of capture for yelloweye rockfish released, not kept. This may be difficult for anglers and charter operators to estimate, but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many other (non-pelagic) rockfish did you keep?"	If all of the non-pelagic rockfish (not including yelloweye) that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the other non-pelagic rockfish you kept, how many did you clean at sea?"	The question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of non-pelagic rockfish kept.

-Continued-

Appendix D1. (Continued)

"How many other (non-pelagic) rockfish were released at the surface?"	Include all other (non-pelagic) rockfish released at the surface (even dead fish), except those that were vented or fizzed.
"How many other (non-pelagic) rockfish did you release at depth?"	Include all other (non-pelagic) rockfish released at depth with a deepwater release mechanism, even dead fish.
"How many other (non-pelagic) rockfish were vented or fizzed?"	Include all other (non-pelagic) rockfish that were vented or fizzed then released, even dead fish. Venting or fizzing refers to the practice of puncturing the swim bladder to allow the fish to submerge.
"What was the average depth of capture for the non-pelagic rockfish you released?"	Reiterate that this is the depth of capture for non-pelagic rockfish released, not kept. This may be difficult for anglers and charter operators to estimate, but ask them to take their best guess. This information will be used for estimation of rockfish mortality.
"How many lingcod did you keep?"	If all of the lingcod that were harvested are available and in sight, count them and enter "Y" in the validation field.
"Of the lingcod you kept, how many did you clean at sea?"	Again, the question is asked to assess the accuracy of our sampling program by knowing what fraction of harvest is available for sampling. This number cannot exceed the number of lingcod kept.
"How many lingcod 35 inches and larger did you release?" *"How many lingcod less than 35 inches did you release?"*	Include all lingcod released, regardless of release condition. The questions are broken down by size category for stock assessment purposes.
"How many Pacific cod (or gray cod) did you keep?"	Include all cod killed and cut up for bait. Validate numbers if fish are available. Do not include Walleye Pollock or sablefish (black cod), you will ask the same questions for both species as you are asking for Pacific cod.
"Of the Pacific cod you kept, how many did you clean at sea?"	This number cannot exceed the number of Pacific cod kept, but should include all Pacific cod killed and cut up for bait.
"How many Pacific cod (gray cod) did you release?"	Include all cod released, regardless of release condition.
"How many sablefish (or black cod) did you keep?"	Validate numbers if fish are available. Do not include Walleye Pollock or Pacific (grey) cod.
"Of the sablefish you kept, how many did you clean at sea?"	This number cannot exceed the number of sablefish kept.
"How many sablefish did you release?"	Include all sablefish released, regardless of release condition.
"How many walleye Pollock did you keep?"	Validate numbers if fish are available. Do not include sablefish (black cod) or Pacific (grey) cod.
"Of the Pollock you kept, how many did you clean at sea?"	This number cannot exceed the number of walleye Pollock kept.
"How many pollock did you release?"	Include all Pollock released, regardless of release condition.

At this point you can simply ask if any sharks were caught. If any were, repeat the last three questions for all applicable shark species.

Appendix D2.–Data fields for DataPlus Professional interview data application program deployed on an Allegro CX field PC (Juniper Systems). (DataPlus CE Professional is Version 3.05.0).

Field	Description	Format	Valid entries
PORT	Port of landing (except is sublocation in CCI application)	Text	Kodiak, Homer, DC (Deep Creek), AP (Anchor Point), Seward, Whittier, Valdez
DATE	Date	MM/DD/YEAR	Autoentry
NAME	Name of port sampler	Text	
SURVEYAREA	Standard SF Division site codes	Text	Autoentry
BOATNAME	Name of boat	Text	
LOGBOOK	ADF&G logbook number	Integer	130000 - 133200
INT_TIME	Time of interview	HHMMSS	Autoentry
TRIP	First or second trip of the day	Integer	1 or 2
TOT_DAYS	Duration of trip in days (number of days fishing)	Integer	1-9
USER_GRP	User group (charter/private)	Text	C or P
TARGET	Target species category	Text	B (bottomfish), B+S (bottomfish & salmon), H (halibut), L (lingcod), R (rockfish), S (salmon), SSK (salmon shark), O (other finfish – must describe the target finfish in comments section)
STATAREA	ADF&G groundfish statistical area	Integer 6	Port-specific values in drop down list
INT_AREA	Interview area; varies by harbor	Integer	1-5
IN_OUT_BAY	Use to indicate whether the boat was fishing inside or outside Resurrection Bay (or both)	Text	I (inside), O (outside), B (both)
CLIENTDAYS	Number of angler-days of effort by clients and comps (anglers that fish for free)	Integer	1-30
CREW_DAYS	Number of angler-days of effort by skipper and crew	Integer	0-9
HOURSFISHED	Number of hours of fishing time – time spent fishing and moving between fishing spots.	HH:MM (nearest 15 min)	0.25-99.99
HA_KPT	Number of halibut kept	Integer	0-60 with bag limit check
HA_KPT_VER	Verified the number of halibut kept	Text	Y (yes) or N (no)
HA_CAS	Number of halibut cleaned at sea	Integer	0-60
HA_REL_CIR	Number of halibut released that were caught on circle hooks	Integer	0-99
HA_REL_OTH	Number of halibut released that were caught on all other hook types	Integer	0-99
P_KPT	Number of pelagic rockfish kept	Integer	0-150 with bag limit check
P_KPT_VER	Verified the number of pelagic rockfish kept	Text	Y (yes) or N (no)
P_CAS	Number of pelagic rockfish cleaned at sea	Integer	0-150
P_R_SURF	Number of pelagic rockfish released at the surface except those fish that were vented or fizzed.	Integer	0-99
P_R_DRM	Number of pelagic rockfish released at the depth of capture with deepwater release mechanism	Integer	0-99
P_R_VENT	Number of pelagic rockfish vented or fizzed and then released.	Integer	0-99
P_R_DEPTH	Average depth of capture (in feet) for pelagic rockfish that were released	Integer	0-999
YE_KPT	Number of yelloweye rockfish kept	Integer	0-150 with bag limit check
YE_KPT_VER	Verified the number of pelagic rockfish kept	Text	Y (yes) or N (no)
YE_CAS	Number of yelloweye rockfish cleaned at sea	Integer	0-150
YE_R_SURF	Number of yelloweye rockfish released at the surface except those fish that were vented or fizzed	Integer	0-99
YE_R_DRM	Number of yelloweye rockfish released at the depth of capture with a deepwater release mechanism.	Integer	0-99
YE_R_VENT	Number of yelloweye rockfish vented or fizzed and then released.	Integer	0-99

Appendix D2. (Continued)

YE_R_DEPTH	Average depth of capture (in feet) for yelloweye rockfish that were released	Integer	0-999
NP_KPT	Number of other non-pelagic rockfish kept	Integer	0-30 with bag limit check *
NP_KPT_VER	Verified the number of other non-pelagic rockfish kept	Text	Y (yes) or N (no)
NP_CAS	Number of other non-pelagic rockfish cleaned at sea	Integer	0-30
NP_R_SURF	Number of other non-pelagic rockfish released at the surface except those that were vented or fizzed.	Integer	0-99
NP_R_DRM	Number of other non-pelagic rockfish that were released at the depth of capture with a deepwater release mechanism.	Integer	0-99
NP_R_VENT	Number of other non-pelagic rockfish that were vented or fizzed then released.	Integer	0-99
NP_R_DEPTH	Average depth of capture (in feet) for other non-pelagic rockfish that were released	Integer	0-999
LC_KPT	Number of lingcod kept	Integer	0-60 with bag limit check*
LC_KPT_VER	Verified the number of lingcod kept	Text	Y (yes) or N (no)
LC_CAS	Number of lingcod cleaned at sea	Integer	0-60
LC_REL_OVR	Number of lingcod released that were 35 inches or greater in total length	Integer	0-99
LC_REL_UND	Number of lingcod released that were under 35 inches total length	Integer	0-99
PCOD_KPT	Number of Pacific cod kept, includes those used for bait.	Integer	0-99
PCOD_KPT_VER	Verified the number of Pacific cod kept	Text	Y (yes) or N (no)
PCOD_CAS	Number of Pacific cod cleaned at sea (include those caught and used for bait)	Integer	0-99
PCOD_REL	Number of Pacific cod released	Integer	0-99
SAB_KPT	Number of sablefish (black cod) kept	Integer	0-99
SAB_KPT_VER	Verified the number of sablefish kept	Text	Y (yes) or N (no)
SAB_CAS	Number of sablefish cleaned at sea	Integer	0-99
SAB_REL	Number of sablefish released	Integer	0-99
POL_KPT	Number of Pollock kept	Integer	0-99
POL_KPT_VER	Verified the number of Pollock kept	Text	Y (yes) or N (no)
POL_CAS	Number of Pollock cleaned at sea	Integer	0-99
POL_REL	Number of Pollock released	Integer	0-99
SS_KPT	Number of salmon sharks kept	Integer	0-99
SS_KPT_VER	Verified the number of salmon sharks kept	Text	Y (yes) or N (no)
SS_CAS	Number of salmon sharks cleaned at sea	Integer	0-99
SS_REL	Number of salmon sharks released	Integer	0-99
SD_KPT	Number of spiny dogfish kept	Integer	0-99
SD_KPT_VER	Verified the number of spiny dogfish kept	Text	Y (yes) or N (no)
SD_CAS	Number of spiny dogfish cleaned at sea	Integer	0-99
SD_REL	Number of spiny dogfish released	Integer	0-999
SLP_KPT	Number of sleeper sharks kept	Integer	0-99
SLP_KPT_VER	Verified the number of sleeper sharks kept	Text	Y (yes) or N (no)
SLP_CAS	Number of sleeper sharks cleaned at sea	Integer	0-99
SLP_REL	Number of sleeper sharks released	Integer	0-99
COMMENTS	Unrestricted comments.	Text	

Appendix E1.–Gulf of Alaska Bottomfish (GOAB) age-reader precision standards memo.

ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF SPORT FISH

MEMORANDUM

TO: Jack Erickson **DATE:** January 10, 2009

FROM: Barbi J. Failor **TELEPHONE: (907) 235-1731**

SUBJECT: GOAB Age-Reader Precision Standards

In researching the history of the age determination portion of the Gulf of Alaska Bottomfish Assessment Program (GOAB), it has been determined that standards need to be documented in order for an age-reader to progress from the training and calibration level of ageing to production level ageing. This memo covers the current training process (including precision thresholds, training time and calibration sets), options for specifying objective criteria, standards utilized in other in-state age programs, and proposed age-reader agreement standards for the Gulf of Alaska Bottomfish Assessment Program.

The current training process utilized in the GOAB ageing program begins with the new personnel reviewing the CARE (Committee of Age-Reading Experts) Ageing manual. This manual provides an excellent overview and introduction to age structure preparation, storage, and ageing procedures. Following review of the CARE manual, the trainee ageing technician will spend time at the teaching scope with an experienced reader looking at prepared age structures to begin learning about the age structures and associated patterns to look for when ageing. Initial time at the teaching scope may range from two hours to a full day but on average will be three to four hours. Following the trainee's introduction at the scope, he or she is given a prepared set of age structures to assign ages to. Upon completion of the first set of age structures, ages are compared with ages assigned by an experienced reader (between reader calibration), at which point structures with discrepancies are taken to the teaching scope to be resolved. This pattern continues until the trainee reaches a set of mainly qualitative thresholds of precision which differ a bit dependent on species and age structure utilized.

The precision thresholds for repeatability are analyzed both between readers (between reader drift and calibration precision testing) and within a readers own assigned ages (within reader precision testing) in determination of whether a trainee is ready to move on to production ageing. We take into consideration not only percent agreement (both within and between reader) but also the distribution of errors. New age readers train with experienced agers until precision rates fall within acceptable levels. The problem is that these precision levels are subjective targets, unrelated to any documented scientific approach. Preferred percent agreement for the GOAB program (both between and within readers) for black rockfish has been 66-70% with 90% of errors falling within ±1 year. For all other species 50% agreement is desired with 90% of errors falling within ± 2 years. In summarizing the distribution of errors, it is desirable that the error distribution has a mode of zero and that these differences are

unbiased and roughly symmetrical about that mode of zero. Error distribution plots, age bias plots and chi-square tests for bias between readers have been utilized in this regard.

Time to production ageing from beginning trainee differs dependent on the species being aged, but for black, dusky and dark rockfish a trainee will typically begin production ageing within 5 days. For yelloweye rockfish this may be as long as 7-9 days on average. Miscellaneous rockfish species are more difficult to age, but typically aged last and at this point yelloweye ageing has prepared the ager to move directly into ageing the misc rockfish species with no time needed for calibration. Lingcod are aged by means of mounted thin sections of dried prepared fin-ray spines. Preparation of the lingcod fin-rays allows the ager to become familiar with the fin-ray annuli, and calibration for lingcod fin-rays takes 2-3 days on average following extensive age-structure preparation time. Experienced agers typically re-calibrate within 2-3 days then move on to production ageing. As GOAB age determination is only conducted seasonally, age readers must re-calibrate each season with previously aged age structure, for most of the species aged as noted above.

Ideally, for training purposes, there would be a reference set of age structures for each species. In the absence of a reference set of age structures, structures with ages already assigned by an experienced reader are used for training. Utilizing previously aged sets of rockfish otoliths in training works for a time, but degradation of the age structure over multiple bakings, cleanings and general handling can introduce error in the age estimation process. The development of reference sets of rockfish otoliths would benefit the age program in providing a consistent standard for training new agers and for the continued evaluation of experienced readers. A reference set of thin section mounts of rockfish otoliths aged by several experienced agers can also be used to standardize ages from different readers using a classification matrix which would be useful considering the high turnover in seasonal staff. Sectioned and mounted lingcod fin-rays provide the basis for development of a reference set for lingcod, however, fin-ray interpretation can be challenging with the prominence of resorbed annuli occurring in the fin-rays. The GOAB program is beginning to investigate the differences between the use of thin sectioned lingcod fin-rays and lingcod otoliths in obtaining the most accurate and precise age estimates.

There are options to consider when specifying precision criteria for a trainee age reader to move on to production ageing such as average percent error (APE), percent agreement, acceptable limits of error (e.g. percentage of errors lying within ± 2 yrs), age bias plots, chi-square test for bias between age readers and available time/funding for age determination personnel. Precision standards and training time allowed to meet these standards vary due to the nature of the ageing program.

The ADF&G Commercial Fisheries Age Determination Unit (ADU) utilizes APE as their measure of precision and has a desired APE for not only each species of fish, but in some instances by separate stocks of a species. While APE appears to be the determinant as to whether a trainee is ready to advance to production ageing, this says nothing about the associated bias. The ADU is a year-round ageing facility and this is all the dedicated (ageing) staff does, so their precision standards are fairly tight though undocumented. The ADU can spend up to three or four months training and calibrating a new staff member before the ager is ready to move into production ageing though some will not show an aptitude for ageing and this is the time period used for determining the presence or absence of that aptitude.

ADF&G's Commercial Fisheries unit in Homer does not have precision standards, but has had a consistent pair of agers for several years and tracks within-reader agreement using percent agreement and tracking of year classes. It has been quite some time since they had a new age reader to train. Bi-annually the FB I in the program travelled to the Juneau ADU to conduct training and age validation exercises. This training shows their precision remains consistent and allows for correction of straying in ageing on a regular basis.

All three programs (ADU, Homer Comm. Fish, and GOAB) conduct exchanges of age structures and attend the Committee of Age Reading Experts (CARE) meetings to keep abreast of the latest developments in age reading technologies and work to resolve inter-agency discrepancies in ageing. Age structure exchanges also allow for age validation and evaluation of drifting between departments and agencies helping to ensure that those conducting training of new age readers are not introducing new sources of error.

Appendix E1. (continued).

Overall, choosing criteria by which to judge that a new age-reader is ready to move from training to production status is a subjective matter, because: (a) an acceptable level of error depends largely on what the age data are going to be used for, and (b) the error structure can be corrected or adjusted before being used in various analyses or assessments.

I propose maintaining the current agreement standards for the GOAB program which are as follows:

Species and/or Complex	Within Reader Agreement Precision	90% within	Between Reader / Reference Agreement Precision	90% within
Lingcod	50%	± 2 years	50%	± 2 years
Black Rockfish	70%	± 1 year	70%	± 1 year
Dusky Rockfish	50%	± 2 years	50%	± 2 years
Dark Rockfish	50%	± 2 years	50%	± 2 years
Yelloweye Rockfish	50%	± 2 years	50%	± 2 years
Salmon Shark	50%	± 2 years	50%	± 2 years
Spiny Dogfish	50%	± 2 years	50%	± 2 years
Miscellaneous Rockfish Species	50%	± 2 years	50%	± 2 years

New personnel should be able to meet the standards for black rockfish within 10 working days (2 calendar weeks), and standards for the remaining species within 15 working days (3 calendar weeks). Returning personnel should be able to meet these standards within half these proposed times.

As black rockfish are the easiest to read, the desired within-reader and between reader/reference agreement precision is set at seventy percent with ninety percent of the age estimates falling within ± 1 year, an even distribution of estimates around a mode of zero (perfect agreement) and no apparent age-related bias. For the remaining species specified along with the miscellaneous rockfish group, a fifty-percent within-reader and between reader/reference agreement rate is desirable with ninety percent of the age estimates falling within ± 2 years, along with an even distribution of errors around a mode of zero and no apparent age-related bias. Due to their low sample size numbers and variability in species sampled among ports the remaining rockfish species fall into the category of Miscellaneous Rockfish Species. If sample sizes of some of the Miscellaneous Rockfish species increase, this program may consider setting species-specific targets on those species. As these are subjective targets, future changes may be necessary dependent on what the data come to be used for and what the impact of any associated ageing error may be.

Cc: James Hasbrouck, Nicky Szarzi, Scott Meyer, Steve Fleishman, Tom Vania, Matt Miller.