

**Final Completion Report**  
**Assessment of Recreational Halibut Harvest in Alaska**

By

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## **Project Summary**

The goal of this project was to monitor the composition of harvest and fishery characteristics for the recreational Pacific halibut *Hippoglossus stenolepis* fisheries in Southeast and Southcentral Alaska during the 2008 fishing season. The specific objectives were to estimate the average weight of harvested fish, total biomass of the recreational harvest (lb), length composition of harvested fish, and the spatial distribution of fishing effort and harvest. Federal fishery managers use this information to assess the halibut stock, set fishery quotas, establish regulations to provide for optimum yield, and evaluate regulatory options to address allocation conflicts between user groups.

Final estimates of sport fishery harvest biomass require estimates of harvest in numbers of fish from the ADF&G Statewide Harvest Survey (SWHS). Because this is a mail survey that requests information from the entire year, estimates are not available until the fall of the following year. Therefore, harvest biomass estimates for 2008 cannot be calculated until September of 2009. This report, however, provides final mean weight and harvest biomass estimates for 2007 that were not provided in the previous completion report for NOAA Grant Award NA4370027. Additionally, November 2008 letter to the International Pacific Halibut Commission that provides projections of sport fishery harvest biomass for 2008 is attached.

The recreational harvest of halibut was sampled at the primary boat harbors, public launches, and beach launching areas in Southeast and Southcentral Alaska. Harvested halibut were measured to estimate length composition and mean weight, and charter operators and unguided anglers were interviewed to obtain information on the amount of fishing effort, numbers of halibut harvested, and fishing locations. The total harvest biomass was estimated by multiplying SWHS harvest estimates (in numbers of fish) for specific survey areas by estimated mean weight from representative ports in each area. Estimates by survey area were aggregated to provide estimates for International Pacific Halibut Commission (IPHC) regulatory areas 2C and 3A. Data from vessel-trip interviews were used to estimate the geographic distribution of bottomfishing effort and halibut harvest.

Estimates of mean net weight varied widely by port and user group in both areas in 2008. Charter mean weight ranged from 9.2 to 45.3 lb among Area 2C ports and from 15.3 to 38.9 lb among Area 3A ports. Mean weight in the private harvest ranged from 11.6 to 31.3 lb in Area 2C and 10.2 to 20.9 lb in Area 3A. Estimates of area-wide mean weights and harvest biomass will be finalized once 2008 harvest estimates become available in September 2009.

For 2007, the overall Area 2C mean net weights (headed and gutted) were 17.5 lb for the charter fishery and 16.5 lb for the private fishery. Mean weights for Area 3A were 16.9 lb for the charter fishery and 13.7 lb for the private boat fishery. The 2007 harvest biomass was estimated at 3.05 M lb in Area 2C and 6.28 M lb in Area 3A. The charter portion was 1.92 M lb in Area 2C (63%) and 4.00 M lb in Area 3A (64%).

Most of the halibut harvest in both regulatory areas was in the 60-100 cm range, but significant numbers of larger fish were harvested in the Prince William Sound, Yakutat, and Glacier Bay areas. Charter and private harvest were spread over a large geographic area, but at most ports the harvest came largely from a small number of areas. There were differences in the spatial distribution of the charter and private harvests at most ports studied.

## **Purpose of Project**

The marine waters of Southeast and Southcentral Alaska support the largest recreational fishery for Pacific halibut *Hippoglossus stenolepis*. Recreational halibut harvest statewide grew from about 10,000 fish in the mid-1970s (Skud 1975) to a high of about 585,000 fish in 2007 (Jennings et al. *In prep.*). Practically all of the recreational harvest in Alaska is from the Southeast and Southcentral regions. The sport halibut harvest in these two areas represented about 75% by weight of the entire Pacific coast wide sport harvest in 2007. The recreational halibut fishery and related tourism are important to the economy of coastal communities, providing significant seasonal employment and income.

Growth in the sport harvest and changes in the halibut stock have led to allocation conflicts between sport and commercial users. Changes have been proposed for management of the guided (charter) sport fishery in Alaska. Although the International Pacific Halibut Commission (IPHC) and North Pacific Fishery Management Council (NPFMC) manage the halibut fishery, the State of Alaska, Department of Fish and Game (ADF&G), has taken the lead in collecting data from the recreational harvest in conjunction with sampling of state-managed fisheries. The information that ADF&G provides is used by the IPHC for annual stock assessments, formulation of harvest strategies, and quota recommendations.

Allocation issues underscore the need for data collection, particularly from the charter fishery. In August of 2003, the National Marine Fisheries Service (NMFS) issued a final rule to implement a guideline harvest level (GHL) for charter halibut fisheries in Southeast and Southcentral Alaska (IPHC Regulatory Areas 2C and 3A respectively). In 2004, the charter fisheries in Southeast and Southcentral exceeded their respective GHLs. In response, the NPFMC initiated an analysis of proposed management measures to reduce charter harvest in both areas in October 2005. The NPFMC also appointed a committee to recommend alternatives to amend the GHL regulations. In December 2005, the NPFMC voted to rescind its April 2001 motion to incorporate charter vessels into the existing commercial IFQ program, and is now considering a suite of options for managing the charter fishery in these regulatory areas. The final estimates of halibut harvest for 2005, 2006, and 2007 exceeded the GHLs in Area 2C and Area 3A, fueling continued development of regulatory options to constrain charter harvest. In April 2007, the NPFMC passed a motion to implement a moratorium on new entry into charter halibut fisheries in areas 2C and 3A using a control date of December 9, 2005. The moratorium is essentially a limited entry program for halibut charter businesses and is expected to be implemented in 2010. In October 2008, the NPFMC passed a motion to implement a catch sharing plan that allocates halibut harvest among the commercial and sport charter sectors and provides a regulatory framework for the charter fisheries in areas 2C and 3A. The regulatory framework consists of bag and maximum size limits for the charter fishery that are triggered at various levels of combined commercial and charter allowable catch, and projected levels of charter harvest. The catch sharing plan also includes provisions for use, including leasing, of commercial IFQ by charter operators to provide additional harvest opportunity beyond the allocation. The catch sharing plan is anticipated to be implemented in 2011.

There is an ongoing need for annual estimates of average weight for both the charter and non-charter harvests in each regulatory area. Collection of biological data from the halibut and other important marine fisheries will help ensure that management and allocation decisions are based on the best available information. This federal grant provided for ADF&G sampling at Gustavus, Elfin Cove, Petersburg, and Wrangell (Area 2C), and Yakutat (Area 3A), and augmented sampling at Ketchikan and Sitka (Area 2C) and Seward (Area 3A). Obtaining additional data from these locations that would not otherwise have been collected resulted in more accurate and precise data from the sport fishery.

The goal of this project was to monitor the composition and harvest and fishery characteristics for the principal recreational halibut fisheries in IPHC Regulatory Area 2C (Southeast Alaska excluding Yakutat) and Area 3A (Southcentral Alaska plus Yakutat).

Specific objectives for the 2008 fishing seasons were to estimate:

1. The mean net weight and harvest biomass of halibut harvested by both chartered and non-chartered anglers in each port surveyed.
2. The length composition of halibut landed at each port, and
3. The geographic distribution of bottomfishing effort and halibut harvest by both chartered and non-chartered anglers interviewed by port.

## **Approach**

### Sampling Design and Data Collection

The State of Alaska estimates the number of halibut harvested annually through the ADF&G Sport Fish Survey, or Statewide Harvest Survey (SWHS). Although the SWHS is funded separately by the state, the results of that survey were linked with data from this project to achieve the objectives. The SWHS is a mail survey that has been conducted since 1977. Survey questionnaires are mailed to a stratified, random sample of households containing licensed anglers (or anglers with a license substitute) to estimate the numbers of fish caught and harvested by species on a statewide basis (for example, see Jennings et al. 2007). Repeated mailings are used to adjust the estimates for non-response bias. Estimates of harvest, in numbers of fish, are provided for charter and non-charter fisheries in each of seven survey areas (SWHS areas) in IPHC Area 2C (Figure 1) and seven modified SWHS areas in IPHC Area 3A (Figure 2). These estimates are generated by ADF&G, Division of Sport Fish, Research and Technical Services in Anchorage and are not available until the fall following the season of estimation. Therefore, final SWHS estimates for the 2008 season will not be available until the fall of 2009. Estimates for the 2007 season were made available in September 2008, and are included in this report.

Some of the SWHS areas in Area 3A were modified slightly from the original SWHS areas in order to align the areas represented by harvest estimates and sampling for biological characteristics. Although the Area 2C/3A boundary line does not correspond with the SWHS Area G boundary line (Figure 1), very little of the SWHS Area G harvest occurs in Area 3A and all of it was attributed to Area 2C. Likewise, a small amount of Area 3A harvest from waters adjacent to the Alaska Peninsula is attributed to Area 3B each year (1995-2007 average = 85 fish).

This project provided for collection of data on the sizes of halibut landed at the primary boat harbors, public launches, and beach launching areas throughout Areas 2C and 3A (Figure 1, Table 1). No sampling was conducted in Area F (Haines-Skagway) because the fishery there is too small. Juneau average weight data were substituted for Area F for the 2007 estimates and 2008 projections. The following sections describe the specific data collection methods used in each area and methods of data analysis.

#### **Southeast Alaska:**

Halibut data collection was implemented as part of the existing ADF&G creel survey program for salmonids and bottomfish at Ketchikan, Juneau, and Sitka in Southeast Alaska. Catch sampling of halibut at these ports occurred on stratified random sampling days, with the following strata: weekday/weekend, time of day (usually morning or afternoon), and fishery exit point (i.e., dock or boat launch site). Bottomfish and salmon sampling priority days were designated systematically during the season to provide guidance on sampling priorities between bottomfish and salmonids if sampling decisions had to be made during a busy period of a day. In addition, an extra biological sampler(s) was hired at the three creel survey ports to increase sample sizes of bottomfish (halibut, lingcod and rockfish) and salmon. Halibut were also sampled at Craig, Klawock, Petersburg, Wrangell, Elfin Cove, and Gustavus in Area 2C, and at Yakutat in Area 3A. All of the sampled ports accounted for 66% of the halibut harvest reported in charter logbooks in 2007. The proportion of private halibut harvest landed at these ports was not estimated. Halibut sampling was conducted from April 28 to September 28 at the creel survey ports of Ketchikan, Juneau, and Sitka, while at the sampling at some of the other ports starting several weeks later and/or ending several weeks earlier.

The following information was recorded during creel survey interviews: port, date, dock/boat launch sampled, creel technician identification number, interview number, number of rods fished, number of anglers fishing, hours fished, trip type (charter or private), number of days in trip, primary statistical area fished, target category (bottomfish, salmon, or both), and numbers of halibut (and other species) kept and released. If anglers targeted both bottomfish and salmon, then effort and catch were recorded separately for each targeted portion of the trip. The same statistical areas were used as for logbooks. Charter skippers

were interviewed for all charter trips to help ensure that the most accurate information was obtained. Logbook numbers and boat names were recorded for all charter vessels interviewed. Technicians counted and verified the reported numbers of fish harvested whenever possible for later comparison to logbook data.

Fork length of halibut was recorded to the nearest 0.5 cm. No sex information or otolith samples were collected from measured halibut. All halibut measurements were coded to indicate whether the fish were caught by charter or private anglers, the statistical area of capture, and whether they were from whole fish or carcasses. Sample size goals were established for each user group and port using optimum allocation formulae for stratified sampling (Thompson 1992) to meet the desired precision of the mean weight estimates ( $\pm 10\%$  with 90% confidence).

For most of the season, NMFS regulations prohibited charter anglers only from cleaning at sea unless the carcasses of the fish were retained until the fish were landed (NMFS 2007). This regulation was in conjunction with a 32-inch maximum size limit on at least one of the fish in the daily bag limit of charter anglers. On June 1, 2008, NMFS implemented a one-fish bag limit and removed the size limit and restriction on cleaning at sea (NMFS 2008). Court orders effective June 10, 2008 reinstated the two-fish bag limit with a maximum size limit on one fish and restrictions on cleaning at sea. Throughout the duration of the season, technicians were instructed to measure halibut from a vessel only if all of the fish (or intact carcasses) were available to be sampled.

All data were recorded in the field on weather-resistant, machine-readable Mark Sense forms. Forms were scanned and converted to digital format as the season progressed. Efforts were made to ensure that data collection procedures are standardized throughout the region. Technicians were supplied with the project operational plan that included a creel technician manual outlining all sampling and data recording procedures. Nearly all new creel survey technicians were provided with at least a 2-day onsite training session at the beginning of the season with either their crew leader or project supervisor. Feedback on problems with interview and biological sampling data forms were provided to creel technicians throughout the season.

#### Southcentral Alaska:

Halibut data collection was integrated with the existing catch sampling programs at Kodiak, Homer, Deep Creek/Anchor Point, Seward, Whittier, and Valdez. These seven sampling areas accounted for 95% of the charter halibut harvest reported in logbooks in 2007. The corresponding proportion of private harvest was not estimated but is probably similar. Biological data were collected three days per week and interviews were conducted two days per week at Homer, Deep Creek/Anchor Point, Seward, and Valdez. Biological and interview days were chosen at random such that each type was distributed proportionally among weekends and weekdays to minimize bias due to differences in user group composition. Interview and biological sampling effort were distributed between Deep Creek and Anchor Point proportional to harvest so those data could be pooled to represent the Central Cook Inlet (CCI) SWHS area. At Kodiak and Whittier, the interviews and biological sampling were conducted concurrently on five randomly selected days per week.

Sampling began May 19 at Homer and Deep Creek/Anchor Point, and between May 22 and June 15 at other ports. Sampling coverage at some ports was disrupted by vacancies due to staff changes and difficulties in hiring. It was intermittent at Seward until the port was permanently staffed on July 9. At Homer and CCI, sampling was conducted on alternating weeks from July 8 to August 14, and permanently staffed afterward. Sampling ended August 17 in Kodiak, and between August 28 and September 2 at other ports.

Technicians attempted to obtain interviews for all boats on which halibut or groundfish were targeted or caught. Angler parties that targeted salmon and didn't catch any halibut or groundfish were not interviewed. The following information was recorded during interviews: location sampled, time of

interview, duration of trip in days, whether the trip is the first or second of the day (to facilitate logbook comparisons), total number of angler-days of fishing effort, hours fished, trip type (charter or private), primary statistical area fished, target category (several codes), and numbers of halibut and other species kept and released. Numbers of halibut cleaned at sea were recorded and monitored as a potential source of bias, but were also used in calculation of the charter mean weight for Homer (see Analysis section). The numbers of halibut released were recorded by hook type (circle hook or “other” hook type) for application to estimation of discard mortality (not an objective of this study). As in Area 2C, charter skippers were interviewed for all charter trips to help ensure that the most accurate information was obtained. Logbook numbers and boat names were recorded for all charter vessel interviews.

As in Southeast Alaska, samplers commonly encountered boats with a portion of their harvest already cleaned and carcasses disposed of at sea. This would not be expected to cause bias unless the length composition of these fish differed from the landed fish. Homer typically was the port with the highest proportion of charter-caught fish cleaned at sea (21-38% during the years 2005-2007), and some charter operators there tend to clean smaller fish at sea and bring the larger fish back to the docks. Therefore, sampling at Homer included procedures for sampling charter-caught fish cleaned at sea. A list of vessels that cleaned at sea was compiled, and vessels were selected at random and provided with tubs in which to retain the carcasses of fish cleaned at sea. Average weight for the Homer charter fleet was designed to be calculated as a stratified mean with stratum weights (proportions cleaned at sea and in port) determined from interview data. Technicians at all other ports were instructed not to sample any portion of the catch from a vessel unless all of the fish (or intact carcasses) were available for measurement.

Fork length of halibut was recorded to the nearest centimeter. Sex was determined based on direct examination of gonads, and the left otolith was removed and forwarded to the IPHC for age determination. Sample size goals for length measurements were set based on the standard sample size equations for estimating a population mean (Thompson 1992) to achieve the target precision of  $\pm 10\%$  (with  $\alpha = 0.10$ ). Interview data were entered directly into field computers with a custom data input application with error trapping and lookup tables. Biological data were recorded directly on coin envelopes containing the halibut otoliths and later transferred into Excel spreadsheets with data validation checks.

Efforts were made to ensure that data collection procedures were standardized throughout the region. Technicians were supplied with the project operational plan and a Field Procedure Manual that provided background management and biological information, in-depth descriptions of sampling procedures, and detailed administrative information. All technicians received 2-3 days of hands-on training with periodic visits from a supervisor, and data quality was monitored inseason.

### Analysis

Mean net weight (headed and gutted) was estimated from fork length measurements using the IPHC length-weight relationship (Objective 1). Mean net weight in pounds for each user group ( $g$ ) in each SWHS area ( $a$ ) as the mean of the predicted weights of all  $n_{ga}$  sampled fish (Nielsen and Schoch 1980):

$$\bar{w}_{ga} = \frac{\sum_{k=1}^{n_{ga}} aL_{gak}^b}{n_{ga}}, \quad (1)$$

where  $L_{gak}$  = the observed length of fish  $k$  in cm,  $a = 6.921 \times 10^{-6}$ , and  $b = 3.24$  (Clark 1992). Variances of the mean predicted weights were estimated using standard normal procedures but did not incorporate variation inherent in the length-weight relationship. Pounds net weight (headed and gutted) is the standard unit used by federal halibut management agencies.

The mean net weight of charter-caught fish in Lower Cook Inlet was estimated using stratification to account for the different sizes of fish cleaned at sea and cleaned in port at Homer:

$$\hat{w}_C = (\hat{w}_{CS} \hat{p}_{CS}) + (\hat{w}_{CP} \hat{p}_{CP}), \quad (2)$$

where

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

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

$\hat{w}_{CP}$  = 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 ( $= 1 - \hat{p}_{CS}$ ).

In 2008, there was no sampling of charter halibut cleaned at sea in Homer after June 30 due to confusion from vacancies and staff substitutions. Examination of data from past years indicated that it was unlikely that the June samples were representative of the entire season. Therefore,  $\hat{w}_{CS}$  was estimated from a double exponential time series projection of estimates from 1994-2007, rather than from the sample mean. The projection was made in Minitab® using default smoothing parameters.

Methods for estimating the stratum weight  $\hat{p}_{CS}$  also varied by year. In 2007, the stratum weight was estimated using completed-trip interview data as

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

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

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 was estimated by (Goodman 1960):

$$\hat{v}(\hat{w}_C) = \hat{v}(\hat{w}_{CS} \hat{p}_{CS}) + \hat{v}(\hat{w}_{CP}) + \hat{v}(\hat{w}_{CP} \hat{p}_{CS}) - 2cov(\hat{w}_{CS} \hat{p}_{CS}, \hat{w}_{CP} \hat{p}_{CS}) - 2cov(\hat{w}_{CP}, \hat{w}_{CP} \hat{p}_{CS}), \quad (5)$$

where

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

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

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

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

In 2008, not all scheduled interview days were sampled in Homer, and the number of interviews used to estimate the proportion of harvest cleaned at sea were not distributed in proportion to effort over time. Therefore, the estimate of  $\hat{p}_{CS}$  was stratified by month as follows to minimize bias from non-representative sampling:

$$\hat{p}_{CS} = \sum_{i=1}^5 \hat{p}_{CS_i} \hat{h}_i, \quad (6)$$

where  $\hat{p}_{CS_i}$  = the estimated proportion of harvest cleaned at sea in month  $i$  (May-Sep), and  $\hat{h}_i$  = the average proportion of 2006-2007 charter harvest reported in logbooks for month  $i$  for the port of Homer.

Harvest biomass ( $B$ ) was estimated for each user group  $g$  in each SWHS area  $a$  (Objective 1) as:

$$\hat{B}_{ga} = \hat{H}_{ga} \hat{w}_{ga}, \quad (7)$$

where  $\hat{H}_{ga}$  = the Statewide Harvest Survey estimate of number of halibut harvested, and  $\hat{w}_{ga}$  = the estimated mean weight of halibut harvested by user group  $g$  in area  $a$ . Harvest projections were substituted for the SWHS estimates for 2008 because the SWHS estimates will not be available until September 2009. The projection methods used in 2008 are described in the November 2008 letter to the IPHC (attached).

The variance of the 2007 estimated harvest biomass was estimated as (Goodman 1960):

$$\hat{v}(\hat{B}_{ga}) = \hat{H}_{ga}^2 \hat{v}(\hat{w}_{ga}) + \hat{v}(\hat{H}_{ga}) \hat{w}_{ga}^2 - \hat{v}(\hat{H}_{ga}) \hat{v}(\hat{w}_{ga}). \quad (8)$$

Harvest biomass estimates were summed over SWHS areas to estimate harvest by user group for each IPHC Regulatory Area (2C or 3A). The average weight for each user group  $g$  and IPHC Regulatory Area was simply the total harvest in pounds divided by the total harvest in numbers of fish:

$$\hat{w}_g = \sum_a \hat{B}_{ga} / \sum_a \hat{H}_{ga}, \quad (9)$$

Variance of the 2007 average weight for each user group was obtained with Markov-Chain Monte Carlo methods using WinBUGS software (Lunn et al. 2000). Normal sampling error was assumed for average weights and harvest estimates. Variance estimates were not provided for 2008 because the harvest estimates were time series projections that will be updated with final harvest numbers next year.

Length composition (Objective 2) was estimated for 2008 as the proportions of harvest in each 10-cm length class. As with mean weight estimates, length composition estimates are presented by SWHS area, rather than by port. With the exception of the Petersburg/Wrangell, Glacier Bay, and Central Cook Inlet areas, each area was represented by a single port (Table 1). Data from multiple ports within an area were pooled because the relative proportions of charter and private harvest at each sampled port could not be determined. The estimates for Homer were stratified by the proportions of projected harvest in each of three user groups: charter cleaned at sea, charter cleaned in port, and private.

Finally, the spatial distributions of bottomfishing effort and halibut harvest (Objective 3) were estimated separately for charter and private fisheries using reported effort and harvest from vessel-trip interviews. The proportions of total bottomfishing effort and halibut harvest (number of fish) were computed for each ADF&G statistical area, and standard errors were estimated using equation 9. Effort was included in the estimate if the target species was halibut, or any other species of bottomfish (except salmon shark), or any bottomfish species in connection with salmon. For Area 2C and Yakutat, effort was measured in angler-hours because it was collected in a manner that allows separation of effort for halibut, bottomfish, or bottomfish and salmon. Angler-days were used as the unit of effort for all Area 3A ports except Yakutat. Although the hours spent fishing were recorded for each boat trip, they were not separable between species. An angler-day was counted in a statistical area if an angler fished any portion of a day in that area. Estimates of the spatial distribution of halibut harvest used all interviews, regardless of the target species.

The underlying structure of statistical areas differs between Southeast and Southcentral Alaska. Southeast areas are modified from the state salmon statistical area structure (figures 3 and 4), because the pre-existing marine creel survey program was set up largely to track Chinook and coho salmon harvest. In



contrast, groundfish/shellfish statistical areas (based on latitude and longitude) are used in Southcentral Alaska (figures 5 and 6) because the sampling program was set up to monitor mostly groundfish.

### Project Personnel

Following is a list of ADF&G personnel involved in carrying out the project activities and their respective duties.

Region	Name	Duties and Responsibilities
Southeast	Michael Jaenicke	Southeast Region project leader. Responsible for planning, budgeting, data analysis, and assisting in writing the progress reports.
	Diana Tersteeg	Assistant project leader for northern Southeast Region. Responsible for hiring, training, and supervision of technicians, data control and validation.
	Heather Riggs	Assistant to Diana Tersteeg. Provide help with hiring, training, and supervision of technicians, data control and validation for the port of Sitka.
	Kathleen Wendt	Assistant project leader for southern Southeast Region. Responsible for hiring, training, and supervision of technicians, data control and validation.
	Mike Wood	Assistant to Kathleen Wendt. Provide help with hiring, training, and supervision of technicians, data control and validation for southern Southeast Region.
	Fish and Wildlife Technicians (27)	All aspects of data collection, including interviews and length measurements.
Southcentral	Barbi Failor	Southcentral Region project leader. Responsible for planning, budgeting, hiring and supervision, data control, and data analysis.
	William Dunne	Assistant project leader. Responsible for hiring and supervision of technicians, data control and validation.
	Fish and Wildlife Technicians (7)	All aspects of data collection, including interviews and length measurements.
Statewide	Steve Fleischman	Provided biometric support and review of planning, assisted with data analysis.
	Clay Kent	Grant administrative support
	Scott Meyer	Project overview, technical guidance, lead role in writing progress reports and final report.

## **Results, Evaluation and Conclusions**

### Results

This report provides estimates of mean weight (Objective 1), length composition (Objective 2), and the spatial distribution of effort and harvest (Objective 3) for the 2008 fishing season. As noted previously, the final harvest biomass estimates for 2008 (Objective 1) could not yet be computed, but the attached November 2008 letter to the IPHC that provides projections of harvest biomass for 2008. These projections will be updated in the fall of 2009.

The previous project completion report for NOAA Grant Award NA4370027 did not provide final estimates of mean weight or harvest biomass for 2007. Those estimates are provided in this report along with the 2008 estimates.

### Mean Net Weight and Harvest Biomass (Objective 1):

Mean weight estimates for Area 2C were based on sample sizes of 12,122 fish in 2007 and 11,443 fish in 2008 (Table 2). The mean net weight of charter-caught halibut landed in Area 2C ranged from 9.9 to 31.5 lb among ports in 2007 and from 9.2 to 45.3 lb in 2008. The overall mean weight for the Area 2C charter fishery in 2007, weighted by the proportions of harvest in each SWHS area, was 17.5 lb.

Mean weight for halibut harvested in the private boat fishery ranged from 10.6 to 25.4 lb among ports in 2007 and from 11.6 to 31.3 lb in 2008. The mean weight for the Area 2C private sector harvest overall in 2007 was 16.5 lb. The Prince of Wales area fishery, sampled at Craig and Klawock, had the lowest mean weight in both the charter and private sectors both years, while Glacier Bay had the largest fish on average. The overall (charter and private) Area 2C mean weight was 17.1 lb in 2007.

Total sample sizes in Area 3A were 6,504 fish in 2007 and 6,027 fish in 2008 (Table 2). Charter harvest mean weight varied among ports from 13.4 to 41.7 lb in 2007 and 15.3 to 38.9 lb in 2008. The area wide charter mean weight in 2007 was 16.9 lb. Non-charter harvest mean weight ranged among ports from 10.7 to 19.5 lb in 2007 and from 10.2 to 20.9 lb in 2008, and the area wide mean was 13.7 lb. The lowest mean weights for both sectors were observed at Seward (North Gulf Coast subarea), and the highest were at Yakutat both years. Charter mean weights exceeded the private mean weights at each area except for Kodiak in 2007.

The final 2007 SWHS sport halibut harvest estimates were 178,333 fish in Area 2C and 402,471 fish in Area 3A (Table 3). Applying mean weights resulted in a final harvest biomass estimates for Area 2C of 3.049 M lb. About 1.92 M lb of that was taken in the charter fishery (63%), and the remaining 1.13 M lb (37%) was taken by private anglers. For Area 3A, the overall sport harvest biomass estimate was 6.28 M lb, with 4.00 M lb (64%) taken by charter boat anglers and 2.28 M lb (36%) taken by private anglers.

The final harvest estimates for 2007 were considerably higher than harvest projections provided to the IPHC and NPFMC at the end of 2007. For example, the Area 2C charter estimate was nearly 13% higher than last year's projection of 1.70 M lb, and the private harvest estimate was 34% higher than last year's projection of 0.84 M lb. In Area 3A, the charter harvest estimate was almost 18% higher than last year's projection of 3.40 M lb and the private harvest estimate was 39% higher than last year's projection of 1.64 M lb. There are several possible reasons for the discrepancy between projected and final harvest estimates. First, the SWHS estimates showed an increase in angler effort in both areas, particularly in the unguided (private) fishery. SWHS estimates also indicated an 11% increase in charter harvest per angler-day in both areas, a 31% increase in the harvest rate for private anglers in Area 2C, and a 24% increase in the harvest rate in Area 3A. The final estimates of average weight for Area 2C were also higher than the mean weights assumed in the projections, which added to the discrepancy. Finally, the harvest projections for 2007 were forecasts of the historical trend in harvest, which is quite noisy, and no explanatory factors were included. Any abrupt change in effort or catch rate from year to year will affect the accuracy of the projection.

Harvest biomass for 2008 was projected to be 3.08 M lb in Area 2C and 5.63 M lb in Area 3A (see attached letter to IPHC). The charter harvest projections were 1.91 M lb for Area 2C and 3.60 M lb for Area 3A. Charter harvest was projected by applying the relative change in partial-year logbook data (through July) from 2007 to 2008, to the 2007 SWHS estimates. Private harvest projections were based on single exponential time series forecasts multiplied by 2008 estimates of mean weight.

### Length Composition (Objective 2):

Lengths of sampled halibut ranged from 31 to 237 cm in Area 2C and from 36 to 213 cm in Area 3A. The majority of the harvest in areas 2C and 3A was generally in the 60-110 cm range. Larger fish were more common some years in the Petersburg/Wrangell and Glacier Bay areas in Area 2C (Table 4, Figure 7), and in the Prince William Sound and Yakutat areas in Area 3A (Table 5, Figure 7). Once final harvest estimates are available for 2008, the length composition for each user group and SWHS area can be

weighted to calculate an overall estimated for each IPHC regulatory area. These data will be useful for designating maximum size limits that may be required under the catch sharing plan expected to be implemented no sooner than 2011.

#### Geographic Distribution of Bottomfishing Effort and Halibut Harvest (Objective 3):

For Area 2C, the spatial distribution of effort was based on 5,416 vessel-trip interviews where the target species was halibut, bottomfish, or bottomfish and salmon. The Area 2C harvest distribution was based on data from all 12,060 interviews. Effort and harvest at most ports was spread over a large number of statistical areas (Table 6). Even so, at most ports the majority of effort or harvest came from a handful of areas. For example, statistical area 104400 accounted for 72% of charter effort at Craig and 75% of charter effort at Klawock. Although there was often overlap between the charter and private fleets, this was not always the case. One clear demonstration of this is at Sitka, where the Sitka Local Area Management Plan prohibits charter boats from fishing for halibut in Sitka Sound through most of the summer. Statistical areas making up Sitka Sound (113313, 113350, 113411, 113412, 113413, 113414, 113415, 113416, and 113430) accounted for 44% of private effort and 33% of the private harvest, but only 2% of charter effort harvest (Table 6).

Estimates of the spatial distribution of effort in Area 3A were based on 2,915 vessel-trip interviews with bottomfish effort, and harvest distribution estimates were based on the total 3,624 vessel-trip interviews. As in Area 2C, effort and harvest at most ports in Area 3A were spread out over many statistical areas (Table 7). At some ports, a few statistical areas accounted for the majority of harvest. For example, stat area 525931 accounted for 93% of charter and private effort, 64% of charter harvest, and 67% of private harvest in the Central Cook Inlet fishery. Similarly, stat areas 525731 and 525733 accounted for 77-78% of effort and 98-99% of harvest by charter and private anglers at Kodiak. Harvest was more evenly distributed at other ports. For example, only four stat areas at Homer accounted for 10% or more of the charter effort or harvest, and only one stat area exceeded 25%. At Whittier, stat area 476003 accounted for 38% of charter effort and 40% of harvest, with the remainder scattered over 31 other stat areas. No more than 12% of the private harvest at Whittier came from any one stat area.

As in Area 2C, and as noted in past years, there were differences in the spatial distribution of effort and harvest between the charter and private sectors. This is not surprising, given the fact that charter boats are larger on average than private boats, and economics allow them to make longer day trips in search of fish. In addition, some charters operate multi-day trips and may depart and land from different ports.

In the Central Cook Inlet fishery, two nearshore stat areas (515938 and 515929) made up nearly 32% of the private effort, but only 5% of charter effort. These two stat areas are typically passed over by charters on their way to offshore grounds. At Homer, the nine stat areas comprising Kachemak Bay accounted for 27% of charter effort and harvest, but 58% of private effort and 51% of private harvest. Similar examples of the discrepancy between charter and private effort and harvest for other ports can be easily seen by comparing stat areas with more than 10% of effort or harvest (shaded cells in Table 7).

Estimates of the spatial distribution of effort and harvest are not immediately applicable to any particular needs for assessment or management, but they were obtained at practically no additional cost. These data may be summarized further in the future, along with spatial data on commercial and subsistence removals, in order to better understand whether, or to what degree or manner, the halibut stock is locally depleted by these fisheries.

#### Modifications to Original Objectives

None.

#### Conclusions (including future work)

The accurate estimation of mean weight and length composition requires that the samples are representative of the sizes of fish harvested in each area. Although sampling dates, locations, and hours of

the day were chosen to maximize the percentage of harvest encountered by sampling, funding was insufficient to allow sampling at all remote lodges or communities in Southeast and Southcentral Alaska, at several smaller road accessible access points, or during the morning or late night hours in Southcentral Alaska. Incomplete temporal or spatial coverage is a potential source of bias in estimates of size composition or spatial distribution of the harvest.

Another potential bias may have been introduced by cleaning and disposal of smaller halibut at sea, so that the fish returned to shore for sampling were larger on average than the total harvest. This was addressed by sampling the catch from a vessel only when the vessel's entire catch could be sampled, or by establishing specific procedures to deal with cleaning at sea (e.g., stratified estimation for Homer). This was less of an issue for sampling the Area 2C charter harvest in 2008 because NMFS size limit regulations requiring all fish or carcasses to be landed whole were in effect for most of the year.

This project provided support for the state's effort to gather statistics on this federally managed fishery, and allowed for expansion to ports that otherwise would not have been sampled. All objectives were addressed and mean weight and recreational harvest were estimated with adequate precision for assessment of the halibut stock and management of the sport fishery. Because this is a major fishery with substantial annual removals, there is a need for continuation of this monitoring program. This monitoring will continue in 2009 under State of Alaska funding.

Future work is likely to continue with similar objectives. ADF&G intends to estimate harvest (through the SWHS and logbook) and estimate average weight to address needs for federal management under the current guideline harvest rule. Harvest and size composition information will also be needed in the future under the catch sharing plan. ADF&G is also continuing work on assessing the quality and accuracy of charter logbook data, with the prospect of using the more timely logbook data for charter management in the future.

Collection of charter boat name data along with biological data in Southcentral Alaska in 2007 allowed ADF&G to examine assumptions regarding the variance formulas used for average weight. This work was undertaken because many catch sampling projects estimate the variance assuming the data are random, when in fact it is clustered. A limited resampling analysis using 2007 data indicated that the point estimates of mean weight are unbiased, but the standard error of the Southcentral charter harvest estimate was about 27% larger than estimated. ADF&G is considering changes to the sampling design in 2009 to allow the use of bootstrap methods to estimate the variance of mean weight.

### **Products and Publications**

No journal articles or other published products were produced during the report period. Results of the work were instead disseminated to federal halibut regulatory agencies through a variety of means.

ADF&G sent a letter in November 2008 to the IPHC presenting final estimates of mean weight and harvest biomass for charter and private recreational fisheries in areas 2C and 3A for 2007, as well as estimates of mean weight and projections of harvest for 2008. Harvest projections were needed because SWHS harvest estimates are not typically available until September of the following year. Methods of projecting harvest varied by regulatory area and by year, and are described in the attached letter. ADF&G continues efforts to improve the projection methods.

Several types of information collected by this project were also provided to the NPFMC and incorporated into Council documents. Harvest estimates, including the finalized 2007 estimates, and length composition information were incorporated into the analysis of potential GHM management measures in Area 3A (NPFMC 2008a), and into the analysis of the proposed catch sharing plan (NPFMC 2008b).

In April 2008, ADF&G staff presented an evaluation of the 2006 ADF&G charter logbook data to the NPFMC, Advisory Panel, Scientific and Statistical Committee, and the public. This evaluation included

comparison of logbook data to interview data collected by this project (Meyer et al. 2008). Staff also presented the finalized charter harvest estimates for 2007 at the October 2008 NPFMC meeting.

## References

- Clark, W. G. 1992. Validation of the IPHC length-weight relationship for halibut. International Pacific Halibut Commission Report of Assessment and Research Activities 1991: 113-116.
- Goodman, L. A. 1960. On the exact variance of products. J. Amer. Statistical Assn. 55:708-713.
- Jennings, G. B., K. Sundet, and A. E. Bingham. *In prep.* Participation, catch, and harvest in Alaska sport fisheries during 2007. Alaska Department of Fish and Game, Fishery Data Series, Anchorage
- Jennings, G. B., K. Sundet, and A. E. Bingham. 2007. Participation, catch, and harvest in Alaska sport fisheries during 2004. Alaska Department of Fish and Game, Fishery Data Series No. 07-40, Anchorage. (<http://www.sf.adfg.state.ak.us/FedAidPDFs/fds07-40.pdf>)
- Lunn, D.J., Thomas, A., Best, N., and Spiegelhalter, D. 2000. WinBUGS -- a Bayesian modelling framework: concepts, structure, and extensibility. *Statistics and Computing*, 10:325-337.
- Meyer, S., R. Powers, A. Bingham, M. Jaenicke, R. Clark, K. Sundet, and D. Sigurdsson. 2008. Evaluation of the 2006 ADF&G Charter Logbook. Unpublished discussion paper presented to the North Pacific Fishery Management Council, March 2008. ([http://www.fakr.noaa.gov/npfmc/current\\_issues/halibut\\_issues/LogbookEval308.pdf](http://www.fakr.noaa.gov/npfmc/current_issues/halibut_issues/LogbookEval308.pdf))
- Nielsen, L. A. and W. F. Schoch 1980. Errors in estimating mean weight and other statistics from mean length. *Transactions of the American Fisheries Society* 109:319-322.
- NMFS (National Marine Fisheries Service). 2007. Pacific halibut fisheries; guided sport charter vessel fishery for halibut. Final Rule. Vol. 72 Federal Register 30714-30728 (June 4, 2007).
- NMFS. 2008. Pacific halibut fisheries; guided sport charter vessel fishery for halibut. Final Rule. Vol. 73 Federal Register 30504-30524 (May 28, 2008).
- NPFMC. 2008a. Environmental assessment/regulatory impact review/initial regulatory flexibility analysis for a regulatory amendment to implement guideline harvest level measures in the halibut charter fishery in IPHC Regulatory Area 3A. August 28, 2009 Draft for Public Review. NOAA Fisheries Service, North Pacific Fishery Management Council, Anchorage. ([http://www.fakr.noaa.gov/npfmc/current\\_issues/halibut\\_issues/3AGHL908.pdf](http://www.fakr.noaa.gov/npfmc/current_issues/halibut_issues/3AGHL908.pdf))
- NPFMC. 2008b. Regulatory amendment for a catch sharing plan for the Pacific halibut charter and commercial longline sectors in International Pacific Halibut Commission Regulatory Area 2C and Area 3A. August 28, 2008 Draft for Public Review. NOAA Fisheries Service, North Pacific Fishery Management Council, Anchorage. ([http://www.fakr.noaa.gov/npfmc/current\\_issues/halibut\\_issues/Area2C3A\\_CSP908.pdf](http://www.fakr.noaa.gov/npfmc/current_issues/halibut_issues/Area2C3A_CSP908.pdf))
- Skud, B. E. 1975. The sport fishery for halibut: development, recognition, and regulation. Technical Report No. 13, International Pacific Halibut Commission, Seattle, WA.
- Thompson, S. K. 1992. Sampling. John Wiley and Sons, NY.

## Key Words

Pacific halibut, *Hippoglossus stenolepis*, bottomfish, recreational fishery, sport fishery, guideline harvest level, Southeast Alaska, Southcentral Alaska, Area 2C, Area 3A, Kodiak, Cook Inlet, Seward, Whittier, Valdez, Yakutat, Prince William Sound, Glacier Bay, Elfin Cove, Gustavus, Haines, Skagway, Juneau, Sitka, Craig, Klawock, Prince of Wales Island, Petersburg, Wrangell, Ketchikan, estimation, mean, variance, standard error, effort, harvest, weight, length, sex, statistical area, spatial distribution, Alaska Department of Fish and Game, International Pacific Halibut Commission, North Pacific Fishery Management Council, National Marine Fisheries Service.

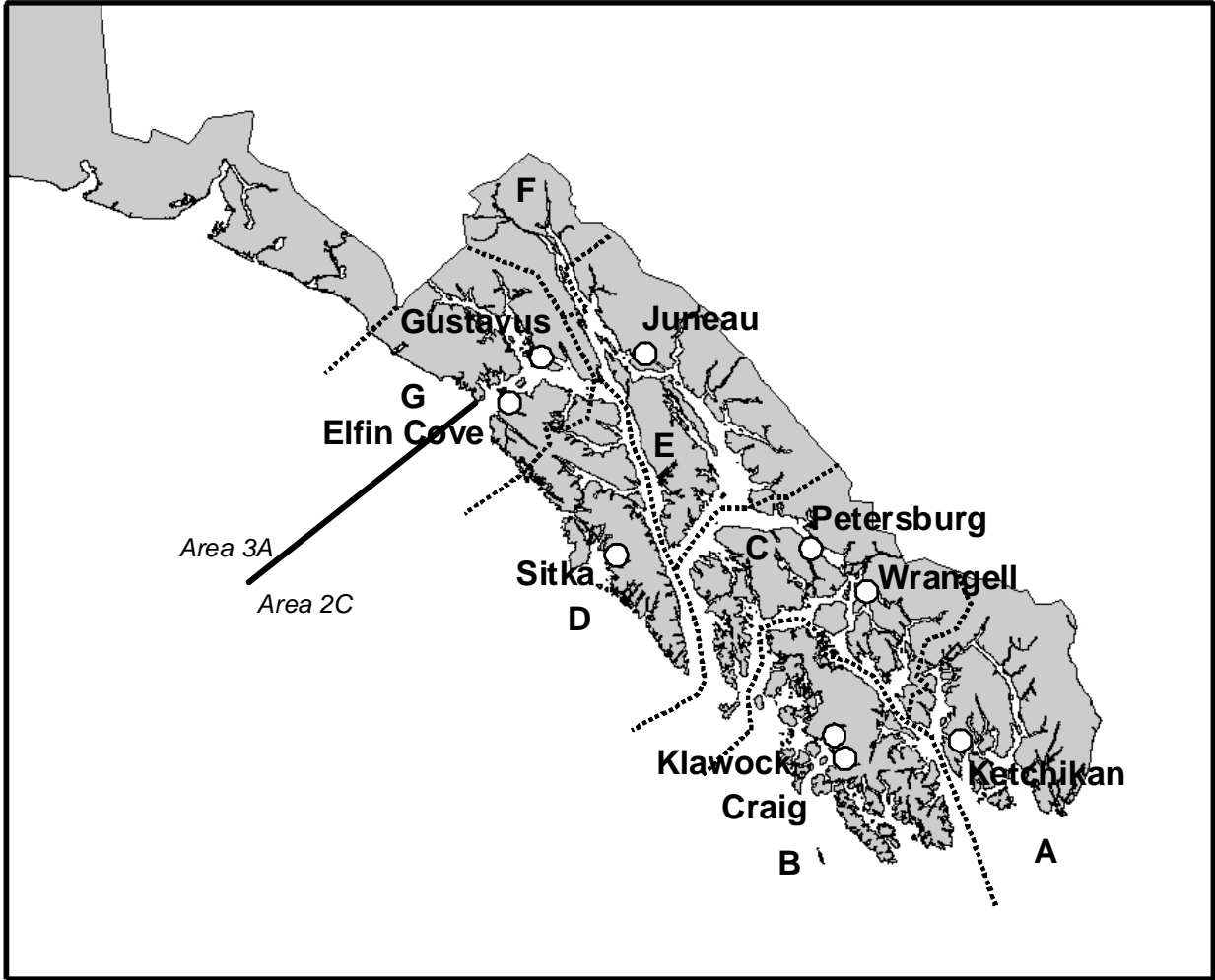


Figure 1. Statewide harvest survey areas, sampled ports, and IPHC area boundary, Southeast Alaska.

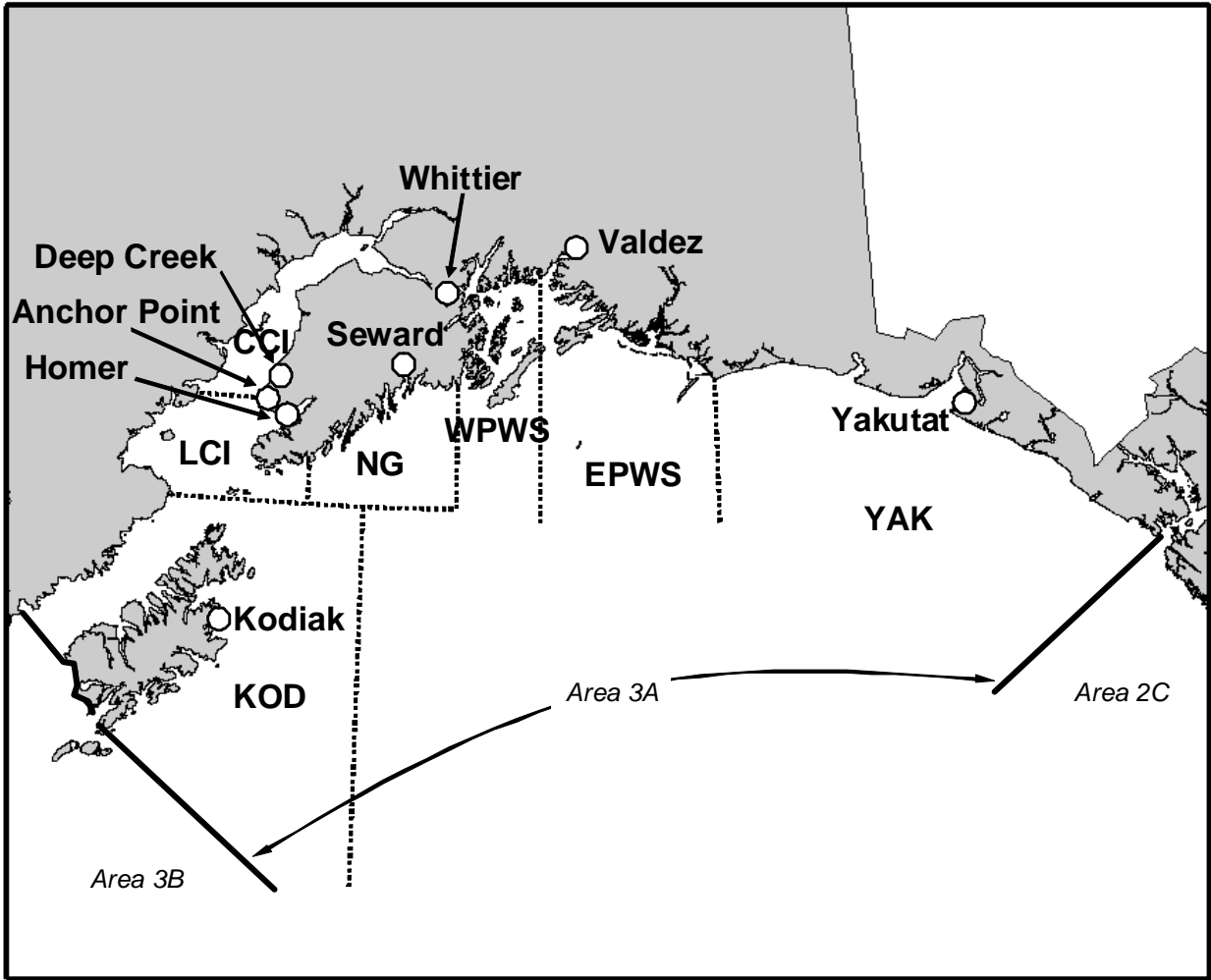


Figure 2. Statewide harvest survey areas (see Table 1 for definitions), sampled ports, and IPHC area boundaries, Southcentral Alaska.

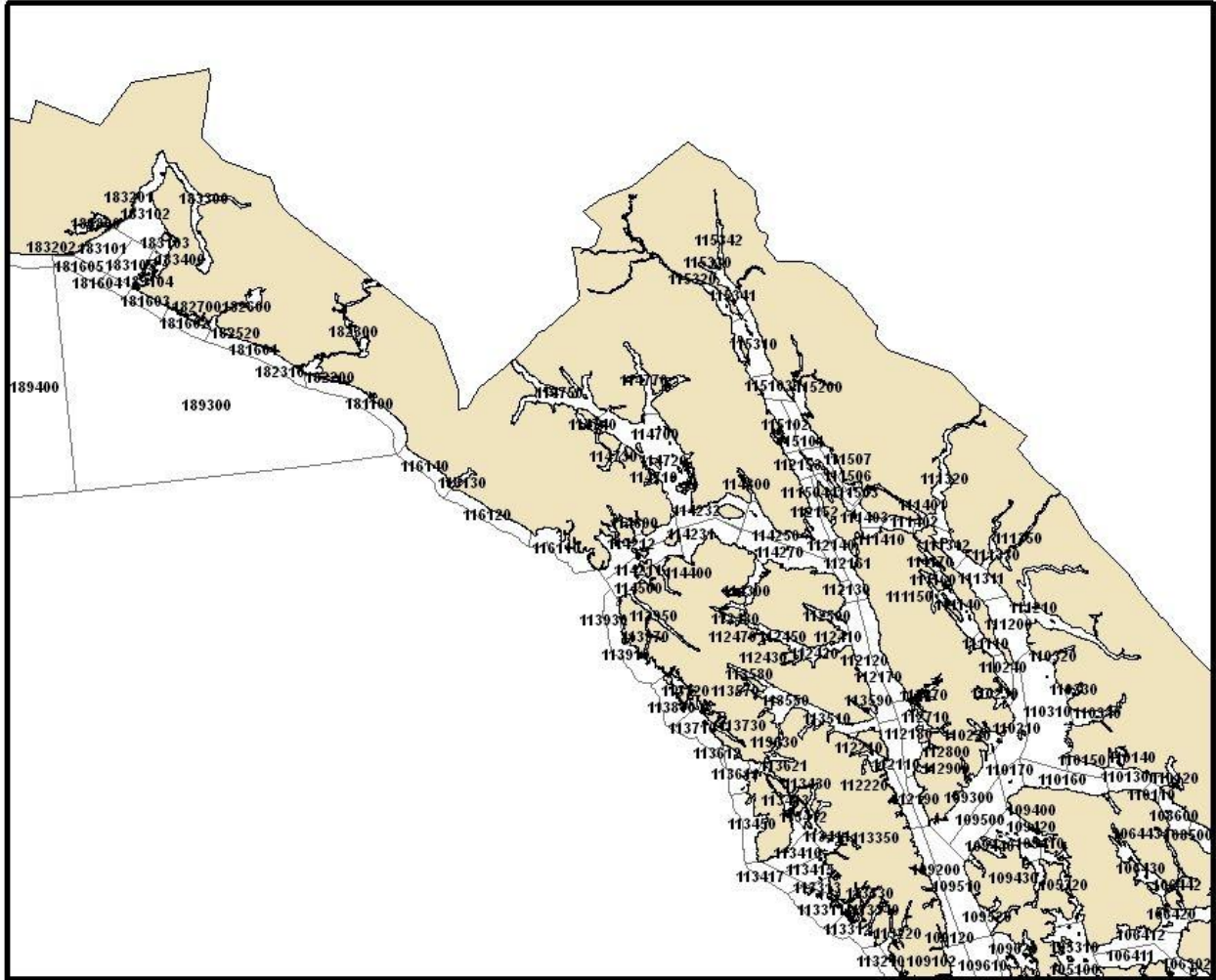


Figure 3. ADF&G statistical areas for recreational effort and halibut harvest in northern Southeast Alaska.



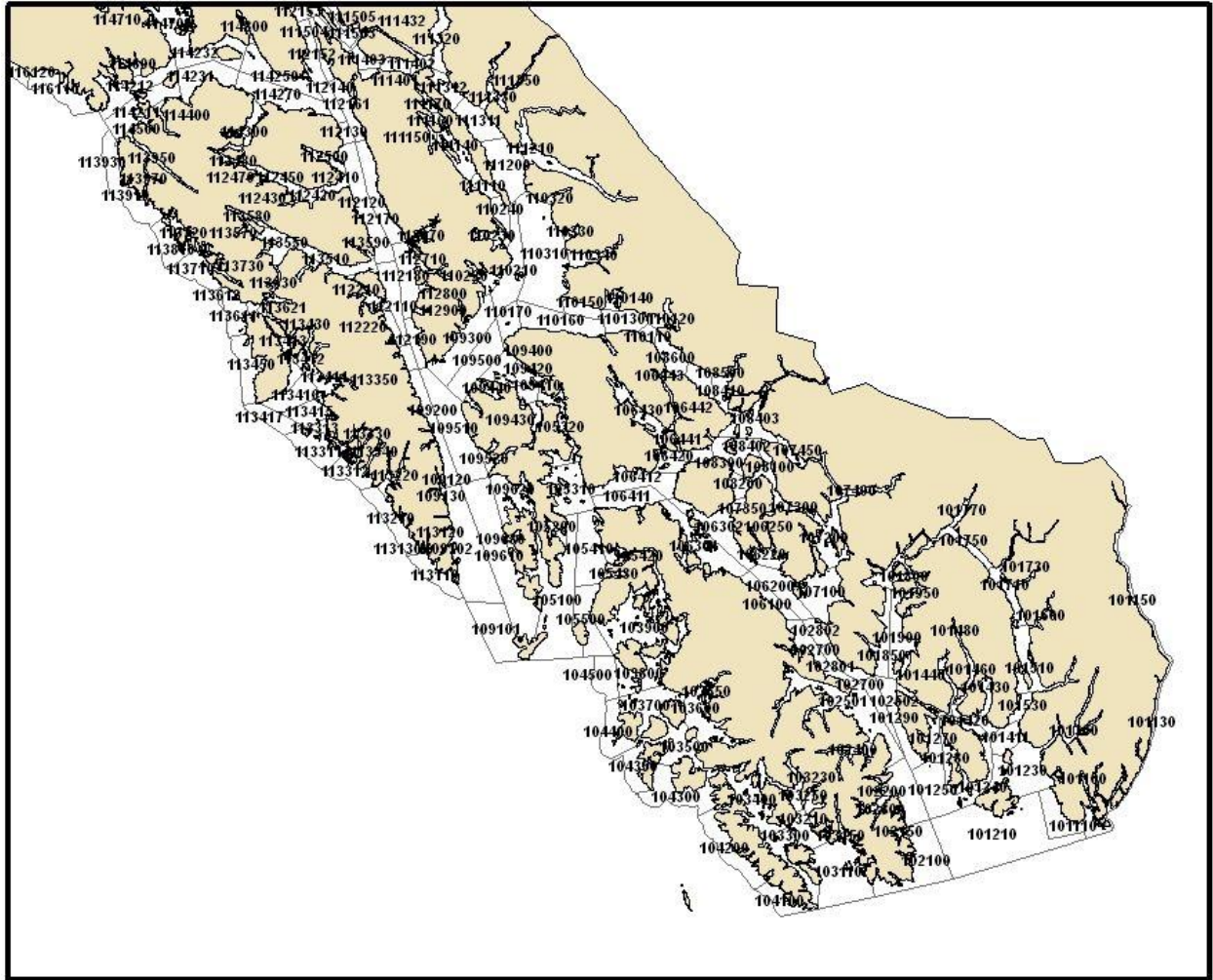


Figure 4. ADF&G statistical areas for recreational effort and halibut harvest in southern Southeast Alaska.

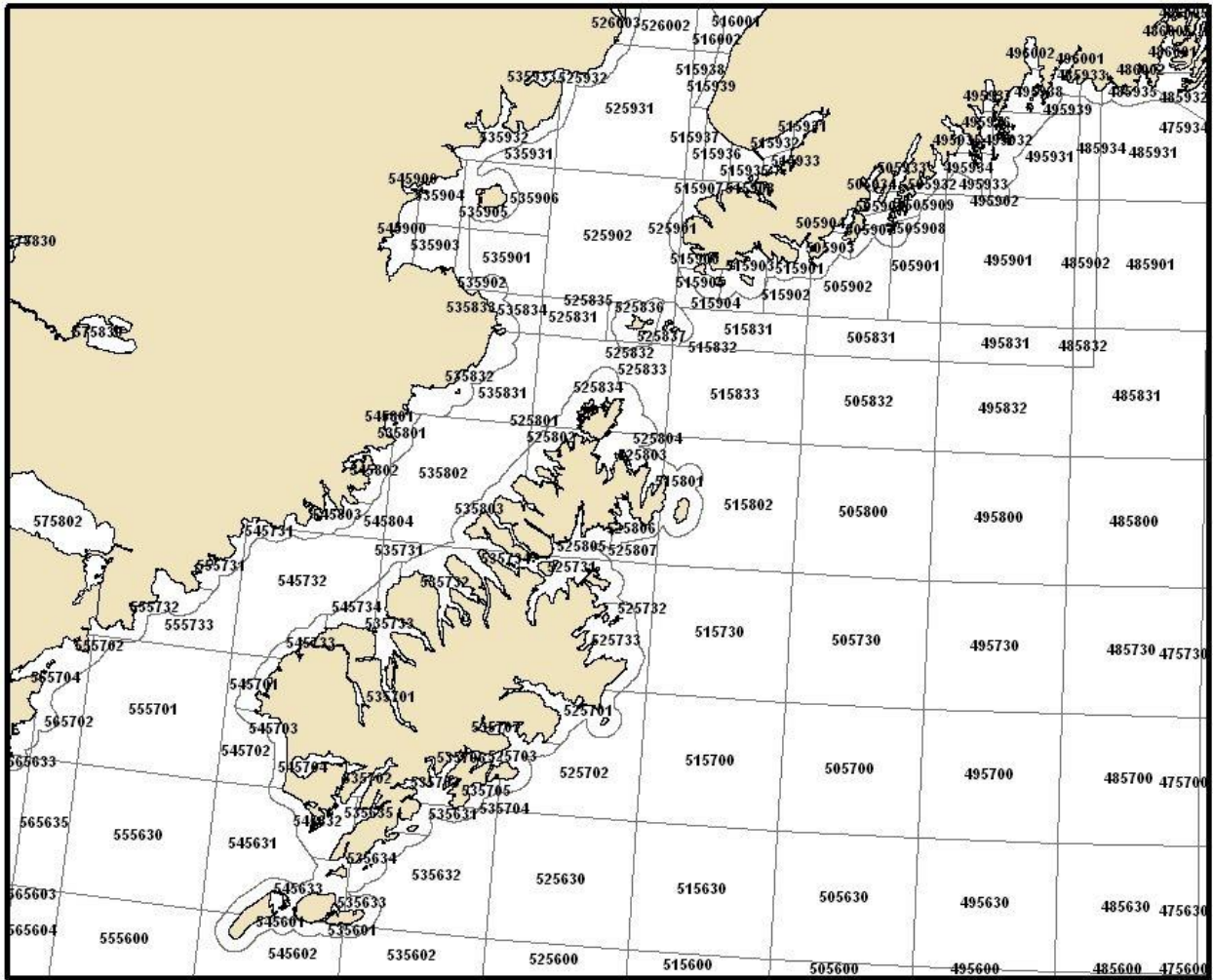


Figure 5. ADF&G statistical areas for recreational effort and halibut harvest in western Southcentral Alaska.

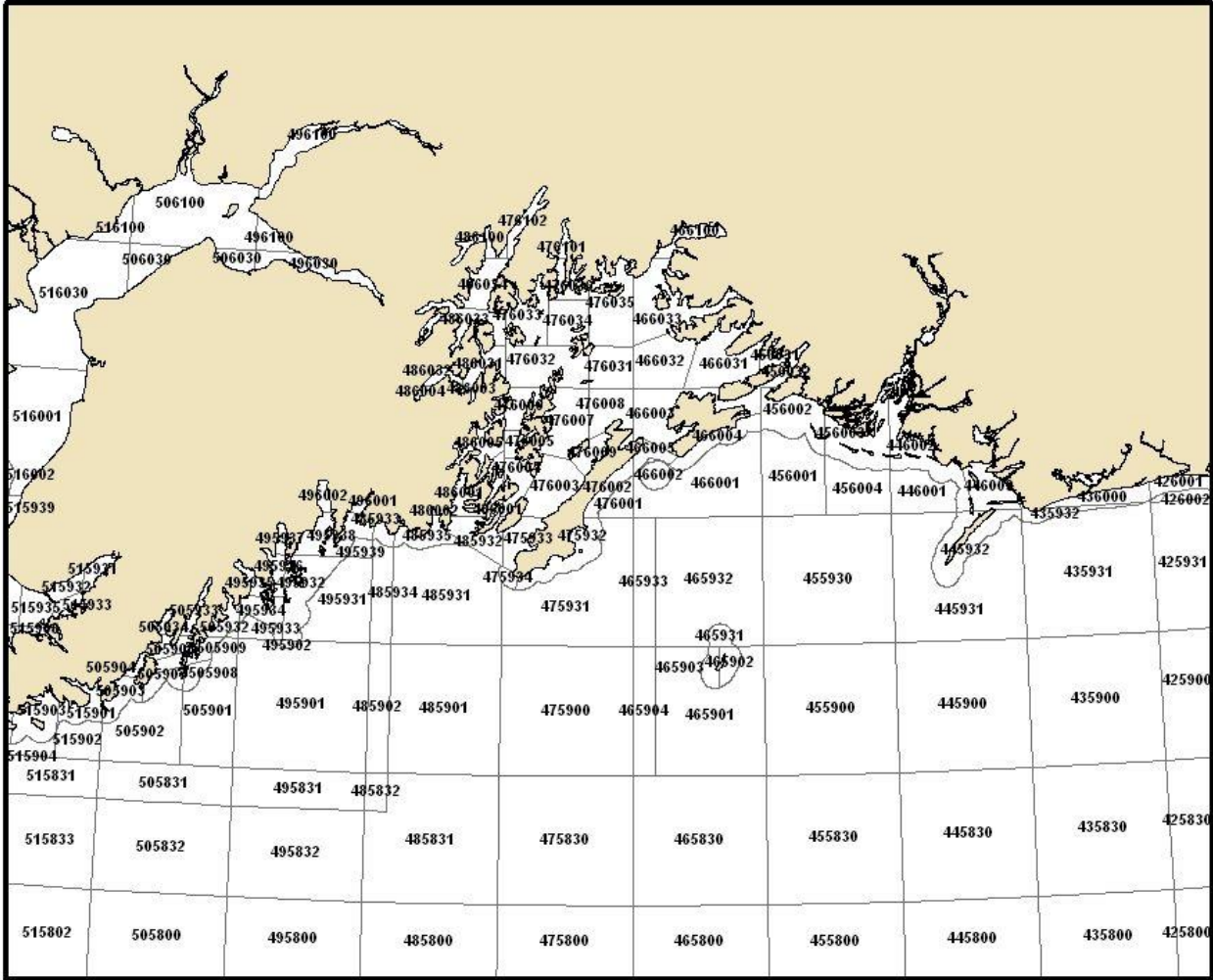


Figure 6. ADF&G statistical areas for recreational effort and halibut harvest in eastern Southcentral Alaska.

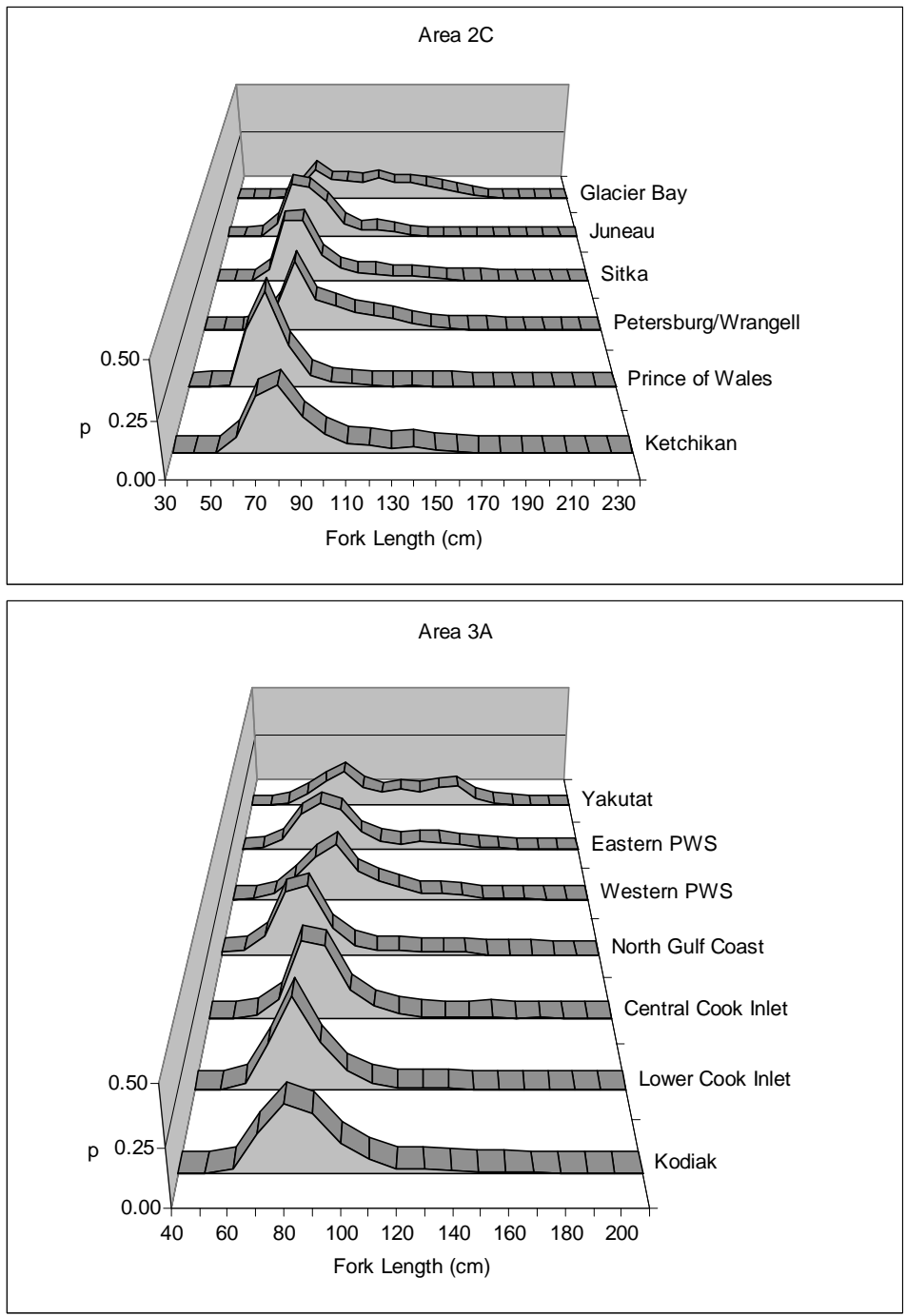


Figure 7. Length composition of the 2008 recreational harvest in areas 2C and 3A, by Statewide Harvest Survey Area.

Table 1. Statewide Harvest Survey (SWHS) areas and representative ports of sampling for recreational harvest in International Pacific Halibut Commission Regulatory Areas 2C and 3A in 2008.

IPHC Area	SWHS Area	Description	Ports Sampled
2C	A	Ketchikan	Ketchikan
	B	Prince of Wales Island	Craig, Klawock
	C	Kake, Petersburg, Wrangell, Stikine	Petersburg, Wrangell
	D	Sitka	Sitka
	E	Juneau	Juneau
	F	Haines-Skagway	None <sup>a</sup>
	G	Glacier Bay	Elfin Cove, Gustavus
3A	H	Yakutat	Yakutat
	EPWS	Eastern Prince William Sound	Valdez
	WPWS	Western Prince William Sound	Whittier
	NG	North Gulf Coast	Seward
	LCI	Lower Cook Inlet	Homer
	CCI	Central Cook Inlet	Deep Creek and Anchor Point beaches
	KOD	Kodiak Island	Kodiak

<sup>a</sup> – Data from Juneau were substituted for the Haines-Skagway SWHS area.

Table 2. Sample size (n), mean net weight in lb, and standard error (SE) by Statewide Harvest Survey (SWHS) area for charter and private sport harvest in IPHC areas 2C and 3A, 2007-2008. Final estimates of charter, private, and overall mean weight cannot be calculated for 2008 until SWHS harvest estimates become available in the fall of 2009.

IPHC Area User	SWHS Area	2007			2008			
		n	Mean (lb)	SE	n	Mean (lb)	SE	
<b>Area 2C</b>	Charter	Ketchikan	364	15.5	0.8	319	18.9	1.2
		Prince of Wales Island	1,653	9.9	0.3	2,903	9.2	0.3
		Petersburg/Wrangell	1,026	21.9	0.7	557	22.5	0.9
		Sitka	2,822	18.5	0.4	1,732	16.1	0.4
		Juneau	411	12.0	0.6	350	11.6	0.6
		Glacier Bay	2,050	31.5	0.8	2,110	45.3	0.9
		Total charter	8,326	17.5	0.4	7,971	--	--
	Private	Ketchikan	757	15.7	0.7	659	14.9	0.6
		Prince of Wales Island	479	10.6	0.7	499	11.6	0.8
		Petersburg/Wrangell	939	17.0	0.5	460	21.9	1.1
		Sitka	112	15.1	1.6	91	17.2	2.1
		Juneau	1,122	12.4	0.4	1,352	15.2	0.4
		Glacier Bay	387	25.4	1.4	411	31.3	1.7
		Total private	3,796	16.5	0.5	3,472	--	--
All	Total Area 2C	12,122	17.1	0.5	11,443	--	--	
<b>Area 3A</b>	Charter	Central Cook Inlet	1,016	15.6	0.4	573	15.6	0.4
		Lower Cook Inlet	961	16.5	0.5	508	15.4	NA
		Kodiak	255	17.0	0.6	232	20.2	1.2
		North Gulf Coast	760	13.4	0.5	355	15.3	0.8
		Eastern PWS	489	26.3	1.2	602	24.7	1.0
		Western PWS	321	20.4	0.9	312	21.5	0.9
		Yakutat	951	41.7	1.0	1,224	38.9	0.9
		Total charter	4,753	16.9	0.2	3,806	--	--
	Private	Central Cook Inlet	202	14.5	0.6	281	13.8	0.7
		Lower Cook Inlet	445	13.2	0.6	437	13.2	0.6
		Kodiak	358	17.6	0.9	321	14.0	0.7
		North Gulf Coast	165	10.7	0.9	385	10.2	0.6
		Eastern PWS	88	13.6	1.6	411	14.4	0.9
		Western PWS	388	14.2	0.8	205	19.1	1.4
Yakutat		105	19.5	2.0	182	20.9	1.7	
Total private	1,751	13.7	0.3	2,222	--	--		
All	Total Area 3A	6,504	15.6	0.2	6,028	--	--	

Table 3. Estimated recreational harvest in numbers of fish (from the Statewide Harvest Survey) and pounds net weight, Areas 2C and 3A, 2007.

IPHC Area	User	SWHS Area	Harvest (no. fish)	SE	Harvest (lb)	SE	
<b>Area 2C</b>	Charter	Ketchikan	11,600	1,323	179,296	22,482	
		Prince of Wales Island	30,814	2,449	306,567	26,540	
		Petersburg/Wrangell	8,882	1,357	194,691	30,306	
		Sitka	35,431	2,050	654,409	40,983	
		Juneau	7,424	1,149	89,433	14,425	
		Haines/Skagway <sup>a</sup>	0	--	0	--	
		Glacier Bay	15,684	1,960	493,413	62,969	
		Total charter	109,835	4,225	1,917,808	85,456	
	Private	Ketchikan	9,320	1,419	146,339	23,134	
		Prince of Wales Island	12,816	1,607	135,866	19,105	
		Petersburg/Wrangell	8,041	1,284	136,570	22,213	
		Sitka	5,409	770	81,927	14,609	
		Juneau	14,905	1,687	185,130	21,732	
		Haines/Skagway <sup>a</sup>	986	320	12,247	3,991	
		Glacier Bay	17,021	2,062	432,830	57,595	
		Total private	68,498	3,848	1,130,909	73,174	
	All	Total Area 2C	178,333	5,505	3,048,717	109,759	
	<b>Area 3A</b>	Charter	Central Cook Inlet	58933	2,928	917,046	50,146
			Lower Cook Inlet	93933	3,791	1,553,105	74,983
			Kodiak	19035	1,739	323,050	31,676
			North Gulf Coast	37051	2,393	496,868	36,941
			Eastern Prince William Sound	11515	1,078	303,160	31,489
			Western Prince William Sound	11497	1,274	235,069	27,976
			Yakutat	4169	703	173,860	29,595
			Total charter	236,133	6,176	4,002,159	119,945
		Private	Central Cook Inlet	38,247	2,718	554,601	45,458
			Lower Cook Inlet	62,152	4,263	823,493	66,557
Kodiak			16,302	2,130	286,414	40,059	
North Gulf Coast			25,528	2,070	274,325	32,108	
Eastern Prince William Sound			9,890	1,130	134,032	21,612	
Western Prince William Sound			13,118	1,728	186,560	26,533	
Yakutat			1,101	464	21,497	9,283	
Total private			166,338	6,443	2,280,921	103,756	
All		Total Area 3A	402,471	8,067	6,283,081	149,904	

<sup>a</sup> - NA = final estimates could not be calculated for 2007 because they must be weighted by SWHS harvest estimates that are not yet available.

Table 4. Length composition of the 2008 Area 2C recreational harvest by SWHS area. Columns for each port show the number of fish in each length group (No.), proportion (p), and standard error of the proportion (SE).

Length Class Midpoint (cm)	Ketchikan			Craig/Klawock			Petersburg/Wrangell			Sitka			Juneau			Gustavus/Elfin Cove		
	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)
30	0	0.000	--	1	0.000	0.000	0	0.000	--	1	0.001	0.001	0	0.000	--	0	0.000	--
40	0	0.000	--	6	0.002	0.001	0	0.000	--	1	0.001	0.001	1	0.001	0.001	0	0.000	--
50	2	0.002	0.001	23	0.007	0.001	1	0.001	0.001	3	0.002	0.001	11	0.006	0.002	5	0.002	0.001
60	67	0.068	0.008	888	0.260	0.008	15	0.015	0.004	108	0.059	0.005	127	0.075	0.006	18	0.007	0.002
70	243	0.247	0.014	1450	0.425	0.008	124	0.122	0.010	540	0.294	0.011	463	0.272	0.011	145	0.058	0.005
80	287	0.292	0.014	641	0.188	0.007	326	0.321	0.015	548	0.299	0.011	439	0.258	0.011	398	0.158	0.007
90	154	0.157	0.012	185	0.054	0.004	146	0.144	0.011	235	0.128	0.008	319	0.187	0.009	255	0.101	0.006
100	83	0.084	0.009	77	0.023	0.003	120	0.118	0.010	121	0.066	0.006	124	0.073	0.006	253	0.100	0.006
110	43	0.044	0.007	44	0.013	0.002	85	0.084	0.009	70	0.038	0.004	65	0.038	0.005	222	0.088	0.006
120	34	0.035	0.006	25	0.007	0.001	72	0.071	0.008	64	0.035	0.004	68	0.040	0.005	282	0.112	0.006
130	20	0.020	0.004	14	0.004	0.001	56	0.055	0.007	46	0.025	0.004	51	0.030	0.004	219	0.087	0.006
140	26	0.026	0.005	23	0.007	0.001	30	0.029	0.005	39	0.021	0.003	18	0.011	0.002	213	0.084	0.006
150	14	0.014	0.004	9	0.003	0.001	19	0.019	0.004	28	0.015	0.003	6	0.004	0.001	186	0.074	0.005
160	8	0.008	0.003	7	0.002	0.001	10	0.010	0.003	18	0.010	0.002	6	0.004	0.001	136	0.054	0.004
170	0	0.000	--	4	0.001	0.001	5	0.005	0.002	6	0.003	0.001	4	0.002	0.001	98	0.039	0.004
180	2	0.002	0.001	5	0.001	0.001	5	0.005	0.002	4	0.002	0.001	0	0.000	--	44	0.017	0.003
190	1	0.001	0.001	3	0.001	0.001	2	0.002	0.001	2	0.001	0.001	0	0.000	--	20	0.008	0.002
200	0	0.000	--	1	0.000	0.000	1	0.001	0.001	0	0.000	--	0	0.000	--	11	0.004	0.001
210	0	0.000	--	2	0.001	0.000	0	0.000	--	0	0.000	--	0	0.000	--	10	0.004	0.001
220	0	0.000	--	1	0.000	0.000	0	0.000	--	0	0.000	--	0	0.000	--	3	0.001	0.001
230	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	3	0.001	0.001
240	0	0.000	--	1	0.000	0.000	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--
<b>Total</b>	<b>984</b>			<b>3,410</b>			<b>1,017</b>			<b>1,834</b>			<b>1,702</b>			<b>2,521</b>		



Table 5. Length composition of the 2008 Area 3A recreational harvest by SWHS area. Columns for each port show the number of fish in each length group (No.), proportion (p), and standard error of the proportion (SE).

Length Class Midpoint (cm)	Kodiak			Lower Cook Inlet			Central Cook Inlet			North Gulf Coast			Western PWS			Eastern PWS			Yakutat		
	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)	No.	p	SE(p)
40	0	0.000	--	0	0.000	--	0	0.000	--	7	0.009	0.004	0	0.000	--	0	0.000	--	0	0.000	--
50	1	0.002	0.002	3	0.003	0.002	0	0.000	--	13	0.018	0.005	1	0.002	0.002	12	0.012	0.003	0	0.000	--
60	10	0.018	0.006	29	0.031	0.007	11	0.013	0.004	67	0.091	0.011	14	0.027	0.007	54	0.053	0.007	18	0.013	0.003
70	93	0.168	0.016	190	0.201	0.018	75	0.088	0.010	218	0.295	0.017	57	0.110	0.014	185	0.183	0.012	96	0.068	0.007
80	161	0.291	0.019	382	0.405	0.021	297	0.348	0.016	240	0.324	0.017	107	0.207	0.018	241	0.238	0.013	186	0.132	0.009
90	141	0.255	0.019	196	0.207	0.016	281	0.329	0.016	96	0.130	0.012	141	0.273	0.020	206	0.204	0.013	255	0.181	0.010
100	71	0.128	0.014	79	0.083	0.009	110	0.129	0.011	35	0.047	0.008	71	0.137	0.015	95	0.094	0.009	143	0.102	0.008
110	34	0.061	0.010	31	0.033	0.005	47	0.055	0.008	17	0.023	0.006	48	0.093	0.013	48	0.047	0.007	101	0.072	0.007
120	12	0.022	0.006	8	0.009	0.003	19	0.022	0.005	17	0.023	0.006	32	0.062	0.011	32	0.032	0.006	126	0.090	0.008
130	13	0.024	0.006	9	0.010	0.003	5	0.006	0.003	8	0.011	0.004	15	0.029	0.007	45	0.044	0.006	107	0.076	0.007
140	7	0.013	0.005	9	0.010	0.003	3	0.004	0.002	8	0.011	0.004	16	0.031	0.008	39	0.039	0.006	136	0.097	0.008
150	3	0.005	0.003	3	0.003	0.001	1	0.001	0.001	11	0.015	0.004	9	0.017	0.006	30	0.030	0.005	149	0.106	0.008
160	4	0.007	0.004	3	0.003	0.001	4	0.005	0.002	1	0.001	0.001	2	0.004	0.003	14	0.014	0.004	56	0.040	0.005
170	2	0.004	0.003	2	0.002	0.001	0	0.000	--	1	0.001	0.001	3	0.006	0.003	8	0.008	0.003	19	0.014	0.003
180	0	0.000	--	0	0.000	0.000	1	0.001	0.001	1	0.001	0.001	1	0.002	0.002	3	0.003	0.002	8	0.006	0.002
190	1	0.002	0.002	1	0.001	0.001	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	2	0.001	0.001
200	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--
210	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	0	0.000	--	4	0.003	0.001
Total	553			945			854			740			517			1,012			1,406		

Table 6. Spatial distribution of bottomfishing effort and halibut harvest in Area 2C charter and private recreational fisheries in 2008. For effort, p is the estimated proportion of angler-hours in each ADF&G statistical area. For harvest, p represents the estimated proportion of halibut harvest by all target categories. Table cells are shaded if the proportion  $\geq 0.10$  to highlight major statistical areas of effort and harvest.

Port and Creel Area	Stat Area	Effort				Harvest				
		Charter		Private		Charter		Private		
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)	
Ketchikan										
1	101900	0.053	0.005	0.233	0.005	0.053	0.011	0.143	0.011	
2	101800	0.028	0.004	0.006	0.001	0.021	0.007	0.004	0.002	
3	101850	0.049	0.005	0.035	0.002	0.026	0.008	0.035	0.006	
4	102501	0.041	0.004	0.097	0.004	0.067	0.012	0.107	0.009	
5	101290	0.166	0.008	0.181	0.005	0.239	0.021	0.220	0.012	
6	101472	0.000	--	0.014	0.001	0.000	--	0.006	0.002	
7	101270	0.038	0.004	0.096	0.004	0.012	0.005	0.094	0.009	
8	101452	0.070	0.005	0.043	0.003	0.021	0.007	0.025	0.005	
9	101440	0.032	0.004	0.009	0.001	0.002	0.002	0.001	0.001	
10	101451	0.171	0.008	0.039	0.002	0.064	0.012	0.025	0.005	
11	101412	0.012	0.002	0.034	0.002	0.002	0.002	0.021	0.004	
12	101411	0.056	0.005	0.040	0.002	0.062	0.012	0.060	0.007	
13	101460	0.034	0.004	0.014	0.001	0.002	0.002	0.004	0.002	
14	101471	0.007	0.002	0.003	0.001	0.002	0.002	0.004	0.002	
17	101400	0.000	--	0.001	0.000	0.000	--	0.000	--	
19	101530	0.013	0.002	0.000	--	0.021	0.007	0.000	--	
20	102801	0.007	0.002	0.007	0.001	0.010	0.005	0.005	0.002	
22	101510	0.014	0.003	0.000	--	0.019	0.007	0.001	0.001	
23	102100	0.048	0.005	0.010	0.001	0.105	0.015	0.033	0.005	
24	101250	0.034	0.004	0.084	0.003	0.072	0.013	0.120	0.010	
25	101230	0.000	--	0.010	0.001	0.000	--	0.024	0.005	
26	101210	0.045	0.004	0.028	0.002	0.079	0.013	0.056	0.007	
28	102200	0.032	0.004	0.010	0.001	0.105	0.015	0.011	0.003	
29	102700	0.020	0.003	0.000	0.000	0.012	0.005	0.000	--	
30	101430	0.026	0.003	0.004	0.001	0.002	0.002	0.002	0.001	
31	102502	0.000	--	0.001	0.000	0.000	--	0.001	0.001	
99	NA <sup>a</sup>	0.000	--	0.002	0.001	0.000	--	0.000	--	
Craig										
1	103600	0.012	0.002	0.081	0.008	0.013	0.002	0.058	0.012	
2	103500	0.016	0.002	0.176	0.011	0.013	0.002	0.114	0.016	
3	103700	0.113	0.006	0.312	0.014	0.137	0.007	0.261	0.022	
4	103800	0.008	0.002	0.038	0.006	0.009	0.002	0.030	0.009	
5	104400	0.720	0.008	0.216	0.012	0.695	0.010	0.397	0.025	
6	104350	0.057	0.004	0.053	0.007	0.051	0.005	0.061	0.012	
7	104300	0.053	0.004	0.023	0.004	0.062	0.005	0.043	0.010	
9	104500	0.015	0.002	0.042	0.006	0.015	0.003	0.010	0.005	
10	103900	0.000	--	0.060	0.007	0.000	--	0.025	0.008	
16	105500	0.006	0.001	0.000	--	0.002	0.001	0.000	--	
99	NA <sup>a</sup>	0.000	--	0.000	--	0.002	0.001	0.000	--	

(continued)

Table 6. Page 2 of 4.

Port and Creel Area	Stat Area	Effort				Harvest				
		Charter		Private		Charter		Private		
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)	
Klawock										
1	103600	0.013	0.003	0.263	0.015	0.013	0.002	0.140	0.016	
2	103500	0.009	0.002	0.189	0.013	0.011	0.002	0.196	0.018	
3	103700	0.086	0.007	0.144	0.012	0.064	0.005	0.036	0.008	
4	103800	0.000	0.000	0.057	0.008	0.000	--	0.034	0.008	
5	104400	0.751	0.010	0.319	0.016	0.823	0.008	0.502	0.022	
6	104350	0.082	0.007	0.028	0.006	0.066	0.005	0.032	0.008	
7	104300	0.016	0.003	0.000	--	0.015	0.003	0.059	0.011	
9	104500	0.043	0.005	0.000	--	0.009	0.002	0.000	--	
Petersburg										
1	106443	0.000	--	0.002	0.001	0.000	--	0.002	0.001	
3	108500	0.043	0.004	0.175	0.006	0.051	0.007	0.150	0.011	
4	108600	0.012	0.002	0.074	0.004	0.016	0.004	0.091	0.009	
5	110130	0.021	0.003	0.090	0.005	0.015	0.004	0.113	0.010	
7	106441	0.256	0.008	0.213	0.007	0.203	0.014	0.179	0.012	
18	106442	0.000	--	0.018	0.002	0.002	0.002	0.015	0.004	
22	106301	0.202	0.007	0.096	0.005	0.151	0.012	0.085	0.009	
25	108410	0.023	0.003	0.118	0.005	0.025	0.005	0.105	0.010	
26	110110	0.413	0.009	0.157	0.006	0.508	0.017	0.219	0.013	
27	110120	0.000	--	0.039	0.003	0.000	--	0.024	0.005	
29	110150	0.015	0.002	0.000	--	0.012	0.004	0.000	--	
30	110310	0.014	0.002	0.018	0.002	0.017	0.004	0.015	0.004	
99	NA <sup>a</sup>	0.000	--	0.000	--	0.000	--	0.000	--	
Wrangell										
7	106441	0.000	--	0.009	0.004	0.000	--	0.044	0.021	
12	108403	0.000	--	0.163	0.015	0.000	--	0.143	0.037	
13	108402	0.538	0.056	0.599	0.020	0.500	0.354	0.549	0.052	
14	108200	0.000	--	0.000	--	0.000	--	0.011	0.011	
15	108401	0.000	--	0.052	0.009	0.000	--	0.055	0.024	
19	108100	0.000	--	0.071	0.011	0.000	--	0.022	0.015	
20	107200	0.000	--	0.014	0.005	0.000	--	0.044	0.021	
21	106302	0.462	0.056	0.005	0.003	0.500	0.354	0.011	0.011	
22	106301	0.000	--	0.057	0.010	0.000	--	0.033	0.019	
23	106411	0.000	--	0.019	0.006	0.000	--	0.044	0.021	
24	106420	0.000	--	0.010	0.004	0.000	--	0.044	0.021	
Sitka										
1	113411	0.004	0.001	0.056	0.007	0.001	0.001	0.016	0.008	
2	113415	0.000	--	0.008	0.003	0.000	--	0.008	0.006	
3	113416	0.018	0.001	0.152	0.012	0.015	0.002	0.188	0.025	
4	113414	0.000	--	0.071	0.008	0.000	--	0.060	0.015	
5	113413	0.000	--	0.033	0.006	0.000	--	0.012	0.007	
6	113621	0.001	0.000	0.024	0.005	0.001	0.001	0.024	0.010	
7	113430	0.000	--	0.001	0.001	0.000	--	0.000	--	
8	113412	0.001	0.000	0.104	0.010	0.002	0.001	0.040	0.012	
9	113450	0.379	0.004	0.146	0.011	0.439	0.009	0.208	0.026	
10	113311	0.168	0.003	0.125	0.011	0.147	0.006	0.092	0.018	
13	113611	0.119	0.003	0.116	0.010	0.106	0.005	0.164	0.023	

(continued)

Table 6. Page 3 of 4.

Port and Creel Area	Stat Area	Effort				Harvest				
		Charter		Private		Charter		Private		
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)	
Sitka (cont.)										
14	113417	0.218	0.004	0.081	0.009	0.200	0.007	0.112	0.020	
15	113630	0.021	0.001	0.000	--	0.007	0.001	0.000	--	
16	113660	0.001	0.000	0.000	--	0.001	0.000	0.000	--	
17	113313	0.000	--	0.009	0.003	0.000	--	0.008	0.006	
18	113622	0.005	0.001	0.035	0.006	0.002	0.001	0.040	0.012	
19	113710	0.015	0.001	0.000	--	0.012	0.002	0.000	--	
20	113810	0.002	0.000	0.000	--	0.005	0.001	0.000	--	
21	113210	0.028	0.001	0.029	0.005	0.038	0.003	0.028	0.010	
22	113220	0.001	0.000	0.000	--	0.002	0.001	0.000	--	
23	113330	0.004	0.001	0.000	--	0.004	0.001	0.000	--	
96	113612	0.002	0.000	0.000	--	0.002	0.001	0.000	--	
97	113550	0.001	0.000	0.000	--	0.002	0.001	0.000	--	
98	113312	0.011	0.001	0.000	--	0.016	0.002	0.000	--	
99	NA <sup>a</sup>	0.000	--	0.008	0.003	0.000	--	0.000	--	
Juneau										
1	115200	0.000	--	0.002	0.000	0.000	--	0.002	0.001	
2	115101	0.077	0.011	0.187	0.004	0.069	0.018	0.191	0.010	
3	115102	0.117	0.013	0.039	0.002	0.294	0.032	0.037	0.005	
4	111507	0.105	0.013	0.227	0.004	0.108	0.022	0.212	0.010	
5	111506	0.070	0.011	0.056	0.002	0.044	0.014	0.038	0.005	
6	111505	0.056	0.010	0.055	0.002	0.034	0.013	0.065	0.006	
7	112151	0.042	0.008	0.034	0.002	0.010	0.007	0.025	0.004	
8	112162	0.000	--	0.029	0.002	0.000	--	0.010	0.002	
9	111503	0.000	--	0.020	0.001	0.000	--	0.010	0.002	
10	111502	0.000	--	0.013	0.001	0.000	--	0.006	0.002	
11	111410	0.000	--	0.027	0.002	0.000	--	0.021	0.003	
12	111403	0.000	--	0.052	0.002	0.000	--	0.057	0.006	
13	111431	0.000	--	0.005	0.001	0.000	--	0.003	0.001	
14	111320	0.000	--	0.006	0.001	0.000	--	0.005	0.002	
15	111312	0.000	--	0.008	0.001	0.000	--	0.005	0.002	
16	111501	0.000	--	0.027	0.002	0.005	0.005	0.026	0.004	
17	111432	0.000	--	0.001	0.000	0.000	--	0.002	0.001	
18	112161	0.000	--	0.007	0.001	0.000	--	0.016	0.003	
19	111401	0.000	--	0.012	0.001	0.000	--	0.005	0.002	
20	111402	0.000	--	0.007	0.001	0.000	--	0.008	0.002	
21	111504	0.000	--	0.027	0.002	0.000	--	0.018	0.003	
23	112153	0.044	0.009	0.007	0.001	0.000	--	0.005	0.002	
24	112152	0.167	0.016	0.056	0.002	0.270	0.031	0.086	0.007	
25	112140	0.014	0.005	0.014	0.001	0.049	0.015	0.021	0.004	
26	114250	0.032	0.007	0.034	0.002	0.015	0.008	0.054	0.006	
27	114270	0.135	0.014	0.016	0.001	0.093	0.020	0.031	0.004	
29	114232	0.000	--	0.008	0.001	0.000	--	0.015	0.003	
30	114700	0.000	--	0.002	0.000	0.000	--	0.006	0.002	
34	111311	0.000	--	0.001	0.000	0.000	--	0.000	--	
35	111200	0.000	--	0.010	0.001	0.000	--	0.007	0.002	
40	114750	0.140	0.015	0.000	--	0.010	0.007	0.000	--	
52	114500	0.000	--	0.000	0.000	0.000	--	0.002	0.001	
99	NA <sup>a</sup>	0.000	--	0.011	0.001	0.000	--	0.011	0.003	

(continued)

Table 6. Page 4 of 4.

Port and Creel Area	Stat Area	Effort				Harvest			
		Charter		Private		Charter		Private	
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)
<b>Elfin Cove</b>									
26	114250	0.000	--	0.031	0.007	0.000	--	0.007	0.007
27	114270	0.000	--	0.005	0.003	0.000	--	0.000	--
28	114231	0.053	0.002	0.108	0.012	0.068	0.006	0.149	0.029
29	114232	0.003	0.001	0.009	0.004	0.000	--	0.000	--
45	114600	0.009	0.001	0.023	0.006	0.006	0.002	0.034	0.015
46	114212	0.097	0.003	0.126	0.013	0.066	0.006	0.101	0.025
47	116110	0.031	0.002	0.000	--	0.023	0.003	0.000	--
48	116120	0.002	0.000	0.000	--	0.000	--	0.000	--
51	114400	0.003	0.001	0.000	--	0.002	0.001	0.000	--
52	114500	0.001	0.000	0.000	--	0.001	0.001	0.000	--
53	114211	0.508	0.005	0.468	0.020	0.425	0.011	0.345	0.039
54	113940	0.004	0.001	0.000	--	0.001	0.001	0.000	--
55	113910	0.242	0.004	0.206	0.016	0.349	0.011	0.324	0.038
56	113930	0.001	0.000	0.000	--	0.000	--	0.000	--
61	154000	0.046	0.002	0.023	0.006	0.058	0.005	0.041	0.016
<b>Gustavus</b>									
26	114250	0.004	0.000	0.015	0.002	0.000	0.000	0.013	0.004
27	114270	0.000	--	0.010	0.002	0.000	--	0.007	0.003
28	114231	0.027	0.001	0.073	0.005	0.021	0.002	0.070	0.010
29	114232	0.789	0.003	0.454	0.009	0.838	0.006	0.546	0.019
30	114700	0.134	0.003	0.417	0.009	0.123	0.006	0.337	0.018
36	114300	0.001	0.000	0.000	--	0.000	--	0.000	--
39	114770	0.001	0.000	0.000	--	0.000	--	0.000	--
46	114212	0.006	0.001	0.024	0.003	0.007	0.001	0.023	0.006
51	114400	0.001	0.000	0.000	--	0.001	0.001	0.000	--
53	114211	0.022	0.001	0.002	0.001	0.004	0.001	0.001	0.001
55	113910	0.015	0.001	0.006	0.001	0.005	0.001	0.003	0.002
99	NA <sup>a</sup>	0.000	--	0.000	--	0.000	--	0.000	--
<b>Yakutat</b>									
1	183104	0.131	0.003	0.771	0.011	0.101	0.007	0.752	0.026
2	183103	0.008	0.001	0.003	0.001	0.008	0.002	0.000	0.000
3	183102	0.027	0.001	0.005	0.002	0.013	0.002	0.000	0.000
4	183105	0.072	0.002	0.034	0.005	0.086	0.006	0.035	0.011
5	183101	0.171	0.003	0.021	0.004	0.204	0.009	0.028	0.010
6	181604	0.254	0.004	0.150	0.009	0.203	0.009	0.160	0.022
7	181605	0.336	0.004	0.005	0.002	0.380	0.011	0.014	0.007
8	183201	0.002	0.000	0.000	--	0.005	0.002	0.000	--
10	181603	0.000	--	0.000	--	0.000	--	0.000	--
16	189300	0.000	--	0.011	0.003	0.000	--	0.011	0.006

<sup>a</sup> NA – Area outside of typical marine fishery boundary for the particular port.

Table 7. Spatial distribution of bottomfishing effort and halibut harvest in Area 3A charter and private recreational fisheries in 2008. For effort, p is the estimated proportion of angler-days in each ADF&G statistical area (except angler-hours for Yakutat). For harvest, p represents the estimated proportion of halibut harvest by all target categories. Table cells are shaded if the proportion  $\geq 0.10$  to highlight major statistical areas of effort and harvest.

Port	Stat Area	Charter				Private			
		Effort		Harvest		Effort		Harvest	
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)
CCI	515905	0.006	0.002	0.006	0.001	0.000	--	0.000	--
	515907	0.006	0.002	0.006	0.001	0.000	--	0.000	--
	515937	0.000	--	0.000	--	0.002	0.002	0.002	0.001
	515938	0.021	0.003	0.021	0.002	0.198	0.014	0.188	0.011
	515939	0.027	0.004	0.027	0.003	0.118	0.011	0.104	0.008
	516002	0.002	0.001	0.002	0.001	0.033	0.006	0.029	0.005
	525902	0.004	0.001	0.003	0.001	0.000	--	0.000	--
	525931	0.932	0.006	0.933	0.004	0.642	0.017	0.672	0.013
	525932	0.002	0.001	0.002	0.001	0.000	--	0.000	--
	526002	0.000	--	0.000	--	0.007	0.003	0.004	0.002
Homer	515831	0.006	0.002	0.006	0.002	0.000	--	0.000	--
	515832	0.039	0.006	0.013	0.003	0.000	--	0.000	--
	515901	0.039	0.006	0.019	0.003	0.000	--	0.000	--
	515902	0.002	0.001	0.002	0.001	0.008	0.003	0.011	0.003
	515903	0.016	0.004	0.017	0.003	0.000	--	0.000	--
	515904	0.017	0.004	0.017	0.003	0.000	--	0.000	--
	515905	0.046	0.007	0.050	0.005	0.028	0.005	0.026	0.004
	515906	0.105	0.010	0.113	0.007	0.018	0.004	0.026	0.004
	515907	0.088	0.009	0.080	0.006	0.110	0.010	0.111	0.008
	515908	0.000	--	0.000	--	0.028	0.005	0.004	0.002
	515931	0.004	0.002	0.004	0.002	0.005	0.002	0.000	--
	515932	0.000	--	0.000	--	0.020	0.005	0.012	0.003
	515933	0.000	--	0.000	--	0.033	0.006	0.013	0.003
	515934	0.000	--	0.000	--	0.013	0.004	0.001	0.001
	515935	0.011	0.003	0.009	0.002	0.060	0.008	0.043	0.005
	515936	0.105	0.010	0.110	0.007	0.129	0.011	0.119	0.009
	515937	0.063	0.008	0.070	0.006	0.180	0.012	0.203	0.011
	515939	0.000	--	0.000	--	0.008	0.003	0.006	0.002
	525836	0.010	0.003	0.011	0.002	0.000	--	0.000	--
	525901	0.054	0.007	0.051	0.005	0.076	0.008	0.075	0.007
525902	0.255	0.014	0.279	0.010	0.135	0.011	0.184	0.010	
525931	0.136	0.011	0.143	0.008	0.148	0.011	0.166	0.010	
535933	0.006	0.002	0.006	0.002	0.000	--	0.000	--	
Kodiak	515801	0.004	0.002	0.005	0.002	0.000	--	0.000	--
	525701	0.085	0.009	0.091	0.007	0.000	--	0.000	--
	525702	0.015	0.004	0.015	0.003	0.000	--	0.000	--
	525731	0.136	0.011	0.131	0.008	0.294	0.018	0.288	0.015
	525732	0.006	0.003	0.006	0.002	0.000	--	0.000	--
	525733	0.648	0.016	0.643	0.012	0.694	0.018	0.696	0.016
	525805	0.028	0.006	0.031	0.004	0.012	0.004	0.016	0.004
	525806	0.065	0.008	0.067	0.006	0.000	--	0.000	--
	525807	0.007	0.003	0.007	0.002	0.000	--	0.000	--
	535734	0.007	0.003	0.003	0.001	0.000	--	0.000	--

(continued)

Table 7. Page 2 of 3.

Port	Stat Area	Charter				Private			
		Effort		Harvest		Effort		Harvest	
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)
Seward	475931	0.044	0.006	0.047	0.005	0.030	0.009	0.048	0.012
	475932	0.040	0.006	0.046	0.005	0.022	0.008	0.045	0.011
	475933	0.053	0.007	0.063	0.006	0.057	0.012	0.054	0.012
	475934	0.067	0.008	0.071	0.006	0.054	0.012	0.063	0.013
	485931	0.068	0.008	0.072	0.006	0.000	--	0.000	--
	485932	0.103	0.009	0.116	0.008	0.027	0.008	0.048	0.012
	485933	0.008	0.003	0.009	0.002	0.033	0.009	0.030	0.009
	485935	0.144	0.011	0.157	0.009	0.065	0.013	0.084	0.015
	495901	0.007	0.003	0.008	0.002	0.000	--	0.000	--
	495902	0.006	0.002	0.000	--	0.019	0.007	0.039	0.011
	495931	0.006	0.002	0.000	--	0.005	0.004	0.003	0.003
	495932	0.169	0.012	0.142	0.008	0.299	0.024	0.283	0.025
	495934	0.040	0.006	0.033	0.004	0.005	0.004	0.003	0.003
	495935	0.018	0.004	0.020	0.003	0.014	0.006	0.021	0.008
	495936	0.008	0.003	0.009	0.002	0.016	0.007	0.030	0.009
	495938	0.041	0.006	0.019	0.003	0.293	0.024	0.181	0.021
	495939	0.005	0.002	0.001	0.001	0.000	--	0.000	--
	496002	0.004	0.002	0.004	0.002	0.041	0.010	0.024	0.008
	505902	0.012	0.003	0.015	0.003	0.000	--	0.000	--
	505907	0.006	0.002	0.007	0.002	0.000	--	0.000	--
505909	0.032	0.005	0.038	0.005	0.019	0.007	0.042	0.011	
505931	0.006	0.002	0.007	0.002	0.000	--	0.000	--	
505932	0.114	0.010	0.117	0.008	0.000	--	0.000	--	
Valdez	465931	0.023	0.006	0.016	0.004	0.000	--	0.000	--
	465932	0.155	0.016	0.173	0.013	0.000	--	0.000	--
	466002	0.197	0.017	0.210	0.014	0.032	0.007	0.047	0.008
	466003	0.053	0.010	0.055	0.008	0.035	0.008	0.027	0.006
	466004	0.212	0.018	0.212	0.014	0.049	0.009	0.024	0.006
	466005	0.042	0.009	0.036	0.006	0.000	--	0.000	--
	466031	0.000	--	0.000	--	0.014	0.005	0.017	0.005
	466032	0.021	0.006	0.015	0.004	0.303	0.019	0.428	0.019
	466033	0.023	0.006	0.014	0.004	0.273	0.019	0.232	0.016
	466100	0.008	0.004	0.001	0.001	0.124	0.014	0.052	0.009
	475932	0.146	0.015	0.152	0.012	0.025	0.006	0.042	0.008
	476001	0.023	0.006	0.025	0.005	0.000	--	0.000	--
	476002	0.011	0.005	0.014	0.004	0.018	0.005	0.030	0.007
	476003	0.021	0.006	0.022	0.005	0.000	--	0.000	--
	476006	0.009	0.004	0.011	0.004	0.000	--	0.000	--
	476008	0.000	--	0.000	--	0.026	0.007	0.015	0.005
	476009	0.038	0.008	0.032	0.006	0.000	--	0.000	--
	476031	0.019	0.006	0.013	0.004	0.007	0.003	0.003	0.002
	476032	0.000	--	0.000	--	0.023	0.006	0.035	0.007
	476034	0.000	--	0.000	--	0.007	0.003	0.002	0.002
476035	0.000	--	0.000	--	0.065	0.010	0.046	0.008	

(continued)

Table 7. Page 3 of 3.

Port	Stat Area	Charter				Private			
		Effort		Harvest		Effort		Harvest	
		p	SE(p)	p	SE(p)	p	SE(p)	p	SE(p)
Whittier	466002	0.026	0.006	0.027	0.005	0.000	--	0.000	--
	466003	0.041	0.008	0.040	0.006	0.012	0.002	0.038	0.006
	466004	0.041	0.008	0.043	0.006	0.000	--	0.000	--
	466005	0.017	0.005	0.021	0.004	0.015	0.003	0.018	0.004
	466033	0.000	--	0.000	--	0.001	0.001	0.000	--
	475932	0.007	0.003	0.009	0.003	0.000	--	0.000	--
	475933	0.028	0.006	0.026	0.005	0.030	0.004	0.048	0.007
	475934	0.000	--	0.000	--	0.003	0.001	0.008	0.003
	476003	0.376	0.018	0.395	0.014	0.066	0.005	0.091	0.009
	476004	0.090	0.011	0.095	0.009	0.049	0.005	0.123	0.010
	476005	0.000	--	0.000	--	0.023	0.003	0.022	0.005
	476006	0.016	0.005	0.015	0.004	0.048	0.005	0.030	0.005
	476007	0.034	0.007	0.027	0.005	0.080	0.006	0.100	0.009
	476008	0.054	0.009	0.063	0.007	0.012	0.002	0.024	0.005
	476009	0.016	0.005	0.019	0.004	0.025	0.003	0.025	0.005
	476031	0.006	0.003	0.004	0.002	0.040	0.004	0.082	0.009
	476032	0.021	0.005	0.018	0.004	0.062	0.005	0.080	0.008
	476033	0.009	0.003	0.005	0.002	0.110	0.007	0.044	0.006
	476034	0.000	--	0.000	--	0.009	0.002	0.008	0.003
	476035	0.000	--	0.000	--	0.002	0.001	0.008	0.003
	476036	0.000	--	0.000	--	0.005	0.001	0.000	--
	476101	0.000	--	0.000	--	0.004	0.001	0.001	0.001
	476102	0.000	--	0.000	--	0.025	0.003	0.030	0.005
	485932	0.071	0.010	0.072	0.008	0.064	0.005	0.105	0.010
	486001	0.100	0.011	0.098	0.009	0.016	0.003	0.021	0.005
	486003	0.000	--	0.000	--	0.005	0.002	0.001	0.001
	486005	0.040	0.007	0.018	0.004	0.014	0.002	0.002	0.001
	486031	0.007	0.003	0.006	0.002	0.120	0.007	0.045	0.006
	486032	0.000	--	0.000	--	0.005	0.002	0.000	--
	486033	0.000	--	0.000	--	0.086	0.006	0.024	0.005
486034	0.000	--	0.000	--	0.071	0.005	0.022	0.005	
486100	0.000	--	0.000	--	0.000	--	0.000	--	
Yakutat	183104	0.131	0.003	0.771	0.011	0.101	0.007	0.752	0.026
	183103	0.008	0.001	0.003	0.001	0.008	0.002	0.000	0.000
	183102	0.027	0.001	0.005	0.002	0.013	0.002	0.000	0.000
	183105	0.072	0.002	0.034	0.005	0.086	0.006	0.035	0.011
	183101	0.171	0.003	0.021	0.004	0.204	0.009	0.028	0.010
	181604	0.254	0.004	0.150	0.009	0.203	0.009	0.160	0.022
	181605	0.336	0.004	0.005	0.002	0.380	0.011	0.014	0.007
	183201	0.002	0.000	0.000	--	0.005	0.002	0.000	--
	181603	0.000	--	0.000	--	0.000	--	0.000	--
	189300	0.000	--	0.011	0.003	0.000	--	0.011	0.006



**Attached Document**

# STATE OF ALASKA

## DEPARTMENT OF FISH AND GAME

### DIVISION OF SPORT FISH

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November 5, 2008

Calvin Blood  
International Pacific Halibut Commission  
P.O. Box 95009  
Seattle, WA 98145

Dear Cal:

This letter contains the updated final sport harvest estimates for 2007 and preliminary harvest estimates, or projections for 2008 for areas 2C, 3A, 3B and 4.

#### **Final Estimates of 2007 Sport Harvest, Areas 2C and 3A**

Last October we provided end-of-season projections of the 2007 sport harvest for Areas 2C and 3A. This letter provides updated estimates based on final statewide harvest survey (SWHS) estimates (in numbers of fish) and final estimates of mean weight. These final Area 2C and 3A estimates were also presented at the NPFMC October meeting in Anchorage.

#### **Methods:**

For Area 2C and Area 3A, sport fishery yield (pounds net weight) was calculated separately for the charter and non-charter (unguided) fisheries as the product of the number of fish and average weight of harvested halibut. The number of fish harvested was estimated by the ADF&G statewide harvest survey (SWHS). The SWHS is currently the preferred method for estimating charter harvest and the only method available for estimating the non-charter harvest. Average net weight was estimated from length measurements of halibut harvested at representative ports in Areas 2C and 3A. Ports sampled in Area 2C in 2007 included Ketchikan, Craig, Klawock, Petersburg, Wrangell, Juneau, Sitka, Gustavus, and Elfin Cove. Ports sampled in Area 3A included Yakutat, Valdez, Whittier, Seward, Homer, Deep Creek, Anchor Point, and Kodiak. The estimate of charter average weight for Homer was stratified to account for differences in sizes of halibut cleaned at sea versus cleaned onshore.

Standard errors of the SWHS estimates were produced by bootstrapping (1,000 iterations). Standard errors of the average weight estimates were obtained assuming normal distributions. Approximate 95% confidence intervals are provided for the Area 2C and Area 3A estimates of yield (harvest in pounds) assuming they are normally distributed ( $\pm 1.96$  standard errors). The harvest estimates are not likely as precise as indicated by the confidence intervals presented in this letter, due to the fact that fish measured in the harvest are not truly a simple random sample.

A limited resampling analysis of Area 3A charter data from 2007 indicated that, although the point estimates were unbiased, the standard error of charter average weight was at least 1.77 times as large as estimated using formulas for random sampling. The standard error of the harvest estimate (by weight) was at least 27% larger. ADF&G staff will be considering changes to the sampling design for 2009 to allow the use of bootstrap methods to estimate the variance of mean weight estimates.

#### Results:

The Area 2C sport harvest (yield) in 2007 was estimated at 3.049 million pounds (SE = 0.110). Charter harvest was 1.918 M lb (SE = 0.085), and non-charter harvest was 1.131 M lb (SE = 0.073). The charter removals represented 63% of the Area 2C sport harvest. Average net weight was estimated at 17.5 lb for the charter fishery (n = 8,326), 16.5 lb for the non-charter fishery (n = 3,796), and 17.1 lb overall. The estimated charter removals were 6% higher than the 2006 estimate, and the non-charter estimates increased 57%.

The Area 3A sport harvest was estimated at 6.283 M lb (SE = 0.150). Charter harvest was estimated at 4.002 M lb (SE = 0.120), and non-charter harvest was 2.281 M lb (SE = 0.104). Charter removals in Area 3A accounted for about 64% of the sport harvest. Average net weight was estimated at 16.9 lb for the charter fishery (n = 4,753), 13.7 lb for the non-charter fishery (n = 1,751), and 15.6 lb overall. Estimated charter removals increased 9% and non-charter removals increased 36% from 2006 levels.

The final harvest estimates for 2007 were considerably higher than projected at the end of last year, and higher than in 2006. Charter harvest was 12.8% higher than projected in Area 2C and 17.6% higher in Area 3A. Non-guided harvest was 34% higher than projected in Area 2C and 39% higher in Area 3A. Estimated charter harvest in Area 2C increased 6% from 2006 to 2007 despite implementation by the National Marine Fisheries Service of a maximum size limit of 32 inches for one of the fish in the bag limit to try to keep charter harvest within the 1.432 M lb GHL. The increase in harvest was due to increases in effort and harvest rate, which may not have been much affected by the maximum size limit.

#### **Preliminary Estimates of 2008 Sport Harvest, Areas 2C and 3A**

##### Methods:

Final harvest estimates are typically not available from the SWHS until September of the year following harvest. Therefore, ADF&G provides preliminary estimates of the most recent season's harvest using projections or other estimates of the number of fish harvested multiplied by the recent season's estimates of average weight from length sampling. These preliminary estimates have been a focus of attention by the North Pacific Fishery Management Council (NPFMC) and have been incorporated in decisions regarding allocation of halibut between the sport charter and commercial sectors, despite their limited accuracy. The NPFMC Scientific and Statistical Committee (SSC) reviewed ADF&G's projection methods in October 2007 and did not suggest any alternate methods that can be implemented with available data. We will continue efforts to improve these projections, however.

Last year, we evaluated the retrospective performance of several time series projection methods and based harvest projections on the best method. This remains the best approach for projecting the non-charter harvest. Our ability to use time series methods for charter harvest, however, is hampered by changes in regulations because the time series upon which estimates are based is

inconsistent. Charter skippers and crew in Area 2C were prohibited from retaining fish in 2006-2008, which probably caused a minor drop in harvest. The maximum size limit (on one of two fish in the bag limit) in place in Area 2C in 2007 and most of 2008 may have affected the numbers of fish retained. The one-fish bag limit also in place in Area 2C for a portion of 2008 may have affected effort. In Area 3A, skippers and crew were prohibited from retaining fish in 2007 and 2008, and this was estimated to decrease harvest by about 10%. One strategy for dealing with these changes is to base the time series projections on what the harvest might have been if the regulations had not been in place, and then correct the forecast for the current year to account for the restriction. The difficulty with this approach is that it is not possible to know the true effect of the regulation changes due to confounding changes from year to year in angler effort, angler behavior, halibut catchability, etc.

We feel the best preliminary estimates of charter halibut harvest would be obtained using methods that incorporate as much actual data from the current year as possible. The only comprehensive data that is available for the charter fishery in the current year is charter logbook data. Logbook estimates of charter harvest have not yet been approved by the North Pacific Fishery Management Council for management of the fishery and are still under evaluation for accuracy by ADF&G, but some logbook data have been used to support analyses of proposed regulations. We suspect that logbook data showing relative changes or proportions of harvest over time are probably fairly robust.

Therefore, charter harvest projections for 2008 were based on relative changes in reported logbook harvest from 2007 to 2008, and these changes were applied to the final 2007 SWHS estimate of charter harvest. Logbook data entry for trips made before August 1, 2008 was essentially complete at the time of these projections. These partial logbook data indicate that 2008 charter harvest was about 11% lower than 2007 in Area 2C, and about 12% lower in Area 3A. Because the relative changes varied considerably among SWHS areas, the 2008 charter projections were made separately for each SWHS area and summed to obtain the harvest projections for areas 2C and 3A. Specifically, charter harvest for 2008 was projected for each area as follows:

$$\hat{H}_{2008} = \sum_i r_i \hat{N}_i \bar{w}_i,$$

where:

- $\hat{H}_{2008}$  = the projected 2008 charter harvest by weight,
- $r_i$  = the ratio of reported 2008/2007 logbook harvest through July 31 for SWHS area i,
- $\hat{N}_i$  = the final SWHS halibut harvest estimate for SWHS area i, and
- $\bar{w}_i$  = the estimated mean weight of halibut harvested in area i in 2008.

Alternate methods had to be used to estimate the mean weight of charter halibut harvested in the Lower Cook Inlet fishery (Homer). For this port, the estimate is stratified by fish cleaned at sea and fish cleaned in port. Due to mid-season vacancies, there was no sampling of halibut cleaned at sea after June, and fewer interviews than normal for estimating the proportion of harvest cleaned at sea. The mean weight of halibut cleaned at sea was therefore projected from the recent

time series of mean weights, and the proportion of harvest cleaned at sea was estimated from monthly interview data weighted by 2007 logbook proportions of harvest by month.

Non-charter harvest was estimated by multiplying a time series projection of harvest by the 2008 estimated average weight for each SWHS area and summing across areas. We made projections at the SWHS area level, but evaluated retrospective performance at the regulatory area level. The following time series methods were evaluated retrospectively: (1) using the previous year's harvest, (2) linear trend projections based on the previous 2-6 years, and (3) single and double exponential projections by SWHS area and by IPHC regulatory area. Single and double exponential projections were made with Minitab<sup>®</sup> software, using the default smoothing parameters. The performance criteria for the retrospective projections were mean squared deviations (MSD) and mean absolute percent error (MAPE) relative to the final SWHS estimates. The period 2001-2007 was used for all retrospective evaluations because 6 years of previous data (1995-2000) were required to generate exponential projections.

The best method to use for projecting non-charter harvest was not clear. For Area 2C, the double exponential method had the lowest MSD but single exponential projections by SWHS area and regulatory area had the lowest MAPE. For Area 3A, the lowest MSD was obtained with a 6-year linear projection, but the lowest MAPE was obtained with single exponential projections. The single exponential smoothing method was selected for projecting non-charter harvest in both areas 2C and 3A because many of the SWHS areas had no apparent trend in harvest.

The SSC recommended in October 2007 that ADF&G provide confidence intervals to allow the public to evaluate uncertainty in the projections. Although confidence intervals can be computed for the single and double exponential projections of the numbers of fish harvested, it wasn't clear how to calculate uncertainty in the charter estimates made using changes in the logbook ratio. We therefore provided approximate maximum projection errors, expressed as a percentage of the projection. In other words, the final harvest estimate is likely to be within the specified percentage of the projection. Projection errors for charter harvest were based on logbook ratio projections for 2007 made using the same method as for 2008. Projection errors for the non-charter fishery were set at the largest observed deviation between the retrospective projections and final estimates.

#### Results:

The preliminary yield estimates for Area 2C are 1.914 M lb ( $\pm 21\%$ ) for the charter fishery, 1.169 M lb ( $\pm 39\%$ ) for the non-charter fishery, and 3.083 M lb overall (Table 2, Figure 1). Preliminary estimates of average weight for Area 2C are 19.5 lb for charter ( $n = 9,195$ ), and 19.5 lb for non-charter ( $n = 3,654$ ). The preliminary estimate of charter average weight is up substantially from 2007, mostly due to large increases in average weight in the Ketchikan and Glacier Bay areas.

The preliminary yield estimates for Area 3A are 3.603 M lb ( $\pm 26\%$ ) for the charter fishery, 2.026 M lb ( $\pm 39\%$ ) for the non-charter fishery and 5.629 M lb overall (Table 2, Figure 1). Preliminary estimates of average weight are 17.1 lb for charter ( $n = 3,805$ ) and 13.6 lb for non-charter ( $n = 2,222$ ). Charter and non-charter average weights are nearly identical to 2007.

#### **Updated and Preliminary Estimates for Areas 3B and 4**

##### Methods:

For Area 3B and Area 4, only the final SWHS estimates of harvest in number of fish are provided. We do not conduct any sampling in these areas for mean weight. Historically we have

included in the Area 3B estimate all harvest from SWHS Area R (Alaska Peninsula and Aleutian Islands south of Cape Douglas and the Naknek River) north of the Area 3B/4 boundary. In some years the Area 3B estimates have included small harvests for sites that are actually in Area 3A. Since 1995, the estimated harvest of Area 3A halibut reported in Area 3B has ranged from 0 to 243 fish (average = 85). These harvests are not large, and it is more convenient to continue reporting these Area 3A harvests in Area 3B because the number of survey responses are not sufficient to precisely apportion the Area R harvest among the charter/non-charter sectors as well as IPHC Areas 3A, 3B, and 4. This error has more impact on the Area 3B sport harvest estimate than the Area 3A estimate, but the Area 3B sport harvest is quite small and represents a very minor proportion of the total removals in that area.

Past preliminary estimates of harvest for Areas 3B and 4 have used projections of the linear trend based on the previous five years. This year we also evaluated projections methods for these areas using retrospective analyses. For each area we evaluated (1) using the previous year's harvest, (2) linear trend projections based on the previous 2-6 years, (3) single and double exponential projections, and (4) moving averages of the previous 2-5 years. Retrospective projections were compared for the period 1998-2007 for Area 3B and 1997-2007 for Area 4. A simple two-year moving average was chosen to project harvest in Area 3B because it had the lowest MSD, and nearly the lowest MAPE. Single exponential projections had the best fit to Area 4 data. Harvest in both areas is highly variable from year to year with no apparent trend, but more than doubled in Area 3B from 2007 to 2008.

#### Results

The final 2007 harvest estimate for Area 3B was 1,429 fish, and the final estimate for Area 4 was 2,531 fish (Table 3). The combined harvest had a standard error of 677, but standard errors were not available for IPHC Areas 3B and 4 separately.

Harvest projections for 2008 are 1,039 fish ( $\pm 102\%$ ) in Area 3B and 2,476 fish ( $\pm 56\%$ ) in Area 4 (Table 3). The projection errors have been relatively large, reflecting the inherent variability in the past harvest estimates (Figure 1).

These estimates are provided in numbers of fish because we have no sampling programs to obtain size data in these areas. You typically use Kodiak average weight data to produce the yield estimates. The estimates of average weight for the Kodiak sport fishery (charter and non-charter) were 17.2 lb in 2007 and 17.3 lb in 2008. These average weights assume that the charter fishery accounted for 54% of the harvest (in numbers) both years. Anecdotal reports from the Dutch Harbor/Unalaska suggest a higher average weight.

Feel free to contact either of us if you require clarification or additional information.

Sincerely;

*(sent via email)*

Scott Meyer, Mike Jaenicke, Barbi Failor  
Fishery Biologists

**Table 1. Final estimates of the 2007 sport halibut harvest (numbers of fish), average net weight (pounds), and yield (millions of pounds net weight) in Areas 2C and 3A.**

Area and Estimate	Charter	Non-Charter	Total
<b>Area 2C</b>			
No. Fish	109,835	68,498	178,333
Average Wt (lb)	17.5	16.5	17.1
Yield (M lb)	1.918	1.131	3.049
Approx. 95% CI	1.750-2.085	0.987-1.274	2.834-3.264
<b>Area 3A</b>			
No. Fish	236,133	166,338	402,471
Average Wt (lb)	16.9	13.7	15.6
Yield (M lb)	4.002	2.281	6.283
Approx. 95% CI	3.767-4.237	2.078-2.484	5.989-6.577

**Table 2. Preliminary estimates of the 2008 sport halibut harvest (numbers of fish), average net weight (pounds), and harvest biomass (millions of pounds net weight) in Areas 2C and 3A.**

Area and Estimate	Charter	Non-Charter	Total
<b>Area 2C</b>			
No. Fish	98,051	59,985	158,036
Average Wt (lb)	19.5	19.5	19.5
Yield (M lb)	1.914	1.169	3.083
Projection Error ( $\pm\%$ )	21%	39%	24%
<b>Area 3A</b>			
No. Fish	210,380	149,202	359,581
Average Wt (lb)	17.1	13.4	15.7
Yield (M lb)	3.603	2.026	5.629
Projection Error ( $\pm\%$ )	26%	39%	31%

**Table 3. Final 2007 and preliminary 2008 harvest estimates for Areas 3B and 4 (numbers of fish).**

Estimate	Number of Halibut Harvested	
	Area 3B	Area 4
2007 Final	1,429	2,531
2008 Preliminary	1,039	2,476
Projection Error ( $\pm\%$ )	102%	56%

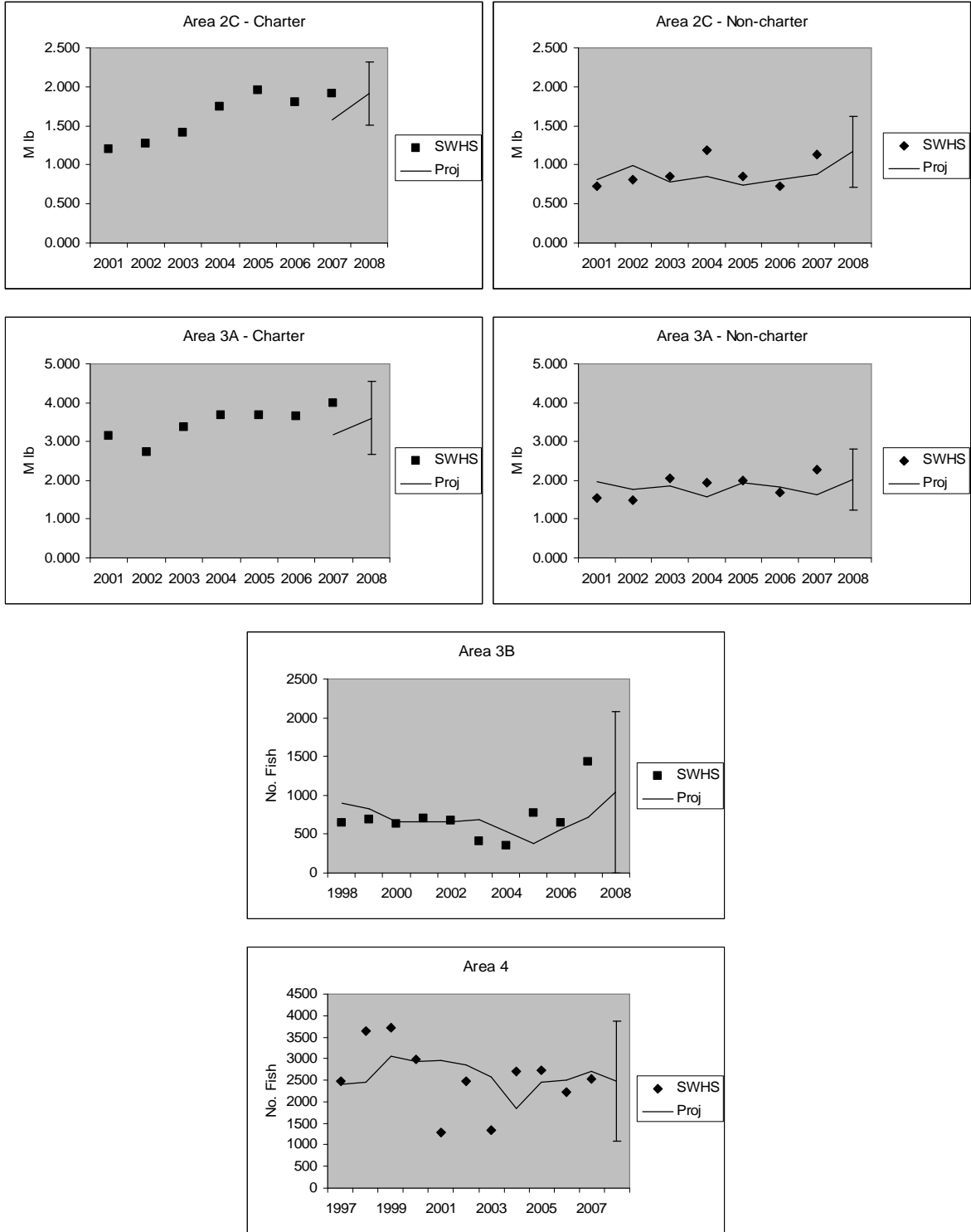


Figure 1. Comparison of final SWHS estimates and retrospective projections for areas 2C, 3A, 3B, and 4 using the methods selected for projecting harvest in 2008. Approximate error bounds are provided for 2008. Charter and non-charter projections are shown for areas 2C and 3A only. The Area 2C and 3A estimates are in pounds, and Area 3B and 4 estimates are in numbers of fish.