

Analysis of Management Options for the Area 2C and 3A Charter Halibut Fisheries for 2015

A Report to the North Pacific Fishery Management Council

Scott Meyer, Robert Powers
Alaska Department of Fish and Game
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1.0 Introduction

Under the North Pacific Fishery Management Council's Halibut Catch Sharing Plan (CSP) for Areas 2C and 3A, the sport charter allocation is set as a percentage of the combined commercial/charter catch limit approved by the International Pacific Halibut Commission (IPHC) in late January each year. The percentage varies with the magnitude of the combined catch limit, referred to as the FCEY, or fishery constant exploitation yield. The CSP further specifies that waste, or discard mortality, of halibut from the charter and commercial sectors will count toward each sector's allocation. The CSP is not specific about which waste, but the FCEY only includes halibut over 26 inches. Beginning with CHP implementation in 2014, charter harvest accounting is based on numbers of halibut reported harvested in Alaska Department of Fish and Game (ADF&G) charter logbooks, and on average weights from onsite sampling of charter halibut harvest at major ports in Areas 2C and 3A.

The North Pacific Fishery Management Council's Charter Management Implementation Committee met October 29 to select a list of alternative management measures to be analyzed by the Alaska Department of Fish and Game for the 2015 season. Preliminary estimates of charter harvest and release mortality for the 2014 season were provided prior to the meeting. The charter sector is estimated to have exceeded its allocation in Area 2C by about 110,000 lb (14%) and in Area 3A by about 413,000 lb (23%). In Area 2C, the number of halibut harvested was about 17% higher than the forecast and average weight was about 2% lower than predicted. In Area 3A, the number of halibut harvested was only 2% higher than the forecast, but average weight was 21% higher than predicted. The higher-than-predicted average weight was caused by a combination of relatively more large fish in the harvest and fewer anglers keeping a second fish (which was required to be less than or equal to 29 inches in length).

The charter committee identified the following measures for analysis for 2015:

Area 2C (all options include a one-fish bag limit)

1. Reverse slot limit (status quo), potentially combined with an annual limit,
2. Maximum size limit, potentially combined with an annual limit,
3. Day of the week closure during the period 15 June to 15 August (if time allows for analysis).

Area 3A (all options include two-fish bag limit, max one trip per vessel per day)

1. One fish of any size with maximum size limit on the "second" fish (status quo), potentially combined with an annual limit
2. Day of the week closure during the period 15 June to 15 August, potentially combined with other measures.
3. Reverse slot limit on both fish,
4. Maximum size limit on one fish and reverse slot limit on the other fish.

The objective of this analysis was to provide the information needed by stakeholders and the Council to select management measures or combinations of measures that are likely to constrain total charter removals in each regulatory area to catch limits that will be determined by the IPHC at the annual meeting in January 2015. These catch limits will not be known when the Council is expected to make its

recommendations in December. However, the Council may base recommendations on the Blue Line¹ FCEYs and include contingencies to accommodate adoption of alternate FCEYs. At the Interim Meeting on December 3, 2014, the IPHC announced Blue Line FCEYs of 4.30 M lb for Area 2C and 10.12 M lb for Area 3A. The corresponding charter allocations under the CSP are 0.79 M lb for Area 2C and 1.89 M lb for Area 3A.

This analysis projects total charter fishery removals (harvest plus O26 release mortality) under each alternative, and provides information on the methods and assumptions used, and when possible, information regarding the uncertainty associated with the projections. Tables highlight the most liberal management measures for which the projected charter removals are less than or equal to the charter allocation under the Blue Line FCEY.

2.0 General Methods

2.1 Subareas

Projections of charter yield were generally calculated as the product of harvest (in numbers of fish) and average net weight (headed and gutted) in pounds. Average net weight was calculated from length measurements using the current IPHC length-weight relationship (Clark 1992). Although all calculations and results are in net weight, a table is provided for conversion to round weights, which is how anglers tend to regard harvest (Table 1). Nearly all calculations for Area 2C and Area 3A were done by subarea and then summed to obtain yield estimates for each regulatory area. Most analyses were done at the subarea level because most of the variables analyzed (client harvest, average weight, etc.) vary substantially by subarea.

There are six subareas in Area 2C and eight subareas in Area 3A (Table 2). ADF&G collected length data from harvested halibut and interviewed anglers and charter captains in at least one port in each subarea. With few exceptions, the subareas correspond to ADF&G sport fishery management areas as well as SWHS reporting areas. Harvests from the Juneau and Haines/Skagway areas were combined because the Haines/Skagway area is not sampled for average weight and harvests are quite small. The SWHS Area J is split into three subareas: Eastern Prince William Sound (EPWS), Western Prince William Sound (WPWS), and the North Gulf coast (NG). Likewise, Cook Inlet (SWHS Area P) is split into Central Cook Inlet (CCI) and Lower Cook Inlet (LCI) subareas. These SWHS areas were split into subareas based on the location of halibut landings, rather than harvest. For example, Central Cook Inlet includes all points of landings north of and including Anchor Point. Basing the subarea definitions on port of landing allows matching of harvest estimates of logbook data to estimates of average weight from port sampling. In addition, port of landing is recorded more accurately than catch locations.

2.2 Harvest Forecasts

Harvest forecasts for 2015 were done using time series methods. No other data, such as socioeconomic factors have yet been linked to the halibut fishery in a way that would improve forecasting of effort or harvest. Time series forecasts are uncertain because they rely only on past data, which are not necessarily indicative of future trends.

The December 2013 analysis (Meyer and Powers 2013) used the Box and Jenkins (1976) procedure for fitting autoregressive integrated moving average (ARIMA) models, as recommended by the Council's Scientific and Statistical Committee in October 2012. ARIMA models can take on a variety of forms, and the goal of the Box-Jenkins procedure is to find the simplest model that adequately describes the data. However, the time series of charter harvests are short (9 years, 2006-2014), which is generally much shorter than recommended for ARIMA forecasting. In addition, the variability in these time series has at times been quite high compared to the level of harvest. As a result, the Box-Jenkins approach typically fails to identify any autoregressive or moving average components, and usually identifies the "naïve"

¹ The "blue line" is the FCEY associated with the harvest rate specified by the current IPHC harvest policy.

model (last year's harvest) as the best forecast. This was a potential problem, especially in Area 2C where harvest has been increasing in recent years and exceeded last year's forecast by 17%.

Therefore, simple and double exponential smoothing models were used to forecast harvest for 2015. Exponential smoothing models give more weight to recent years or trends, and are special cases of ARIMA models. They may not have been selected as the best ARIMA models because the time series was too short for use with the Box-Jenkins model identification procedure. In using them, it is assumed that a forecast that favors recent trends will inherently be better than "naïve" forecasts that are simply the previous year's value. Each subarea forecast was made using both simple and double exponential models, and the best model was chosen as the one with the smallest AICc value (Akaike Information Criterion, corrected for small sample size).

Time series forecasts were done two different ways. The first was to forecast harvest directly from harvest data in the charter logbook. The second was to forecast effort and harvest per unit of effort (HPUE) separately and multiply them together to get harvest. The second method was felt to better get at the underlying causes for changes in harvest. There are no estimates of effort specifically for halibut. Therefore, effort was defined as angler-days with bottomfish effort or harvest of at least one halibut (while targeting salmon or other species). HPUE was defined as total harvest of halibut by all anglers (regardless of target species) divided by the total effort defined above.

Forecasts were based on the 2006-2014 logbook data for each subarea (Table 3). For the years 2006-2013, data included client and comp (anglers fishing for free) harvest only. Skipper and crew harvest was excluded so that total harvest was scaled to the 2014 levels with the prohibition on skipper and crew harvest. Data for 2014 included client and comp harvest as well as any reported harvest by skippers or crew. The 2014 values for harvest, effort, and HPUE were preliminary estimates for the entire year, expanded from logbook data for trips taken through July 31. Harvest and effort were expanded based on simple and double exponential forecasts of the proportion of harvest or effort through July from past years (2006-2013). HPUE was expanded based on a regression of partial-year and full-year HPUE from the same years.

2.3 Projecting Harvest under Annual Limits

Annual harvest calculations were derived from 2013 logbook data. Harvests by skipper and crew were excluded from the analysis because skipper and crew harvest is prohibited in Areas 2C and 3A. The frequency of individual licensed anglers was tallied for annual harvests of 1, 2, 3, etc. halibut up to the maximum number kept by any angler. Logbook data were not compiled for youth anglers because they are not required to be licensed, and therefore logbook data cannot be used to identify individual youth anglers. However, youth effort has accounted for an average of only 4.5% of charter effort in Area 2C and 5.4% of charter effort during the period 2011-2013. Estimates of the effects of each annual limit are expressed as percentage reductions in harvest. By using estimates for licensed anglers, it was assumed that the effects of annual limits on harvest would be similar for youth anglers.

The projection of harvest under various annual limits assumed that the distribution of annual harvest among license numbers would be the same in 2015 as in 2013, and would be the same as for unlicensed anglers. It further assumed that imposition of annual limits will not have an effect on the number of anglers, but that it will only truncate harvest associated with each license number at the annual limit. For example, if 100 anglers each harvested five halibut in 2013, then a 4-fish annual limit would reduce the annual harvest of each of those anglers by one fish, or by 20 percent. A 4-fish annual limit would have no effect on harvest by anglers that harvested four or fewer halibut. Using these assumptions, the annual harvest was calculated over a range of annual limits and the percentage reduction in harvest was calculated by comparison to total harvest without an annual limit. The percentage reductions for each subarea were applied to harvest projections by subarea, and these were summed to obtain the total harvests under each annual limit.

This method could underestimate the effects of annual limits on charter yield for two reasons. First, annual limits could discourage some potential clients from booking guided trips. It is unknown at what level of annual limit this would occur or how large the effect might be. The degree of reduced bookings could vary by subarea, with the largest reductions in areas with mostly small halibut. Second, logbook data indicate that some anglers fish in multiple subareas within a year. Because the analysis was done by subarea, the projected reduction in harvest could be underestimated. For example, if an angler caught four fish in each of two subareas in 2013, the analysis by subarea would indicate that a four-fish annual limit would have no effect on harvest in either subarea. In reality, the annual limit would cut that angler's annual harvest by 50 percent. The amount of bias associated with this latter issue was evaluated by comparing area-wide and subarea-specific annual harvest distributions and found to be minor. Estimated harvest reductions under annual limits of 1 to 5 fish per year in Area 2C were at most 0.5% greater when estimated using area-wide data. Reductions under annual limits from 1 to 10 fish per year in Area 3A varied from 0.1% to 3.7% greater when estimated using area-wide data. The larger differences reflect the greater tendency of Area 3A charter anglers to fish multiple subareas in a year.

Conversely, this analysis could overestimate the reductions in yield associated with annual limits under certain conditions. As mentioned previously, there could be fewer bookings in subareas with smaller halibut. Some of the more flexible clients, in an effort to maximum halibut harvest under annual limits, might respond by booking with charter businesses in subareas with larger halibut. This would result in a redistribution of effort toward subareas with higher average weights, thus increasing the area-wide average weight and negating the effect of reduced harvest. Additionally, harvest reductions associated with annual limits could also be overestimated in Area 3A if the fishery were under a maximum size limit set low enough to discourage harvesting of a second fish. Data through July of 2014 indicate that the proportion of harvest made up of second fish in angler's creels has been steady in most areas but decreased in some areas in 2014 (Figure 1). Numerous charter operators reported that clients preferred to harvest one "good-sized" halibut than fill a bag limit with a second fish under 29 inches. Because fewer anglers kept a second fish, these reductions likely altered the distribution of total annual harvest among anglers in 2014. It is likely, therefore, that the 2013 analysis would overestimate the harvest reductions associated with an annual limit if combined with maximum size limits near or below 29 inches.

2.4 Accounting for Release Mortality of Halibut Over 26 Inches (O26)

Under the CSP, the charter allocation includes total removals by the charter sector, made up of directed harvest and estimated release mortality (or waste) of halibut over 26 inches. Estimation of release mortality requires information on short-term mortality rate from capture, handling, and release in the sport fishery, as well as information on the numbers and sizes of released halibut. There are no known estimates of the mortality rate of halibut associated with catch-and-release in the sport fishery. Estimates of charter waste for 2014 assumed mortality rates of 6% in Area 2C and 5% in Area 3A (Meyer et al. 2014). The number of halibut released in 2014 was expanded from logbook data through July using simple exponential forecasts of the proportion of releases through July during the period 2006-2013. There are no data available on the sizes of individual released fish. However, charter captains and anglers interviewed by ADF&G creel technicians in Area 2C were asked to report released fish by size class, where the classes in 2014 were U44, 44-76 inches, and O76. These data were combined with the estimated numbers of released fish and size class data described above in a modeling approach to derive plausible length distributions of released fish for each subarea (Meyer et al. 2014).

The magnitude of O26 release mortality, relative to the harvest, is probably relatively consistent from year to year as long as there is no major change in the regulations or numbers of fish released. Release mortality of O26 halibut in Area 2C under the U44O76 reverse slot limit was estimated at about 45,500 lb in 2014. This mortality represented about 5.5% of the directed yield of 825,140 lb from the fishery. In other words, total removals represented an additional 5.5% more biomass of halibut harvest. Release mortality in Area 3A, under a two-fish bag limit with a maximum size of 29 inches on one of the fish, was

estimated at 34,500 lb. This represented an additional 1.6% of harvest biomass beyond the directed yield of 2.139 M lb.

For convenience, waste of O26 halibut in the charter sector is included in yield projections under various regulatory alternatives. However, it was not possible to predict release mortality precisely under many alternatives due to the lack of experience with the regulations. Therefore, assumed inflation factors were applied to estimates of charter yield. Projected yield under maximum size limits and reverse slot limits in Area 2C were inflated by 5.5% (multiplied by 1.055) based on 2014 estimates. Projected yields under a maximum size limit on one fish in Area 3A were inflated by 2.0% (rounded up from 1.6% observed in 2013 and 2014). Projected yields under a reverse slot limit on both fish in Area 3A were inflated by 6%. This assumed value was chosen arbitrarily but the choice weighed contrasting concepts: (1) mortality may be higher than in Area 2C under reverse slot limits because proportionally more fish will be released in Area 3A to achieve the two-fish bag limit, and (2) mortality may not be much higher than in Area 2C because a smaller percentage of released fish are likely to be in the protected slot, and (3) the assumed mortality rate in Area 3A is slightly lower than in 2C due to a higher incidence of circle hook use.

3.0 Area 2C

3.1 Status Quo Forecast

Status quo measures for Area 2C include a one-fish bag limit, U44O76 reverse slot limit, and prohibition of halibut harvest by captain and crew while guiding. There were slight upward trends in effort in nearly all subareas of Area 2C in recent years (Table 4). The 2015 time series forecast of harvest based on past harvest only was 67,932 halibut. The preferred harvest forecast, based on effort and HPUE trends, was slightly higher at 69,637 halibut (Table 5, Figure 2). This forecast was based on forecasts of 92,949 angler-days of effort and a HPUE of 0.7492 halibut per angler-day. Applying average weights observed under the U44O76 size limit in 2014 results in a yield forecast of 0.844 M lb. Total estimated charter removals, after inflating by 5.5% to account for O26 release mortality, was 0.891 M lb. This projection exceeds the 0.79 M lb allocation under the Blue Line FCEY by 0.101 M lb, or about 12.8%.

3.2 Effects of Annual Limits

Harvests were projected for annual limits of 1-5 halibut in Area 2C. The percentage harvest reduction associated with annual limits varied substantially by subarea (Table 6). Estimated harvest reductions ranged from nearly 54% under an annual limit of one fish to less than 2% under an annual limit of five fish. Annual limits of three to five fish offered moderate reductions in harvest of about 2-10%.

3.3 Maximum Size Limit With and Without Annual Limit

Yields under maximum size limits were calculated as the product of projected harvest and projected average weight. Average weights corresponding to various maximum size limits were estimated simply as the average weight of the portion of the charter harvest that was less than or equal to that length during 2010, the last year in which there was no size limit in Area 2C. Average weight was predicted for each subarea and the overall average weight for each regulatory area was calculated as a weighted mean, where the predicted harvests in each subarea were the weighting factors.

This accuracy of average weight prediction was evaluated by comparing the predicted and observed (final estimated) average weights for Area 2C for 2011 when the fishery was managed under a 37" maximum size limit. The Area 2C fishery was also managed under a U45O68 reverse (or "protected") slot limit in 2012 and 2013 and under a U44O76 reverse slot limit in 2014. Because the lower limit essentially functions as a maximum size limit for the majority of harvest, these data could also be used in an evaluation of the predicted weights. Observed average weights for these years were estimated using all fish below the lower limit as well as any illegally harvested fish in the protected slot to within 2 inches of the upper limit. Inclusion of harvest in the protected slot was intended to provide a realistic estimate of

average weight under these maximum size limits. Predicted average weights by subarea were weighted by logbook harvest to obtain the weighted average for Area 2C overall.

The Area 2C predicted average weights for the last four years were 2.5% (0.32 lb) to 8.8% (1.04 lb) higher than the observed average weights (Table 7). There was considerable variation in prediction errors among subareas and years. For example, predictions were consistently low in the Prince of Wales Island subarea and consistently high for the Ketchikan, Sitka, and Glacier Bay subareas. Predictions for the other areas were sometimes above and sometimes below the observed averages. These inconsistent prediction errors cause the variability in the projection error for Area 2C overall.

Total charter removals were projected for maximum size limits ranging from 30 to 55 inches, and under annual limits from one to five fish. In the case of no annual limit, projected removals ranged from 0.478 M lb under a 30-inch maximum size limit to 1.322 M lb under a 55-inch maximum size limit (Table 8). The corresponding average weights ranged from 6.5 to 18.0 pounds. The most liberal combinations of size limits and annual limits for which projected removals are within the Blue Line FCEY are highlighted in this table.

Projected removals (Table 8) vary primarily in proportion to the projected harvest under each annual limit. This is because the analysis did not assume that average weight was directly affected by the choice of annual limit. It is possible that implementation of an annual limit would provide additional incentive for anglers to select for larger fish in the harvest (high-grade). The degree to which this may happen is unknown and was not incorporated into the projections. Since projections tend to overestimate the average weight slightly, some of the effect of highgrading would be mitigated by the inflated estimates of removals.

3.4 Reverse Slot Limit With or Without Annual Limit

Reverse slot limits have been used to manage the Area 2C charter yield since 2012. The goal of the reverse slot limit is to reduce the average weight of the harvest by requiring most fish to be below a lower limit, yet allow the opportunity for a small amount of harvest above an upper, or trophy limit. Average weight under reverse slot limits was predicted using the standard procedure used last year (Meyer and Powers 2013). Briefly, this procedure fixes the proportion of harvest above the upper limit equal to the proportion in 2010, the last year without a size limit. The proportion of harvest below the lower limit is set to the remainder. Average weight is then estimated as a weighted mean of the average weight of fish above and below the upper and lower limits, weighted by the respective proportion of harvest above and below the limits. This approach assumes that 2010 data are representative of the length distribution of harvest in the absence of a size limit. This assumption grows more tenuous with the passage of time. This approach also uses the status quo forecasts of numbers of halibut harvested, therefore it inherently assumes that reverse slot limits have no effect on the numbers of halibut retained by individual anglers.

Predicted average weights from the standard method were evaluated by comparing them to the observed, or estimated average weights from the fishery in 2012-2014. Average weights were predicted with subarea harvests set to the logbook values for those years. Therefore, this comparison does not take into account possible errors in the allocation of the predicted harvest among subareas. Predicted average weights were 9.7-16.1% higher than the observed weights over the last three years (Table 9). The average difference over these three years is 12.8%. Absolute values of prediction errors were consistently largest for the Sitka and Glacier Bay subareas and smallest for the Ketchikan subarea. Predicted average weights in the Prince of Wales Island subarea were below the observed values in 2013 and 2014. It could be that much of this variation is due to changes in stock composition among the subareas of Area 2C since 2010.

Total charter removals were projected for a range of reverse slot limits with lower limits ranging from 35 to 50 inches and upper limits ranging from 50 to 80 inches. Tables of projected total removals were generated for 2015 under no annual limit, and for annual limits ranging from one to five halibut (Table

10). The most liberal measures that meet the fishery targets under the Blue Line alternative are highlighted in the table.

Charter projections were also provided for the current U44O76 reverse slot limit under annual limits from one to five fish per year. Rather than predict average weight using methods described above, these projections used the 2014 preliminary estimates of average weight in each subarea. This was the same approach used for the Area 2C status quo projection in Table 5, but with addition of annual limits. These projections are compared to projections using the standard methodology. Projected removals using empirical average weights under annual limits from one to five fish ranged from 0.413 to 0.873 M lb (Table 11). The corresponding projections using the standard method were 14.5% to 16.0% higher than the projections based on empirical average weights.

Therefore, even though projected removals are likely overestimated using the standard methodology, appropriate size limits can be found in Table 10 by incorporating some level of projection error. For example, the Council could recommend a size limit that corresponds to a predicted charter removal that is somewhat higher than the target level, depending on whether an annual limit was involved, and the desired level of risk. As an example, boxed cells in Table 10 highlight projected removals that are within the Blue Line allocation assuming 15% overestimation. In other words, they correspond with the 0.79 M lb allocation inflated by 15% to 0.909 M lb. Last year's recommendation for a U44O76 size limit for 2014 included a similar 11% correction for projection error, and the 2014 preliminary estimate of average weight was close to (2.2% below) the predicted average weight including that correction.

3.5 Day of the Week Closure During the Period 15 June – 15 August

This alternative was not analyzed for Area 2C. It was identified as a low priority. Charter Management Implementation Committee members spoke briefly to this, suggesting that it would not be likely be effective for lodges because they would simply choose the closed day as the “changeover” day. Members also noted that this option would disproportionately affect businesses that cater to cruise ship traffic, where fishing days are scheduled far in advance of a possible announced closure. As shown later in this document, the impacts of daily closures cannot be projected precisely due to a lack of information regarding the willingness or ability of charter business to absorb displaced harvest, and the willingness or ability of clients to book alternate days.

4.0 Area 3A

4.1 Status Quo Forecasts

The status quo measures for Area 3A included a two-fish bag limit, maximum size limit of 29 inches on one of the fish, a limit of one trip per vessel per day, and no retention of halibut by captain and crew while guiding. The 2014 preliminary estimate of Area 3A charter harvest based on logbook data was 181,947 halibut. This was down 16% from the 2013 logbook harvest of 217,217, which included captain and crew harvest, and down 9.2% from the 2013 logbook harvest of 200,478 excluding crew harvest.

As was the case in Area 2C, the two types of harvest forecasts for 2015 were similar in Area 3A. The time series forecast based solely on the 2006-2014 harvests was 180,123 halibut. The preferred forecast, based on effort and HPUE trends, was 181,238 halibut. This was the product of an effort forecast of 110,365 angler-days and HPUE forecast of 1.6422 halibut per angler-day (Table 12, Figure 3). The similarity in forecasts was due to the flat trends in effort and HPUE in recent years. The harvest forecast is slightly lower than the preliminary harvest estimate of 181,947 for 2014.

Multiplying the harvest forecast for each subarea by preliminary estimates of average weight from 2014 results in a yield forecast of 2.169 M lb. Yield was inflated by 1.6% (estimated for 2013 and 2014) to arrive at the forecast of total charter removals of 2.204 M lb under status quo regulations (Table 12). Although the harvest forecast was slightly lower than the 2014 preliminary estimate, the forecasts of yield and total removals are slightly higher due to differences in the allocation of harvest among subareas.

This status quo forecast of 2.204 M lb of charter removals is 0.314 M lb, or 17%, over the 1.89 M lb allocation for the Blue Line FCEY. This would be the appropriate starting value if considering measures in addition to the current 29-inch maximum size limit. If alternate size limits are to be considered, a status quo projection that excludes the effects of the current size limit would be the appropriate starting value (see next section).

4.2 Harvest Forecast Without A Size Limit

The Charter Management Implementation Committee indicated in October a desire to keep the trip limits in place. In order to proceed with analysis of size limits, it was necessary to make a harvest forecast under the conditions of a two-fish bag limit without size limits, but with continued trip limits and prohibition on harvest by captains and crew. Because the maximum size limit in 2014 had notable effects on harvest (that will be described in a later section), it was necessary to forecast harvest without using harvest data from 2014. Therefore, this harvest forecast was based on the time series forecast of effort from 2006-2014, a time series forecast of HPUE from 2006-2013, and observed average weights by subarea from 2013 as a proxy for what average weight would be in the absence of a size limit.

The forecast for this scenario predicts a harvest of 185,653 halibut and total removals of 2.424 M lb (Table 13). The harvest, in numbers of fish, is higher than the status quo forecast because it doesn't include the effect of the size limit on retention of second fish. The weight of total removals is higher than the status quo forecast because it uses the average weight from 2013, before the effect of the maximum size. This forecast is the basis for all Area 3A harvest projections under size limits, even when combined with other measures.

4.3 Annual Limit

Harvests were projected for annual limits of 1-10 halibut in Area 3A for both harvest scenarios (1) status quo, and (2) without a size limit. An annual limit of 1 halibut was analyzed for informational purposes even though this would require a daily bag limit of one fish, which was not requested to be analyzed. The percentage harvest reduction associated with annual limits varied substantially by subarea (Table 14). Annual limits in Area 3A are projected to reduce the area harvest by 0.5 to nearly 59%. An annual limit of two fish would reduce harvest by 20.4% and an annual limit of three fish would reduce it by 12.6%. A harvest reduction of at least 10% would not be achieved until the annual limit was set below four fish. Annual limits greater than two halibut had a relatively small effect on harvest because few anglers harvested three or more halibut in 2013. Under status quo regulations, including the 29-inch maximum size limit on one fish, projected harvests for Area 3A overall ranged from approximately 75,000 to 181,000 halibut. Without size limits, projected harvests under annual limits would range from 77,000 to 185,000 halibut.

Total charter removals, including release mortality, were projected under status quo regulations combined with annual limits from one to ten fish, using the observed average weights from 2014 (Table 15). As above, results for a one-fish annual limit are shown even though a one-fish daily bag limit was not identified for analysis. Total removals ranged from 1.75 M lb under a two-fish annual limit to 2.19 M lb under a 10-fish annual limit. Under status quo regulations, a two-fish annual limit would be required in Area 3A to keep the projected removals under the 1.89 M lb charter allocation for the Blue Line FCEY.

Estimates of the effect of annual limits assume that the 2013 distribution of annual harvests among individual anglers still applies in 2015. Charter halibut harvest in Area 3A decreased 16% from 217,000 in 2013 to 182,000 in 2014 (preliminary estimate). Effort for bottomfish, or by anglers that caught halibut, declined only 6%, indicating lower annual harvests per angler. The expected effect would be that the 2013 results would overstate the expected harvest reductions, but the degree of error is unknown.

4.4 Maximum Size Limit on One Fish Combined with an Annual Limit

Average weight under each maximum size limit was predicted as a weighted mean of the average weight of the first fish (fish of any size) and second fish (under maximum size). The weighting factors were the projected proportions of harvest made up of first and second fish. These proportions were obtained from logbook data on harvest by individual anglers. Total projected removals were calculated as the product of the predicted average weights, harvest forecasts without a size limit (from section 4.2) under various annual limits, and an inflation factor for release mortality.

Projection under a size limit on one fish was made more complex for 2015 by the response of the fishery to this regulation in 2014. The overall average weight in Area 3A was reduced from 2013 to 2014, but by less than projected. Two results are likely attributable to the maximum size limit: (1) there was an increase in the number of anglers that failed to keep a second fish, and (2) charter anglers appeared to harvest more large halibut than in 2013, the basis year for projections of average weight. With respect to the first point, logbook data through July indicate that the proportion of harvest made up of second fish decreased most in the Glacier Bay subarea, followed by Yakutat, Eastern PWS, Western PWS, and Kodiak (Figure 1). Changes were minor in the Cook Inlet and North Gulf subareas. In fact, the decreases were proportional to the average weight in each subarea in 2013. The effect of this decrease is that a smaller proportion of the harvest is made up of fish required to be less than 29 inches, resulting in a higher than projected average weight. Because the changes were most pronounced in subareas that make up a small percentage of the harvest, the proportion of second fish harvest in Area 3A overall changed by a relatively small amount, from 47.6-48.2% of the harvest during the years 2006-2013 to 45.3% through July of 2014.

Highgrading was likely the other factor in not achieving the projected reduction in average weight in 2014. Anglers harvested fewer small fish and more large fish than predicted in several subareas (Figure 4). The projected distributions in these plots use the observed proportions of first and second fish from 2014 in order to mute the effect of the changes in harvest of second fish. Remaining differences highlight that, not only were the projected numbers of U29 fish not realized in many subareas, but the harvest of halibut in the 35 to 50-inch range was higher than expected in some subareas.

Because of the way average weight is projected for maximum size limits on one fish, both of these mechanisms would mitigate the projected decrease in average weight. Observations from 2014 suggest that a maximum size limit, if restrictive enough, may affect the average weight as well as the number of fish harvested. It isn't known, however, at what size limit those effects would become negligible. With only one year of data at a single size limit, the data are inadequate to incorporate these effects into the projection of removals over a wide range of size limits or annual harvests. Furthermore, it isn't possible to separate the effects of the size limit from underlying changes in angler effort or the relative availability of larger halibut. For example, increases in average weight of charter halibut at Kodiak and in PWS were accompanied by increases in average weight of unguided harvest, even though this sector was not constrained by size limits.

For a 29" maximum size limit specifically, the best projections are probably the status quo projections with annual limits in Table 15. Those projections use the empirical average weight from 2014 but may underestimate the removals due to the use of 2013 annual harvest information.

For all other maximum size limits, charter removals were projected using the weighted mean method described above. Feedback from the charter fleet during the 2014 suggested that there was little support for maximum size limits as small as, or smaller than, 29 inches. The proportions of second fish in the harvest in each subarea were set as the mean of the 2013 and 2014 values (Table 16), which would take into account some effect of size limits on the proportions of second fish kept. It was not possible with the limited data to modify the predicted average weights to account for increased highgrading. The relationship between additional highgrading and size limits was unknown, and increased average weight in 2014 could have been due also to changes in availability or catchability of large fish.

Total Area 3A charter removals were projected for maximum size limits on one of the fish that ranged from 26 to 50 inches and annual limits ranging from one to ten fish. Without an annual limit, projected removals ranged from 1.748 M lb with a 26-inch maximum size limit to 2.259 M lb under a 50-inch maximum size limit (Table 17). The projected removal under a 29-inch maximum size limit with no annual limit was 1.873 M lb, which is below the Blue Line allocation of 1.89 M lb. This result differs from the status quo projection of 2.204 with a similar level of harvest. In fact, projected removals using this method are likely underestimated, at least for size limits close to 29 inches, because they do not take into account the highgrading observed in 2014. For size limits of around 29 inches, the standard projection method underestimated charter removals by about 15% (Table 18). Therefore, to increase the utility of the projections, candidate measures were identified for charter removals within the allocation taking into account a 15% underestimation (boxed values in Table 17). Using these boxed values, it appears a 28-inch maximum size limit combined with an annual limit of three fish, or a 32-inch maximum size limit combined with an annual limit of two fish would be suitable measures.

4.5 Day of the Week Closure During the Period 15 June – 15 August

A day of the week closure for the entire year was analyzed for the Council in December 2011 for possible implementation in 2012. That analysis found that each day of the week accounted for 12.5-15.2% of the annual harvest. Those values represented the maximum amount of harvest reduction possible, assuming that none of the anglers who initially preferred to fish on the closed day would or could book a trip on an open day. Smaller values would be expected if the daily closures only applied during a portion of the year.

There has been no significant change since then in the amount or types of data that can be used to analyze daily closures. Logbook data has consistently shown that most charter vessels operate well below their nominal capacity, calculated from the number of days available to fish and the number of anglers per trip authorized by their Charter Halibut Permit. There are no data available to explain why charter vessels operate at the level they do, or whether they would be willing or able to book additional trips if solicited. There are also no data available to indicate whether anglers would be willing or able to book an alternate date if halibut fishing were closed on their pre-booked or preferred date. Although the effect of daily closures could not be rigorously analyzed, the data were summarized and evaluated in an attempt to shed light on some possible outcomes. It was assumed that limits of one charter vessel trip per day would be in effect in 2015. Therefore, instead of projecting numbers of trips, it made sense to summarize data in terms of days fished since these would be equivalent in 2015.

There were just over 500 halibut permits issued for Area 3A in 2013. A total of 385 charter vessels harvested at least one halibut in Area 3A in 2013. Of these, 88% fished 80 days or less, 63% fished 60 days or less, and 41% fished 40 days or less (Figure 5). Although vessel activity is a function of angler demand, vessel availability can vary for other reasons. Although aspiring businesses would welcome additional bookings, many businesses may be operating at their preferred level of activity.

It has been pointed out that vessel availability varies among ports. Therefore, daily activity was plotted by subarea for the closure window June 15 – August 15, 2013. Activity was plotted as the percentage of boats with bottomfish effort during that period that fished on any given date (Figure 6). These plots indicate that the peak period of activity in major subareas (CCI, LCI, EPWS, WPWS, NGulf) was in late July. The CCI and North Gulf subareas (Ninilchik, Anchor Point, Seward) had the highest percentages of active vessels during the peak. Only at Seward (North Gulf) and Yakutat did the percent of active bottomfish vessels exceed 80% at any point.

Logbook data from 2013 were analyzed to compare harvest that would be displaced by a daily closure to the amount of harvest that potentially could be taken on remaining days in the week. First, the numbers of displaced halibut, displaced clients, and displaced trips with halibut harvest were summed for each day of the week. The number of days (or trips) available was calculated as the number of active vessels times the number of open days during the closure window. Active vessels were defined as vessels that recorded

bottomfish effort during the closure window. The amount of harvest available was calculated as the number of available days (=trips) times the average harvest per trip during the closure window. For 2013, the amount of halibut harvest available from potentially active vessels far outweighed the amount of displaced harvest during the closure window (Figure 7).

The maximum expected effect of a daily closure would be to displace all of the harvest from a given day of the week. The data from 2013 were likely not suitable for projections for 2015 because there were no limits on the number of vessel trips per day in 2013. Assuming trip limits would remain in effect in 2015, 2014 data were analyzed the same way to improve estimates of displaced harvest. However, 2014 logbook data were only available through July, and the closure period would extend through August 15. To estimate the effect, the estimated reductions through July were prorated for the entire 2014 season based on the ratios of displaced harvest through July and through the entire year in 2013. The estimated amount of displaced halibut harvest for 2014 ranged from 9% for Friday and Saturday to 12.3% for Thursday (Table 19). These percentages represent the maximum possible reduction in harvest from closing the fishery on these days, assuming that no anglers are able to book a halibut trip on alternate days of the week. In reality, some unknown fraction will be able to book alternate days.

This analysis did not distinguish displaced or available harvest between vessels of different capacities. The closure would apply to all vessels, and it was assumed that the availability of different size classes would remain relatively constant throughout the year. The analysis also viewed vessel availability in terms of being available any day during the entire closure window from June 15 to August 15. In reality, not all anglers would be flexible enough to rebook a trip any time during that window. Instead, most would probably want to book within a few days of the closed day. In addition, not all charter operators may be willing to book halibut trips every day they are available in the closure window. This period coincides with peak salmon fishing in some subareas, and some operators may choose to focus on salmon even though they are willing to do some halibut fishing. It is also likely that many charter businesses do not desire to operate at a level much above their current level. Information about client flexibility or the desired level of activity by businesses is not available and could therefore not be taken into account in this analysis. Therefore, this analysis probably overstates the availability of vessels and cannot precisely estimate the effect of daily closures. The most that can be said is that the effect of a closure would be somewhere between zero and the maximum possible percentage provided.

4.6 Reverse Slot Limit on Both Fish Combined With Annual Limits

Charter removals were projected under reverse slot limits on both fish in the bag limit using the same methods and over the same range of limits as for Area 2C. Charter removals were projected for harvests under no annual limit, and under annual limits from one to five fish. The annual limit of one fish was not practical under a two-fish bag limit, but was presented for comparison. Measures that would be applicable to the 2015 Blue Line allocation of 1.89 M lb are highlighted in the results (Table 20).

Without annual limits, a reverse slot limit was of limited utility. A lower limit of 37 inches or less was needed to stay within the allocation. The highest allowable lower limits for candidate measures with annual limits were 40 inches with an annual limit of five halibut, 42 inches with an annual limit of 4 fish, and 49 inches with an annual limit of 3 fish.

One factor not taken into account in the analysis is that odd-numbered annual limits may be more effective than estimated. The annual distribution of harvest by guided anglers indicates strong modes for even-numbered annual harvests, indicating that when anglers fish on a charter they usually harvest two fish per day. For example, most of the anglers that harvested six fish annually probably did so on three separate charter trips. It is possible that with a three- or five-fish annual limit, some anglers may not book the second or third trip if only allowed to harvest one remaining fish of their annual limit. In that case, a slightly higher reduction in removals may be obtained than projected.

4.7 Maximum Size Limit on One Fish and Reverse Slot on the Other Fish

This option was not analyzed, primarily due to time constraints, but also because the results for reverse slot limits indicate there would be little benefit to combining these two regulations. Regardless of the annual limit selected, varying the upper limit had little effect on projected removals (Table 20). Total removals were mostly affected by the lower limit because very large halibut are rare in the Area 3A harvest. In order for the regulation to be understandable and enforceable, it was assumed that the maximum size limit and lower limit of the reverse slot would be equal. If so, the limit would function like a reverse slot limit but only allow harvest of one fish over the upper limit per day. Savings from this regulation over the reverse slot on both fish would come only from anglers that harvested two halibut per day over the maximum size limit. This would be such a rare event that the savings would be negligible.

5.0 Implementation Issues

5.1 Size Limits

There are no anticipated issues that would prevent implementation of reverse slot limits or maximum size limits on one fish in a two-fish bag limit. These types of size limits, along with a maximum size limit under a one-fish bag limit, have been used in these regulatory areas. Implementation of a reverse slot limit in Area 3A is expected to increase release mortality. Under a maximum size limit on only one fish, many of the fish above that limit that were caught could be retained as the other fish in the bag limit. Under a reverse slot limit on both fish, nearly all fish above the lower limit would be required to be released. Although release mortality would likely increase under a reverse slot limit, that mortality is accounted for and included in the charter allocation. The relative impact of size limits, in terms of release mortality and angler satisfaction, is expected to vary by subarea due to variation in the availability of large fish in the catch. For example, clients fishing in subareas where large fish are commonly caught would end up releasing more fish above the maximum size limit or in the protected slot.

5.2 Annual Limits

It is envisioned that annual limits would be implemented in the charter fishery for halibut as they are by the State of Alaska for king salmon, and as they are for halibut by the Department of Fisheries and Oceans in Area 2B (British Columbia). That is, all anglers would be required to record, in ink, the species, date, and location immediately upon harvesting a halibut. Recording would be on the back of a State of Alaska fishing license, or, if an angler does not have a paper license or is not required to be licensed, on an ADF&G harvest card available at license vendors and ADF&G offices. Charter anglers would not be required to record any Guided Angler Fish (GAF) taken under the CSP provision. This should not present a problem for enforcement or accounting – under the CSP, GAF are required to be recorded in the logbook immediately upon capture. When checking anglers at sea or dockside, enforcement personnel should be able to deduct GAF from fish that count toward an angler's annual limit.

The license or harvest card would not be required to be submitted at the end of the year. Halibut harvest accounting by individual angler would continue to be implemented through ADF&G charter logbooks. Logbooks require reporting of the numbers of halibut harvested and released by individual angler, as well as the angler's name and fishing license number. For anglers fishing under the authority of an ADF&G Permanent Identification (PID) or Disabled Veteran (DAV) card, the PID or DAV number must be recorded. No number need be recorded for youth anglers not required to be licensed. Under the CSP, all anglers (including youth) will be required to sign the logbook verifying that the catch recorded for them is correct.

A number of concerns have been expressed regarding effective enforcement and compliance with a halibut annual limit. A chief concern is that unscrupulous anglers will obtain duplicate or multiple licenses in order to comply with the reporting requirement yet still violate the annual limit. Although this is possible, the magnitude of violations cannot be known in advance. However, ADF&G can merge licensing and logbook data to examine the number of fish harvested by individual anglers, regardless of

the number of licenses, duplicates, PIDs, or DAVs held. This capability provides a post-season evaluation of compliance by individual charter anglers with annual limits for any species included in the logbook.

This capability was tested in 2013 by examining compliance with the nonresident 4-fish annual limit for king salmon in Southeast Alaska in 2012. Statistical data in the logbooks allowed exclusion of harvests from special use areas or terminal harvest areas where annual limits do not apply. In 2012, 13,187 nonresidents that held 13,293 licenses harvested at least one king salmon. Of these anglers, 76 anglers harvested more than four king salmon over 28 inches (annual limit violations). The illegal harvest (in excess of annual limits) of 102 king salmon represented 0.4% of the total harvest of large kings. The low rate of violations among licensed nonresidents in this popular fishery suggests that enforcement of reporting requirement alone creates an effective incentive for compliance.

Compliance among youth anglers that are not required to be licensed cannot be evaluated post-season using logbook data. However, youth anglers have made up only 4.5% of angler-days in Area 2C and 5.4% of angler-days during the previous three years. As stated earlier, all unlicensed youth anglers would be required to report each halibut on a harvest record. Youth typically fish on charter boats with parents or other adults, who, along with the guide or deck hand, would be expected to remind them of recording requirements. The proportion of youth that would violate annual limits is expected to be small.

Post-season evaluations of annual harvests per angler cannot be done until license data are finalized, which is usually by March of the year following harvest. This several-month lag may make post-season enforcement impractical, but the data can be used to inform the Council with respect to compliance issues and assist enforcement by identifying individuals, guides, or businesses frequently associated with annual limit violations.

5.3 Daily Closures

Implementation of daily closures, if effective, would alter the temporal distribution of harvest within the year. This is because they are likely to be constraining only during dates of peak harvest. Depending on the reduction in harvest achieved, the result could potentially compromise the accuracy of preliminary estimates of halibut harvest for the current year. These estimates are calculated using logbook harvests through July 31 and an estimate of the proportion of harvest taken through that date. The estimate of the proportion is derived from past years. If that proportion were to change markedly in one year, without our ability to estimate it, harvest would be overestimated. Using data from 2014, if a daily closure reduced harvest through July by 10% and total harvest by 12%, the preliminary estimate of harvest would be overestimated by a little more than 2%. The current harvest estimation error is unknown but likely to be about the same magnitude. Therefore, this action would have the potential to double the percentage error in preliminary harvest estimates, which are also used for analysis of management measures for the coming year. This same concern would exist for any management measure that changed the temporal distribution of harvest within a year.

NOAA Enforcement informed the Charter Management implementation Committee that daily closure could not be enforced unless they were implemented in such a way as to prohibit possession of sport-caught halibut at any time during a closed day. If enacted without this language, unscrupulous anglers in possession of halibut could say they harvested the fish previously on an open day.

6.0 References

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Table 1. Estimated average net weight (headed and gutted) and round weight of halibut by length. Estimates use based on the current International Pacific Halibut Commission length-weight relationships.

Length (Inches)	Net Weight (lb)	Round Weight (lb)	Length (Inches)	Net Weight (lb)	Round Weight (lb)
20	2.3	3.1	51	48.3	64.3
21	2.7	3.6	52	51.5	68.5
22	3.2	4.2	53	54.8	72.8
23	3.7	4.9	54	58.2	77.4
24	4.2	5.6	55	61.7	82.1
25	4.8	6.4	56	65.5	87.1
26	5.4	7.2	57	69.3	92.2
27	6.2	8.2	58	73.3	97.5
28	6.9	9.2	59	77.5	103.1
29	7.8	10.3	60	81.9	108.9
30	8.7	11.5	61	86.4	114.9
31	9.6	12.8	62	91.0	121.1
32	10.7	14.2	63	95.9	127.5
33	11.8	15.7	64	100.9	134.2
34	13.0	17.3	65	106.1	141.1
35	14.3	19.0	66	111.5	148.3
36	15.6	20.8	67	117.0	155.7
37	17.1	22.7	68	122.8	163.3
38	18.6	24.8	69	128.7	171.2
39	20.3	27.0	70	134.9	179.4
40	22.0	29.3	71	141.2	187.8
41	23.8	31.7	72	147.8	196.5
42	25.8	34.3	73	154.5	205.5
43	27.8	37.0	74	161.5	214.8
44	30.0	39.9	75	168.7	224.3
45	32.2	42.9	76	176.1	234.2
46	34.6	46.0	77	183.7	244.3
47	37.1	49.3	78	191.5	254.7
48	39.7	52.8	79	199.6	265.5
49	42.5	56.5	80	207.9	276.5
50	45.3	60.3			

(continued at right)

Table 2. Subareas of IPHC Areas 2C and 3A, ports where ADF&G creel surveys and halibut sampling occur, and subarea abbreviations used in tables and figures in this report.

IPHC Area	Subarea (sampled ports)	Ports With Sampling and Angler Interviews	Abbreviations
2C	Ketchikan	Ketchikan	Ketch
	Prince of Wales Island	Craig, Klawock	PWI
	Petersburg/Wrangell	Petersburg, Wrangell	Pburg
	Sitka	Sitka	Sitka
	Juneau, Haines, Skagway	Juneau	Jun
	Glacier Bay (2C portion)	Gustavus, Elfin Cove	GlacB
3A	Glacier Bay (3A portion)	Gustavus, Elfin Cove	GlacB
	Yakutat	Yakutat	Yak
	Eastern Prince William Sound	Valdez	EPWS
	Western Prince William Sound	Whittier	WPWS
	North Gulf	Seward	NGulf
	Lower Cook Inlet	Homer	LCI
	Central Cook Inlet	Anchor Point, Deep Creek	CCI
	Kodiak/Alaska Peninsula	Kodiak city	Kod, Kod/AkPen

Table 3. Charter logbook harvest (numbers of halibut) excluding crew, by subarea for IPHC Areas 2C and 3A, 2006-2014. Harvest through 2013 is logbook data as of 11/20/14. The 2014 values (*in italics*) are preliminary estimates based on expansion of harvest through July 2014.

Area 2C									
Year	Subarea						Total 2C		
	Ketch	PWI	Pburg	Sitka	Jun	GlacB			
2006	10,933	38,053	5,505	34,430	9,471	12,468	110,860		
2007	11,719	42,044	5,912	34,056	9,325	17,251	120,307		
2008	8,595	38,047	5,452	29,465	8,004	17,016	106,579		
2009	4,471	13,097	2,246	15,896	4,873	10,433	51,016		
2010	4,322	12,403	2,138	14,010	5,051	9,612	47,536		
2011	3,746	12,045	1,444	16,022	5,377	9,365	47,999		
2012	5,234	13,985	1,748	16,711	4,903	8,175	50,756		
2013	6,711	16,810	2,107	17,265	6,487	8,880	58,268		
2014	<i>6,902</i>	<i>17,954</i>	<i>1,999</i>	<i>22,275</i>	<i>7,856</i>	<i>10,956</i>	<i>67,942</i>		

Area 3A:									
Year	Subarea								Total 3A
	GlacB	Yak	EPWS	WPWS	NGulf	LCI	CCI	Kod	
2006	86	3,266	9,176	3,896	44,888	93,652	65,958	16,624	237,546
2007	150	3,028	9,284	3,674	54,109	98,730	69,708	19,452	258,135
2008	493	3,413	7,032	4,567	50,508	83,165	64,277	17,822	231,277
2009	280	3,042	7,066	4,220	40,165	69,361	52,704	13,934	190,772
2010	142	3,357	7,219	4,843	45,116	75,986	53,074	13,418	203,155
2011	972	2,751	5,925	4,006	45,635	78,572	52,904	14,437	205,202
2012	1,300	3,430	4,954	4,766	45,094	76,381	50,281	13,388	199,594
2013	1,431	3,798	5,450	5,695	44,447	75,179	52,107	11,867	200,478
2014	<i>1,214</i>	<i>3,780</i>	<i>4,704</i>	<i>4,952</i>	<i>46,225</i>	<i>67,531</i>	<i>39,674</i>	<i>13,867</i>	<i>181,947</i>

Table 4. Charter logbook effort, defined as client angler-days of bottomfish effort or harvest of at least one halibut, by subarea for IPHC Areas 2C and 3A, 2006-2014. The 2014 values (*in italics*) are preliminary estimates based on expansion of effort through July 2014.

Area 2C							
Year	Subarea						Total 2C
	Ketch	PWI	Pburg	Sitka	Jun	GlacB	
2006	11,148	26,409	4,441	34,298	8,445	12,499	97,240
2007	13,359	27,906	4,754	36,066	7,990	15,912	105,987
2008	11,672	27,369	4,528	33,928	7,766	18,002	103,265
2009	10,283	17,273	3,489	22,883	7,314	13,186	74,428
2010	10,595	17,981	3,283	24,027	8,472	13,625	77,983
2011	10,552	16,015	2,257	24,038	8,771	11,301	72,934
2012	11,886	18,242	2,675	24,881	7,803	9,976	75,463
2013	13,582	20,180	3,029	24,470	9,288	11,206	81,755
2014	<i>14,460</i>	<i>22,358</i>	<i>2,797</i>	<i>29,162</i>	<i>10,750</i>	<i>13,422</i>	<i>92,949</i>

Area 3A:									
Year	Subarea								Total 3A
	GlacB	Yak	EPWS	WPWS	NGulf	LCI	CCI	Kod	
2006	91	3,164	6,571	2,939	30,381	50,850	34,915	12,030	140,941
2007	137	2,996	6,692	3,326	35,359	52,301	36,870	13,965	151,646
2008	413	3,156	5,414	3,642	32,945	45,495	34,013	12,574	137,652
2009	220	2,201	5,134	3,364	25,591	36,801	27,516	10,059	110,886
2010	161	2,449	5,156	3,753	28,431	40,573	27,824	10,084	118,431
2011	922	2,485	3,855	3,020	27,848	41,634	27,565	10,481	117,810
2012	1,030	2,681	3,440	3,507	30,154	40,561	26,238	10,036	117,647
2013	1,264	2,919	3,618	3,736	29,872	40,614	27,741	9,313	119,077
2014	<i>1,652</i>	<i>3,951</i>	<i>3,747</i>	<i>3,483</i>	<i>30,570</i>	<i>36,303</i>	<i>20,110</i>	<i>10,550</i>	<i>110,365</i>

Table 5. Area 2C projected effort, harvest per unit effort (HPUE), yield, release mortality, and total removals for 2015 under status quo regulations (one-fish bag limit and U44O76 reverse slot limit).

Subarea	Average Weight (lb)	Effort (angler-days)	HPUE	Harvest	Yield (M lb)	RelMort (M lb)	Total Removals (M lb)
Ketch	13.5873	14,460	0.4877	7,052	0.096	0.005	0.101
PWI	9.4155	22,358	0.8049	17,996	0.169	0.009	0.179
Pburg	18.0329	2,797	0.6945	1,943	0.035	0.002	0.037
Sitka	11.6150	29,162	0.8194	23,896	0.278	0.015	0.293
Jun	11.2466	10,750	0.7345	7,896	0.089	0.005	0.094
GlacB	16.3554	13,422	0.8088	10,855	0.178	0.010	0.187
Area 2C	12.1226	92,949	0.7492	69,637	0.844	0.046	0.891

Table 6. Estimated effects of annual limits of one to five halibut on Area 2C anglers and projected harvest for 2015. Effects were estimated using 2013 logbook data from licensed anglers, excluding captain and crew. The percent of affected anglers is the portion of unique anglers that harvested more than each specified annual limit in 2013.

Annual Limit	Subarea						
	Ketch	PWI	Pburg	Sitka	Jun	GlacB	Area 2C
Estimated percent of anglers affected by the annual limit:							
1	26.9%	75.0%	58.0%	67.2%	40.9%	64.0%	58.7%
2	11.6%	54.6%	34.2%	36.6%	25.0%	44.8%	36.7%
3	2.6%	20.3%	16.8%	9.0%	12.4%	29.0%	14.2%
4	0.7%	4.3%	6.9%	1.2%	4.8%	16.5%	4.6%
5	0.4%	1.4%	0.6%	0.3%	1.2%	7.6%	1.7%
Estimated percent change in harvest:							
1	-29.7%	-61.0%	-54.2%	-53.4%	-45.9%	-63.4%	-53.7%
2	-10.8%	-31.8%	-27.7%	-22.1%	-23.8%	-40.1%	-26.6%
3	-2.7%	-10.5%	-12.0%	-5.0%	-10.2%	-23.7%	-9.9%
4	-0.9%	-2.7%	-4.3%	-0.8%	-3.5%	-13.1%	-3.6%
5	-0.3%	-1.0%	-1.2%	-0.2%	-0.9%	-7.0%	-1.6%
Projected harvest (number of halibut):							
1	4,958	7,013	889	11,137	4,272	3,968	32,237
2	6,290	12,269	1,405	18,622	6,020	6,506	51,113
3	6,865	16,098	1,709	22,701	7,088	8,285	62,744
4	6,992	17,519	1,858	23,708	7,619	9,436	67,133
5	7,028	17,817	1,920	23,843	7,823	10,093	68,523
None	7,052	17,996	1,943	23,896	7,896	10,855	69,637

Table 7. Comparison of predicted and observed halibut average weights for maximum size limits in 2011-2014. The lower limits of reverse slot limits in 2012-2014 were used as proxies of maximum size limits for this evaluation. Average weights were predicted for maximum size limits of 37 inches in 2011, 45 inches in 2012 and 2013, and 44 inches in 2014. Observed average weights are for all harvested halibut in 2011, fish less than 66 inches in 2012-2013, and fish less than 74 inches in 2014 (include illegal harvest above the size limit).

Predicted average weights based on 2010 size data:				
Subarea	2011 (U37)	2012 (U45)	2013 (U45)	2014 (U44)
Ketch	10.70	14.16	14.16	13.69
PWI	8.24	9.14	9.14	9.04
Pburg	11.50	21.40	21.40	20.29
Sitka	10.01	13.81	13.81	13.15
Jun	10.33	12.88	12.88	12.53
GlacB	11.20	18.26	18.26	17.40
Area 2C	9.93	13.45	13.35	12.94

Observed average weights (including illegal harvest):				
Subarea	2011	2012	2013	2014
Ketch	10.53	13.39	13.80	13.59
PWI	8.65	9.84	11.82	9.42
Pburg	14.33	19.69	19.29	18.03
Sitka	8.67	12.49	12.02	11.62
Jun	9.77	13.07	12.48	11.25
GlacB	10.24	17.11	15.61	14.83
Area 2C	9.41	12.90	13.03	11.90

Prediction error (predicted relative to observed):				
Subarea	2011	2012	2013	2014
Ketch	1.7%	5.7%	2.6%	0.7%
PWI	-4.8%	-7.1%	-22.7%	-4.0%
Pburg	-19.7%	8.7%	10.9%	12.5%
Sitka	15.4%	10.6%	14.9%	13.2%
Jun	5.7%	-1.4%	3.2%	11.4%
GlacB	9.4%	6.7%	16.9%	17.3%
Area 2C	5.5%	4.3%	2.5%	8.8%

Table 8. Area 2C projected charter removals for 2015 including release mortality (A) and projected average net weight of harvested halibut (B) under a range of maximum size limits and annual limits (including no annual limit) for 2015. Shaded values represent the most liberal measures for which the projected total charter removals are less than the 0.79 M lb allocation under the Blue Line FCEY.

Size limit (inches)	A. Projected total removals including release mortality (M lb).						B. Projected average weight of harvest (lb).					
	Annual Limit						Annual Limit					
	1	2	3	4	5	None	1	2	3	4	5	None
30	0.222	0.351	0.431	0.461	0.470	0.478	6.52	6.51	6.51	6.51	6.51	6.51
31	0.239	0.377	0.463	0.495	0.505	0.513	7.01	7.00	6.99	6.99	6.99	6.99
32	0.260	0.411	0.504	0.539	0.550	0.560	7.64	7.62	7.61	7.61	7.61	7.62
33	0.274	0.433	0.530	0.567	0.579	0.589	8.06	8.03	8.01	8.01	8.01	8.02
34	0.291	0.459	0.562	0.601	0.614	0.625	8.56	8.52	8.49	8.49	8.50	8.50
35	0.304	0.480	0.588	0.629	0.642	0.653	8.94	8.90	8.88	8.88	8.88	8.89
36	0.325	0.513	0.627	0.671	0.686	0.697	9.56	9.51	9.48	9.48	9.48	9.49
37	0.339	0.534	0.653	0.699	0.714	0.726	9.96	9.90	9.86	9.86	9.87	9.89
38	0.359	0.565	0.691	0.740	0.756	0.769	10.55	10.48	10.44	10.44	10.46	10.47
39	0.373	0.588	0.718	0.769	0.786	0.800	10.98	10.90	10.85	10.86	10.87	10.89
40	0.386	0.608	0.744	0.796	0.814	0.829	11.36	11.28	11.23	11.24	11.26	11.28
41	0.402	0.633	0.774	0.829	0.848	0.863	11.83	11.74	11.69	11.70	11.72	11.75
42	0.414	0.651	0.796	0.853	0.872	0.889	12.16	12.08	12.03	12.04	12.07	12.10
43	0.426	0.671	0.820	0.878	0.899	0.916	12.52	12.44	12.39	12.40	12.44	12.47
44	0.441	0.695	0.850	0.911	0.932	0.950	12.98	12.89	12.84	12.86	12.89	12.93
45	0.459	0.722	0.883	0.946	0.968	0.987	13.48	13.40	13.34	13.36	13.39	13.44
46	0.471	0.742	0.906	0.971	0.994	1.014	13.84	13.76	13.69	13.71	13.75	13.80
47	0.487	0.767	0.938	1.005	1.029	1.049	14.32	14.23	14.16	14.19	14.23	14.28
48	0.498	0.785	0.959	1.028	1.052	1.073	14.65	14.56	14.49	14.51	14.55	14.61
49	0.517	0.814	0.996	1.067	1.093	1.116	15.19	15.10	15.04	15.07	15.12	15.19
50	0.531	0.837	1.024	1.098	1.125	1.149	15.61	15.53	15.47	15.51	15.57	15.64
51	0.546	0.861	1.052	1.128	1.156	1.180	16.04	15.96	15.89	15.93	15.99	16.07
52	0.565	0.892	1.090	1.170	1.199	1.224	16.62	16.54	16.47	16.51	16.58	16.66
53	0.578	0.912	1.115	1.196	1.226	1.252	16.99	16.91	16.85	16.89	16.96	17.05
54	0.595	0.940	1.149	1.232	1.263	1.290	17.50	17.42	17.35	17.40	17.47	17.56
55	0.610	0.964	1.178	1.263	1.295	1.322	17.93	17.87	17.80	17.84	17.91	18.00

Table 9. Comparison of predicted and observed average weights under reverse slot limits in Area 2C in 2012-2014. Predicted average weights were based on the standard method (same as Table 10). Both methods obtain the overall Area 2C average weight by weighting the subarea estimates by charter harvests from the logbook.

Subarea	Average Weight Under Reverse Slot Limits (lb)						Prediction Error in Average Weight (predicted relative to observed)		
	2012 (U45O68)		2013 (U45O68)		2014 (U44O76)		2012	2013	2014
	Predicted	Observed	Predicted	Observed	Predicted	Observed			
Ketch	14.66	13.78	14.66	14.02	13.69	13.59	6.4%	4.6%	0.7%
PWI	10.55	10.56	10.55	12.17	9.30	9.42	0.0%	-13.2%	-1.2%
Pburg	22.67	21.57	22.67	20.29	20.29	18.03	5.1%	11.7%	12.5%
Sitka	15.23	13.25	15.23	12.56	13.50	11.61	14.9%	21.2%	16.2%
Jun	13.71	13.68	13.71	12.48	12.53	11.25	0.2%	9.8%	11.4%
GlacB	28.09	22.22	28.09	20.86	23.46	16.36	26.4%	34.7%	43.4%
Area 2C	16.06	14.27	15.87	14.47	14.10	12.14	12.6%	9.7%	16.1%

Table 10. Area 2C projected charter removals (including release mortality) for 2015 under reverse slot limits ranging from U35O50 to U50O80 and annual limits ranging from zero to five fish. Shaded values represent the most liberal measures for which the projected total charter removals are less than the 0.79 M lb allocation associated with the Blue Line FCEY. Boxed values represent candidate measures to stay below 0.79 M lb assuming that the values in the table overestimate the charter removals by 15% (adjusted allocation is 0.909 M lb).

No annual limit, harvest = 69,637 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.439	1.358	1.285	1.204	1.139	1.080	1.004	0.927	0.886	0.849	0.811	0.789	0.759	0.739	0.736	0.718
36	1.476	1.396	1.324	1.245	1.180	1.122	1.046	0.969	0.929	0.893	0.854	0.832	0.803	0.783	0.780	0.762
37	1.499	1.421	1.349	1.271	1.207	1.149	1.073	0.997	0.957	0.921	0.883	0.861	0.832	0.812	0.808	0.791
38	1.534	1.457	1.387	1.309	1.247	1.189	1.114	1.039	0.999	0.963	0.925	0.904	0.875	0.855	0.851	0.834
39	1.560	1.484	1.414	1.337	1.275	1.218	1.144	1.069	1.029	0.993	0.955	0.934	0.905	0.885	0.882	0.864
40	1.582	1.507	1.439	1.363	1.301	1.244	1.171	1.096	1.057	1.021	0.984	0.962	0.933	0.914	0.910	0.893
41	1.610	1.536	1.469	1.393	1.333	1.277	1.203	1.130	1.090	1.055	1.018	0.996	0.968	0.948	0.945	0.928
42	1.629	1.557	1.490	1.415	1.355	1.300	1.227	1.154	1.115	1.080	1.043	1.021	0.993	0.973	0.970	0.953
43	1.650	1.579	1.513	1.439	1.380	1.325	1.252	1.180	1.141	1.106	1.069	1.048	1.019	1.000	0.996	0.980
44	1.677	1.607	1.542	1.469	1.410	1.356	1.284	1.212	1.174	1.139	1.102	1.081	1.053	1.033	1.030	1.013
45	1.707	1.638	1.575	1.503	1.445	1.391	1.320	1.248	1.210	1.176	1.139	1.118	1.090	1.070	1.067	1.050
46	1.728	1.660	1.597	1.526	1.469	1.415	1.345	1.274	1.236	1.202	1.165	1.144	1.116	1.097	1.093	1.077
47	1.756	1.690	1.628	1.557	1.501	1.448	1.378	1.308	1.270	1.236	1.200	1.179	1.151	1.132	1.129	1.112
48	1.775	1.709	1.648	1.578	1.522	1.470	1.400	1.331	1.293	1.259	1.223	1.202	1.174	1.155	1.152	1.135
49	1.808	1.744	1.684	1.616	1.561	1.509	1.441	1.371	1.334	1.301	1.265	1.244	1.216	1.197	1.194	1.178
50	1.834	1.771	1.712	1.645	1.590	1.539	1.472	1.403	1.366	1.333	1.297	1.277	1.249	1.230	1.227	1.211

5-fish annual limit, harvest = 68,523halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.402	1.324	1.252	1.173	1.110	1.053	0.979	0.904	0.864	0.829	0.792	0.771	0.742	0.723	0.720	0.703
36	1.439	1.361	1.291	1.213	1.151	1.094	1.021	0.946	0.907	0.872	0.835	0.814	0.785	0.766	0.763	0.747
37	1.462	1.385	1.316	1.238	1.177	1.121	1.048	0.974	0.934	0.900	0.863	0.842	0.813	0.794	0.791	0.775
38	1.496	1.421	1.352	1.276	1.216	1.160	1.088	1.015	0.975	0.941	0.905	0.883	0.855	0.836	0.833	0.817
39	1.521	1.447	1.379	1.304	1.243	1.188	1.116	1.044	1.005	0.971	0.934	0.913	0.885	0.866	0.863	0.846
40	1.543	1.470	1.403	1.328	1.269	1.214	1.143	1.071	1.032	0.998	0.962	0.941	0.913	0.894	0.891	0.874
41	1.570	1.498	1.432	1.358	1.299	1.246	1.174	1.103	1.065	1.031	0.995	0.974	0.946	0.927	0.924	0.908
42	1.589	1.518	1.453	1.380	1.321	1.268	1.197	1.126	1.088	1.055	1.019	0.998	0.970	0.952	0.948	0.932
43	1.609	1.540	1.475	1.403	1.345	1.292	1.222	1.152	1.114	1.080	1.045	1.024	0.996	0.978	0.974	0.958
44	1.636	1.567	1.504	1.432	1.375	1.323	1.253	1.184	1.146	1.113	1.077	1.056	1.029	1.010	1.007	0.991
45	1.665	1.598	1.536	1.465	1.409	1.357	1.288	1.219	1.181	1.148	1.113	1.092	1.065	1.046	1.043	1.027
46	1.686	1.619	1.558	1.488	1.432	1.381	1.312	1.244	1.206	1.173	1.138	1.118	1.091	1.072	1.069	1.053
47	1.713	1.648	1.587	1.519	1.464	1.413	1.345	1.277	1.240	1.207	1.172	1.152	1.125	1.106	1.103	1.087
48	1.731	1.667	1.607	1.539	1.485	1.434	1.367	1.299	1.262	1.230	1.195	1.175	1.147	1.129	1.126	1.110
49	1.764	1.702	1.643	1.576	1.522	1.472	1.406	1.339	1.302	1.270	1.236	1.215	1.188	1.170	1.167	1.151
50	1.789	1.727	1.670	1.604	1.551	1.502	1.436	1.369	1.333	1.301	1.267	1.247	1.220	1.202	1.199	1.183

(continued)

Table 10. (continued).

4-fish annual limit, harvest = 67,133 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.364	1.288	1.218	1.141	1.080	1.025	0.953	0.880	0.841	0.808	0.772	0.751	0.723	0.705	0.702	0.686
36	1.400	1.324	1.256	1.180	1.119	1.065	0.993	0.922	0.883	0.850	0.814	0.793	0.766	0.747	0.744	0.729
37	1.422	1.348	1.280	1.205	1.145	1.091	1.020	0.948	0.910	0.877	0.841	0.821	0.793	0.775	0.772	0.756
38	1.456	1.383	1.316	1.241	1.183	1.129	1.059	0.988	0.950	0.917	0.882	0.861	0.834	0.815	0.812	0.797
39	1.480	1.408	1.342	1.268	1.210	1.157	1.087	1.016	0.978	0.946	0.911	0.890	0.863	0.845	0.842	0.826
40	1.502	1.431	1.365	1.292	1.235	1.182	1.112	1.043	1.005	0.972	0.938	0.917	0.890	0.872	0.869	0.853
41	1.528	1.458	1.394	1.321	1.264	1.212	1.143	1.074	1.037	1.004	0.970	0.949	0.922	0.904	0.901	0.886
42	1.546	1.477	1.414	1.342	1.286	1.234	1.166	1.097	1.059	1.027	0.993	0.973	0.945	0.928	0.924	0.909
43	1.566	1.498	1.435	1.365	1.309	1.258	1.189	1.121	1.084	1.052	1.018	0.998	0.970	0.953	0.950	0.934
44	1.592	1.525	1.463	1.394	1.338	1.288	1.220	1.152	1.115	1.083	1.050	1.029	1.002	0.985	0.982	0.966
45	1.621	1.555	1.495	1.426	1.371	1.321	1.254	1.187	1.150	1.118	1.085	1.065	1.038	1.020	1.017	1.002
46	1.641	1.576	1.516	1.448	1.394	1.344	1.278	1.211	1.174	1.143	1.109	1.089	1.063	1.045	1.042	1.027
47	1.667	1.604	1.545	1.478	1.424	1.375	1.309	1.243	1.207	1.176	1.142	1.122	1.096	1.078	1.075	1.060
48	1.685	1.623	1.564	1.498	1.445	1.396	1.330	1.265	1.229	1.198	1.164	1.144	1.118	1.100	1.097	1.082
49	1.717	1.656	1.599	1.533	1.481	1.433	1.368	1.303	1.267	1.237	1.204	1.184	1.157	1.140	1.137	1.122
50	1.741	1.681	1.625	1.560	1.509	1.461	1.397	1.333	1.297	1.267	1.234	1.214	1.188	1.171	1.168	1.153

3-fish annual limit, harvest = 62,744 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.265	1.194	1.129	1.057	1.001	0.950	0.883	0.817	0.780	0.750	0.717	0.698	0.672	0.656	0.653	0.639
36	1.298	1.228	1.164	1.093	1.038	0.988	0.922	0.855	0.819	0.789	0.757	0.737	0.712	0.695	0.692	0.679
37	1.320	1.250	1.187	1.116	1.062	1.012	0.946	0.880	0.844	0.814	0.782	0.763	0.737	0.721	0.718	0.704
38	1.351	1.283	1.220	1.151	1.097	1.048	0.982	0.917	0.882	0.851	0.820	0.801	0.775	0.759	0.756	0.742
39	1.374	1.307	1.245	1.176	1.122	1.074	1.009	0.944	0.908	0.878	0.847	0.828	0.802	0.786	0.783	0.769
40	1.394	1.328	1.267	1.198	1.145	1.097	1.033	0.968	0.933	0.903	0.872	0.853	0.827	0.811	0.808	0.795
41	1.418	1.353	1.293	1.226	1.173	1.125	1.061	0.997	0.962	0.933	0.902	0.883	0.857	0.841	0.838	0.825
42	1.435	1.371	1.311	1.245	1.193	1.145	1.082	1.018	0.983	0.954	0.923	0.904	0.879	0.863	0.860	0.846
43	1.454	1.390	1.332	1.265	1.214	1.167	1.104	1.041	1.006	0.977	0.946	0.927	0.902	0.886	0.883	0.870
44	1.478	1.416	1.358	1.293	1.242	1.195	1.133	1.070	1.035	1.006	0.976	0.957	0.932	0.916	0.913	0.900
45	1.505	1.444	1.387	1.323	1.272	1.226	1.164	1.102	1.068	1.039	1.008	0.990	0.965	0.949	0.946	0.933
46	1.523	1.463	1.407	1.343	1.294	1.248	1.186	1.125	1.091	1.062	1.031	1.013	0.988	0.972	0.970	0.956
47	1.548	1.489	1.434	1.371	1.322	1.277	1.216	1.155	1.121	1.092	1.062	1.044	1.019	1.003	1.000	0.987
48	1.565	1.507	1.452	1.390	1.341	1.297	1.236	1.175	1.141	1.113	1.083	1.064	1.040	1.024	1.021	1.008
49	1.595	1.538	1.484	1.423	1.375	1.331	1.270	1.210	1.177	1.149	1.119	1.101	1.076	1.060	1.058	1.044
50	1.617	1.561	1.508	1.447	1.400	1.357	1.297	1.238	1.204	1.176	1.147	1.128	1.104	1.088	1.086	1.073

(continued)

Table 10. (continued).

2-fish annual limit, harvest = 51,113 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.027	0.969	0.915	0.857	0.812	0.771	0.717	0.663	0.634	0.609	0.583	0.567	0.546	0.533	0.531	0.520
36	1.055	0.997	0.945	0.887	0.842	0.803	0.749	0.695	0.666	0.641	0.616	0.600	0.579	0.566	0.564	0.553
37	1.072	1.015	0.963	0.906	0.862	0.823	0.769	0.716	0.686	0.662	0.636	0.621	0.600	0.587	0.585	0.574
38	1.098	1.042	0.991	0.935	0.891	0.852	0.799	0.746	0.717	0.693	0.667	0.652	0.631	0.618	0.616	0.605
39	1.117	1.062	1.011	0.955	0.912	0.873	0.821	0.768	0.739	0.715	0.690	0.674	0.653	0.641	0.639	0.628
40	1.133	1.079	1.029	0.974	0.931	0.892	0.840	0.788	0.759	0.735	0.710	0.695	0.674	0.661	0.659	0.649
41	1.153	1.100	1.051	0.996	0.954	0.916	0.864	0.812	0.783	0.760	0.735	0.719	0.699	0.686	0.684	0.673
42	1.167	1.115	1.066	1.012	0.970	0.932	0.880	0.829	0.801	0.777	0.752	0.737	0.716	0.704	0.702	0.691
43	1.182	1.131	1.082	1.029	0.987	0.950	0.898	0.847	0.819	0.796	0.771	0.756	0.735	0.723	0.721	0.710
44	1.202	1.151	1.104	1.051	1.010	0.973	0.922	0.871	0.843	0.820	0.795	0.780	0.759	0.747	0.745	0.735
45	1.225	1.175	1.128	1.076	1.035	0.998	0.948	0.898	0.870	0.847	0.822	0.807	0.787	0.774	0.772	0.762
46	1.240	1.191	1.145	1.093	1.053	1.016	0.966	0.916	0.889	0.865	0.841	0.826	0.806	0.794	0.791	0.781
47	1.260	1.212	1.167	1.115	1.076	1.040	0.990	0.941	0.913	0.890	0.866	0.851	0.831	0.819	0.817	0.806
48	1.274	1.227	1.182	1.131	1.092	1.056	1.007	0.958	0.930	0.907	0.883	0.868	0.848	0.836	0.834	0.824
49	1.298	1.251	1.208	1.157	1.119	1.084	1.035	0.986	0.959	0.936	0.912	0.898	0.877	0.865	0.863	0.853
50	1.316	1.270	1.227	1.178	1.140	1.105	1.057	1.008	0.981	0.959	0.935	0.920	0.900	0.888	0.886	0.876

1-fish annual limit, harvest = 32,237 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	0.643	0.606	0.572	0.536	0.509	0.484	0.450	0.417	0.399	0.383	0.367	0.358	0.344	0.337	0.335	0.329
36	0.661	0.624	0.591	0.556	0.529	0.504	0.471	0.437	0.419	0.404	0.388	0.379	0.365	0.358	0.356	0.350
37	0.672	0.636	0.603	0.568	0.541	0.517	0.484	0.450	0.432	0.417	0.401	0.392	0.379	0.371	0.370	0.363
38	0.689	0.653	0.621	0.586	0.560	0.536	0.503	0.470	0.452	0.437	0.421	0.412	0.399	0.391	0.390	0.383
39	0.701	0.666	0.634	0.600	0.574	0.550	0.517	0.484	0.466	0.451	0.435	0.426	0.413	0.405	0.404	0.398
40	0.711	0.677	0.645	0.611	0.585	0.562	0.529	0.496	0.479	0.464	0.448	0.439	0.426	0.418	0.417	0.411
41	0.724	0.690	0.660	0.626	0.600	0.577	0.544	0.512	0.495	0.480	0.464	0.455	0.442	0.434	0.433	0.427
42	0.733	0.699	0.669	0.635	0.610	0.587	0.555	0.523	0.505	0.490	0.475	0.466	0.453	0.445	0.444	0.438
43	0.742	0.709	0.679	0.646	0.621	0.598	0.566	0.534	0.517	0.502	0.487	0.478	0.465	0.457	0.456	0.450
44	0.755	0.723	0.693	0.660	0.636	0.613	0.581	0.549	0.532	0.517	0.502	0.493	0.480	0.473	0.472	0.465
45	0.769	0.737	0.708	0.676	0.652	0.629	0.597	0.566	0.549	0.534	0.519	0.510	0.497	0.490	0.489	0.482
46	0.779	0.748	0.719	0.687	0.663	0.640	0.609	0.578	0.561	0.546	0.531	0.522	0.509	0.502	0.501	0.495
47	0.792	0.761	0.733	0.701	0.677	0.655	0.624	0.593	0.577	0.562	0.547	0.538	0.525	0.518	0.517	0.511
48	0.801	0.771	0.743	0.711	0.688	0.666	0.635	0.604	0.587	0.573	0.558	0.549	0.536	0.529	0.528	0.522
49	0.816	0.786	0.759	0.728	0.704	0.683	0.652	0.622	0.605	0.591	0.576	0.567	0.555	0.547	0.546	0.540
50	0.827	0.798	0.771	0.740	0.717	0.696	0.666	0.636	0.619	0.605	0.590	0.581	0.569	0.562	0.560	0.554

Table 11. Comparison of Area 2C projected charter removals for 2015 (including release mortality) under the current U44O76 reverse slot limit combined with annual limits of one to five halibut, using average weights predicted from the standard methodology versus empirical (observed) average weights from the 2014 fishery.

Method	Total Charter Removals Under Annual Limits					
	1	2	3	4	5	None
Standard method based on 2010 data	0.473	0.747	0.916	0.985	1.010	1.033
Empirical – uses average weight from 2014	0.413	0.651	0.796	0.853	0.873	0.891
Percent difference relative to empirical	14.5%	14.8%	15.1%	15.4%	15.6%	16.0%

Table 12. Projected effort, harvest per unit effort (HPUE), yield, release mortality, and total removals for Area 3A for 2015 under status quo regulations of two-fish bag limit, maximum size on one fish of 29 inches, one trip per vessel per day, and no harvest by captain or crew.

Subarea	Average Weight (lb)	Effort (angler-days)	HPUE	Harvest	Yield (M lb)	RelMort (M lb)	Total Removals (M lb)
CCI	11.4191	20,110	1.8982	38,172	0.436	0.007	0.443
EPWS	23.0861	3,747	1.3949	5,227	0.121	0.002	0.123
G3A	44.0306	1,652	1.0498	1,734	0.076	0.001	0.078
H	29.3272	3,951	1.2035	4,755	0.139	0.002	0.142
LCI	9.1902	36,303	1.8685	67,833	0.623	0.010	0.633
NG	10.8533	30,570	1.4823	45,314	0.492	0.008	0.500
QR	14.1560	10,550	1.2661	13,357	0.189	0.003	0.192
WPWS	19.0487	3,483	1.3915	4,846	0.092	0.001	0.094
Area 3A	11.9675	110,365	1.6422	181,238	2.169	0.035	2.204

Table 13. Projected effort, harvest per unit effort (HPUE), yield, release mortality, and total removals for Area 3A for 2015 under a two-fish bag limit with no size limit, one trip per vessel per day, and no harvest by captain or crew.

Subarea	Average Weight (lb)	Effort (angler-days)	HPUE	Harvest	Yield (M lb)	RelMort (M lb)	Total Removals (M lb)
CCI	12.6025	20,110	1.9051	38,311	0.483	0.010	0.492
EPWS	20.5944	3,747	1.4829	5,556	0.114	0.002	0.117
G3A	42.2542	1,652	1.1317	1,869	0.079	0.002	0.081
H	27.9579	3,951	1.2680	5,010	0.140	0.003	0.143
LCI	10.7314	36,303	1.8732	68,003	0.730	0.015	0.744
NG	12.2651	30,570	1.5494	47,365	0.581	0.012	0.593
QR	11.3827	10,550	1.3384	14,120	0.161	0.003	0.164
WPWS	16.3487	3,483	1.5557	5,418	0.089	0.002	0.090
Area 3A	12.7997	110,365	1.6822	185,653	2.376	0.048	2.424

Table 14. Estimated percent change and projected 2015 charter halibut harvests (numbers of fish) in Area 3A under annual limits of one to ten halibut, with a 29-inch maximum size limit, and without any size limits. The percentage reductions were calculated from 2013 logbook harvests by licensed anglers excluding captain and crew.

Annual Limit	Subarea								Area 3A
	CCI	EPWS	GlacBay	Yak	LCI	NGulf	Kod	WPWS	
Estimated percent change in harvest:									
1	-59.3%	-51.7%	-59.2%	-58.8%	-59.7%	-54.7%	-69.0%	-51.8%	-58.6%
2	-20.1%	-11.3%	-30.8%	-26.8%	-21.0%	-14.3%	-42.3%	-10.0%	-20.4%
3	-12.9%	-6.1%	-16.3%	-13.9%	-12.9%	-8.5%	-29.1%	-4.5%	-12.6%
4	-6.2%	-2.1%	-6.0%	-5.4%	-5.4%	-3.6%	-18.1%	-0.6%	-5.8%
5	-4.2%	-1.3%	-2.6%	-2.5%	-3.6%	-2.2%	-11.6%	-0.3%	-3.8%
6	-2.5%	-0.6%	-0.6%	-1.1%	-2.0%	-1.2%	-6.4%	-0.1%	-2.1%
7	-1.8%	-0.3%	-0.3%	-0.4%	-1.4%	-0.8%	-3.7%	0.0%	-1.4%
8	-1.2%	-0.1%	-0.1%	-0.1%	-0.9%	-0.5%	-2.0%	0.0%	-0.9%
9	-1.0%	-0.1%	0.0%	-0.1%	-0.7%	-0.4%	-1.2%	0.0%	-0.6%
10	-0.8%	0.0%	0.0%	0.0%	-0.5%	-0.3%	-0.6%	0.0%	-0.5%
Projected harvest (with trip limit and 29-inch maximum size limit on one fish (status quo):									
1	15,521	2,526	708	1,961	27,343	20,530	4,134	2,334	75,113
2	30,497	4,634	1,200	3,482	53,568	38,829	7,702	4,364	144,292
3	33,241	4,906	1,452	4,093	59,052	41,460	9,468	4,630	158,321
4	35,819	5,114	1,629	4,496	64,195	43,698	10,934	4,815	170,696
5	36,553	5,158	1,690	4,634	65,403	44,316	11,813	4,832	174,404
6	37,230	5,196	1,724	4,705	66,504	44,786	12,505	4,842	177,498
7	37,487	5,212	1,729	4,738	66,881	44,948	12,858	4,845	178,709
8	37,713	5,219	1,733	4,751	67,223	45,075	13,095	4,846	179,665
9	37,803	5,224	1,734	4,752	67,373	45,130	13,202	4,846	180,073
10	37,883	5,226	1,734	4,754	67,508	45,173	13,275	4,846	180,406
None	38,172	5,227	1,734	4,755	67,833	45,314	13,357	4,846	181,238
Projected harvest (with trip limit, no size limits):									
1	15,577	2,685	763	2,067	27,411	21,460	4,371	2,610	76,943
2	30,608	4,926	1,294	3,668	53,703	40,587	8,142	4,879	147,807
3	33,362	5,215	1,565	4,312	59,201	43,337	10,009	5,177	162,177
4	35,949	5,437	1,756	4,737	64,356	45,676	11,559	5,383	174,854
5	36,686	5,484	1,822	4,882	65,568	46,322	12,488	5,402	178,653
6	37,365	5,524	1,859	4,957	66,671	46,813	13,219	5,413	181,822
7	37,624	5,541	1,864	4,992	67,050	46,983	13,592	5,417	183,063
8	37,850	5,549	1,868	5,006	67,392	47,116	13,843	5,418	184,042
9	37,941	5,553	1,869	5,007	67,543	47,173	13,956	5,418	184,460
10	38,021	5,555	1,869	5,009	67,678	47,217	14,033	5,418	184,801
None	38,311	5,556	1,869	5,010	68,003	47,365	14,120	5,418	185,653

Table 15. Projected Area 3A charter removals including release mortality under status quo regulations (29-inch maximum size on one fish, trip limits) combined with annual limits from one to ten fish. Status quo regulations include one vessel trip per day, a two-fish daily bag limit with a 29-inch maximum size limit on one fish, and no retention of halibut by captain and crew.

Annual Limit	Total Charter Removals (M lb) by Subarea								Area 3A
	CCI	EPWS	GlacB	Yak	LCI	NGulf	Kod	WPWS	
1	0.180	0.059	0.032	0.058	0.255	0.226	0.059	0.045	0.916
2	0.354	0.109	0.054	0.104	0.500	0.428	0.111	0.084	1.744
3	0.386	0.115	0.065	0.122	0.551	0.457	0.136	0.090	1.922
4	0.416	0.120	0.073	0.134	0.599	0.482	0.157	0.093	2.074
5	0.424	0.121	0.076	0.138	0.611	0.489	0.170	0.094	2.122
6	0.432	0.122	0.077	0.140	0.621	0.494	0.180	0.094	2.160
7	0.435	0.122	0.077	0.141	0.624	0.496	0.185	0.094	2.175
8	0.438	0.122	0.078	0.142	0.628	0.497	0.188	0.094	2.186
9	0.439	0.123	0.078	0.142	0.629	0.498	0.190	0.094	2.191
10	0.440	0.123	0.078	0.142	0.630	0.498	0.191	0.094	2.194
None	0.443	0.123	0.078	0.142	0.633	0.500	0.192	0.094	2.204

Table 16. Percent of Area 3A charter harvest made up of second fish in angler's bag limits, by subarea, 2013-2014. The average was used for projecting average weights under maximum size limits on one fish in 2015. Data are from the ADF&G charter logbook (excluding crew harvest in 2013).

Subarea	2013	2014	Average
CCI	48.9%	48.2%	48.5%
EPWS	45.0%	35.1%	40.0%
GlacB	35.2%	3.4%	19.3%
Yak	40.4%	19.6%	30.0%
LCI	48.7%	48.1%	48.4%
NG	46.5%	44.7%	45.6%
Kod	43.2%	38.9%	41.1%
WPWS	45.0%	36.7%	40.8%

Table 17. Area 3A projected charter removals for 2015 including release mortality under a range of maximum size limits and annual limits (including no annual limit). Shaded values represent candidate measures for implementation under the 1.89 M lb charter allocation corresponding with the IPHC Blue Line FCEY. Boxed values represent candidate measures to stay below 1.89 M lb assuming that the values in the table underestimate the charter removals by 15% (adjusted allocation is 1.607 M lb).

Projected Total Removals including release mortality (Mlb)											
Size Limit on 2nd fish (in)	Annual Limit										
	1	2	3	4	5	6	7	8	9	10	None
26	0.728	1.388	1.528	1.648	1.684	1.714	1.725	1.734	1.737	1.740	1.748
27	0.743	1.416	1.559	1.682	1.719	1.749	1.760	1.769	1.773	1.776	1.783
28	0.766	1.459	1.607	1.733	1.771	1.802	1.814	1.823	1.827	1.830	1.838
29	0.780	1.487	1.637	1.766	1.805	1.836	1.848	1.858	1.862	1.865	1.873
30	0.802	1.530	1.684	1.816	1.856	1.889	1.901	1.911	1.915	1.918	1.926
31	0.817	1.559	1.716	1.850	1.891	1.924	1.937	1.947	1.951	1.954	1.962
32	0.836	1.596	1.756	1.894	1.936	1.969	1.983	1.993	1.997	2.000	2.009
33	0.848	1.619	1.781	1.921	1.963	1.997	2.011	2.021	2.025	2.029	2.037
34	0.861	1.643	1.808	1.950	1.993	2.028	2.041	2.052	2.056	2.060	2.068
35	0.870	1.660	1.826	1.969	2.013	2.048	2.062	2.072	2.077	2.080	2.089
36	0.881	1.681	1.850	1.995	2.039	2.074	2.088	2.099	2.103	2.107	2.116
37	0.886	1.692	1.861	2.007	2.051	2.087	2.101	2.112	2.116	2.120	2.129
38	0.894	1.706	1.877	2.024	2.069	2.105	2.119	2.130	2.134	2.138	2.147
39	0.900	1.718	1.890	2.038	2.083	2.120	2.134	2.145	2.149	2.153	2.162
40	0.905	1.727	1.900	2.049	2.094	2.131	2.145	2.156	2.160	2.164	2.173
41	0.909	1.735	1.909	2.059	2.104	2.141	2.155	2.166	2.171	2.174	2.184
42	0.913	1.742	1.917	2.067	2.112	2.149	2.163	2.174	2.179	2.183	2.192
43	0.918	1.752	1.927	2.078	2.124	2.161	2.175	2.187	2.191	2.195	2.204
44	0.921	1.757	1.933	2.084	2.130	2.167	2.182	2.193	2.197	2.201	2.211
45	0.924	1.764	1.941	2.092	2.138	2.176	2.190	2.201	2.206	2.210	2.219
46	0.927	1.769	1.945	2.098	2.144	2.181	2.196	2.207	2.211	2.215	2.225
47	0.930	1.775	1.953	2.106	2.152	2.189	2.204	2.215	2.220	2.224	2.233
48	0.932	1.779	1.957	2.110	2.156	2.194	2.208	2.220	2.224	2.228	2.238
49	0.937	1.789	1.968	2.121	2.168	2.206	2.220	2.232	2.236	2.240	2.250
50	0.941	1.796	1.975	2.130	2.177	2.214	2.229	2.240	2.245	2.249	2.259

Table 18. Comparison of Area 3A projected charter removals for 2015 including release mortality under the status quo 29-inch maximum size limit on one fish (plus trip limits) combined with annual limits of one to five halibut. Projection errors indicate the difference relative to the status quo, or empirical, estimates.

Method	Projected Total Charter Removals Under Annual Limits										
	1	2	3	4	5	6	7	8	9	10	None
Standard ^a	0.780	1.487	1.637	1.766	1.805	1.836	1.848	1.858	1.862	1.865	1.873
Status quo ^b	0.916	1.744	1.922	2.074	2.122	2.160	2.175	2.186	2.191	2.194	2.204
Projection error	-14.8%	-14.7%	-14.8%	-14.9%	-14.9%	-15.0%	-15.0%	-15.0%	-15.0%	-15.0%	-15.0%

^a – The standard method uses 2013 average weights by subarea, the 2013-2014 average of proportions of second fish, and the harvest forecast excluding the effect of trip limits (values from 29th row of Table 17).

^b – The status quo method uses 2014 average weights by subarea, the 2014 estimated proportions of second fish, and the preferred status quo harvest forecast (values from Table 15).

Table 19. Estimated maximum reduction (in percent) in halibut harvest that would be expected from closure of each day of the week to charter halibut retention during the period June 15 – August 15. The maximum reduction equals the estimated percentage of halibut harvest that occurred between those dates in 2014.

Day of the Week	Maximum Expected Reduction in Harvest (in numbers of halibut)
Sun	9.9%
Mon	10.4%
Tue	10.0%
Wed	11.0%
Thu	12.3%
Fri	9.0%
Sat	9.0%

Table 20. Area 3A projected charter removals (including release mortality) for 2015 under reverse slot limits ranging from U35O50 to U50O80 and annual limits ranging from zero to five fish. Shaded values represent the most liberal measures for which the projected total charter removals are less than the 1.89 M lb allocation associated with the Blue Line FCEY.

No annual limit, harvest = 185,653 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	2.098	2.052	2.009	1.974	1.925	1.877	1.856	1.826	1.801	1.786	1.779	1.773	1.769	1.766	1.761	1.756
36	2.158	2.112	2.070	2.035	1.987	1.938	1.918	1.888	1.863	1.849	1.841	1.835	1.831	1.828	1.823	1.818
37	2.187	2.142	2.100	2.065	2.017	1.969	1.948	1.918	1.894	1.879	1.871	1.865	1.861	1.859	1.854	1.849
38	2.227	2.182	2.140	2.106	2.058	2.010	1.989	1.960	1.935	1.921	1.913	1.907	1.903	1.900	1.895	1.890
39	2.261	2.217	2.175	2.141	2.093	2.045	2.025	1.995	1.971	1.956	1.949	1.943	1.939	1.936	1.931	1.926
40	2.286	2.242	2.201	2.167	2.119	2.071	2.051	2.022	1.997	1.983	1.975	1.969	1.965	1.962	1.958	1.953
41	2.310	2.266	2.225	2.191	2.144	2.096	2.076	2.046	2.022	2.008	2.000	1.994	1.990	1.987	1.983	1.978
42	2.329	2.285	2.244	2.210	2.163	2.116	2.095	2.066	2.042	2.028	2.020	2.014	2.010	2.007	2.003	1.997
43	2.357	2.314	2.273	2.240	2.193	2.145	2.125	2.096	2.072	2.058	2.050	2.044	2.040	2.037	2.033	2.028
44	2.371	2.328	2.288	2.255	2.208	2.160	2.140	2.111	2.087	2.073	2.066	2.060	2.056	2.053	2.048	2.043
45	2.391	2.348	2.307	2.274	2.227	2.180	2.160	2.132	2.108	2.093	2.086	2.080	2.076	2.073	2.068	2.063
46	2.403	2.361	2.320	2.287	2.241	2.194	2.174	2.145	2.121	2.107	2.099	2.093	2.089	2.087	2.082	2.077
47	2.424	2.381	2.342	2.309	2.262	2.216	2.196	2.167	2.143	2.129	2.122	2.116	2.112	2.109	2.104	2.099
48	2.435	2.393	2.353	2.321	2.274	2.228	2.208	2.180	2.156	2.142	2.134	2.128	2.124	2.122	2.117	2.112
49	2.462	2.421	2.381	2.349	2.303	2.257	2.237	2.209	2.185	2.171	2.163	2.157	2.153	2.151	2.146	2.141
50	2.483	2.442	2.403	2.371	2.325	2.279	2.259	2.231	2.207	2.193	2.186	2.180	2.176	2.173	2.169	2.164

5-fish annual limit, harvest = 178,653 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	2.022	1.977	1.935	1.901	1.854	1.807	1.786	1.757	1.733	1.719	1.711	1.706	1.702	1.699	1.694	1.689
36	2.080	2.035	1.994	1.960	1.913	1.866	1.846	1.817	1.793	1.779	1.771	1.766	1.762	1.759	1.754	1.749
37	2.108	2.064	2.023	1.989	1.942	1.895	1.875	1.846	1.822	1.808	1.801	1.795	1.791	1.788	1.784	1.779
38	2.146	2.103	2.062	2.028	1.982	1.935	1.915	1.886	1.862	1.848	1.841	1.835	1.831	1.828	1.824	1.819
39	2.179	2.136	2.095	2.062	2.016	1.969	1.949	1.920	1.897	1.883	1.875	1.869	1.866	1.863	1.858	1.853
40	2.203	2.160	2.120	2.087	2.041	1.994	1.974	1.946	1.922	1.908	1.901	1.895	1.891	1.888	1.884	1.879
41	2.226	2.183	2.143	2.110	2.064	2.018	1.998	1.970	1.946	1.932	1.925	1.919	1.915	1.913	1.908	1.903
42	2.244	2.202	2.162	2.129	2.083	2.037	2.017	1.989	1.965	1.951	1.944	1.938	1.934	1.932	1.927	1.922
43	2.272	2.230	2.190	2.157	2.112	2.066	2.046	2.018	1.994	1.980	1.973	1.967	1.964	1.961	1.956	1.951
44	2.286	2.244	2.204	2.172	2.126	2.081	2.061	2.033	2.009	1.995	1.988	1.982	1.979	1.976	1.971	1.966
45	2.304	2.263	2.223	2.191	2.146	2.100	2.080	2.052	2.029	2.015	2.008	2.002	1.998	1.996	1.991	1.986
46	2.316	2.275	2.236	2.204	2.158	2.113	2.093	2.065	2.042	2.028	2.021	2.015	2.011	2.009	2.004	1.999
47	2.336	2.295	2.256	2.224	2.179	2.134	2.115	2.087	2.064	2.050	2.043	2.037	2.033	2.030	2.026	2.021
48	2.347	2.307	2.268	2.236	2.191	2.146	2.127	2.099	2.076	2.062	2.055	2.049	2.045	2.043	2.038	2.033
49	2.374	2.333	2.295	2.264	2.219	2.174	2.155	2.127	2.104	2.090	2.083	2.077	2.074	2.071	2.066	2.062
50	2.394	2.354	2.316	2.285	2.240	2.195	2.177	2.149	2.126	2.112	2.105	2.099	2.096	2.093	2.088	2.084

(continued)

Table 20. (continued).

4-fish annual limit, harvest = 174,854 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.978	1.935	1.894	1.860	1.814	1.768	1.748	1.719	1.696	1.682	1.674	1.669	1.665	1.662	1.658	1.653
36	2.035	1.992	1.951	1.918	1.872	1.826	1.806	1.778	1.754	1.740	1.733	1.727	1.724	1.721	1.716	1.712
37	2.062	2.019	1.979	1.946	1.900	1.854	1.835	1.806	1.783	1.769	1.762	1.756	1.752	1.750	1.745	1.740
38	2.100	2.057	2.017	1.985	1.939	1.893	1.874	1.845	1.822	1.808	1.801	1.795	1.791	1.789	1.784	1.779
39	2.132	2.090	2.050	2.018	1.972	1.927	1.907	1.879	1.856	1.842	1.835	1.829	1.825	1.823	1.818	1.813
40	2.156	2.114	2.074	2.042	1.997	1.951	1.932	1.904	1.881	1.867	1.860	1.854	1.850	1.848	1.843	1.838
41	2.178	2.136	2.097	2.065	2.020	1.975	1.955	1.927	1.904	1.890	1.883	1.878	1.874	1.871	1.867	1.862
42	2.196	2.155	2.115	2.083	2.038	1.993	1.974	1.946	1.923	1.909	1.902	1.896	1.893	1.890	1.885	1.881
43	2.223	2.182	2.143	2.111	2.066	2.021	2.002	1.974	1.951	1.938	1.930	1.925	1.921	1.918	1.914	1.909
44	2.237	2.196	2.157	2.125	2.081	2.036	2.017	1.989	1.966	1.952	1.945	1.939	1.936	1.933	1.929	1.924
45	2.255	2.214	2.176	2.144	2.100	2.055	2.036	2.008	1.985	1.972	1.965	1.959	1.955	1.953	1.948	1.943
46	2.267	2.226	2.188	2.156	2.112	2.067	2.049	2.021	1.998	1.985	1.977	1.972	1.968	1.966	1.961	1.956
47	2.286	2.246	2.208	2.177	2.133	2.088	2.069	2.042	2.019	2.006	1.999	1.993	1.989	1.987	1.982	1.977
48	2.297	2.257	2.219	2.188	2.144	2.100	2.081	2.054	2.031	2.018	2.011	2.005	2.001	1.999	1.994	1.990
49	2.323	2.284	2.246	2.215	2.171	2.127	2.109	2.081	2.059	2.045	2.038	2.033	2.029	2.026	2.022	2.017
50	2.343	2.304	2.266	2.236	2.192	2.148	2.130	2.103	2.080	2.067	2.060	2.054	2.050	2.048	2.043	2.039

3-fish annual limit, harvest = 162,177 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.835	1.794	1.756	1.725	1.682	1.639	1.620	1.594	1.572	1.559	1.552	1.547	1.543	1.541	1.537	1.532
36	1.887	1.847	1.809	1.778	1.736	1.693	1.675	1.648	1.626	1.614	1.607	1.601	1.598	1.595	1.591	1.587
37	1.913	1.873	1.835	1.804	1.762	1.719	1.701	1.674	1.653	1.640	1.633	1.628	1.624	1.622	1.618	1.613
38	1.948	1.908	1.871	1.840	1.798	1.755	1.737	1.711	1.689	1.676	1.669	1.664	1.661	1.658	1.654	1.650
39	1.978	1.938	1.901	1.871	1.829	1.786	1.768	1.742	1.720	1.708	1.701	1.695	1.692	1.690	1.685	1.681
40	2.000	1.961	1.924	1.893	1.852	1.809	1.791	1.765	1.743	1.731	1.724	1.718	1.715	1.713	1.709	1.704
41	2.020	1.982	1.945	1.915	1.873	1.831	1.813	1.787	1.765	1.753	1.746	1.741	1.737	1.735	1.731	1.726
42	2.037	1.998	1.962	1.932	1.890	1.848	1.830	1.804	1.783	1.770	1.763	1.758	1.754	1.752	1.748	1.744
43	2.062	2.023	1.987	1.957	1.916	1.874	1.856	1.830	1.809	1.796	1.789	1.784	1.781	1.779	1.774	1.770
44	2.075	2.036	2.000	1.971	1.929	1.887	1.870	1.844	1.823	1.810	1.803	1.798	1.795	1.792	1.788	1.784
45	2.092	2.054	2.018	1.988	1.947	1.905	1.888	1.862	1.841	1.828	1.821	1.816	1.813	1.810	1.806	1.802
46	2.103	2.065	2.029	2.000	1.959	1.917	1.900	1.874	1.853	1.840	1.833	1.828	1.825	1.823	1.818	1.814
47	2.121	2.083	2.048	2.019	1.978	1.936	1.919	1.893	1.872	1.860	1.853	1.848	1.844	1.842	1.838	1.834
48	2.131	2.094	2.058	2.029	1.989	1.947	1.930	1.904	1.884	1.871	1.864	1.859	1.856	1.853	1.849	1.845
49	2.155	2.118	2.083	2.054	2.014	1.973	1.956	1.930	1.909	1.897	1.890	1.885	1.881	1.879	1.875	1.871
50	2.174	2.137	2.102	2.074	2.033	1.992	1.975	1.950	1.929	1.917	1.910	1.905	1.901	1.899	1.895	1.891

(continued)

Table 20. (continued).

2-fish annual limit, harvest = 147,807 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	1.668	1.632	1.597	1.568	1.530	1.491	1.474	1.450	1.431	1.419	1.412	1.407	1.404	1.402	1.399	1.395
36	1.716	1.680	1.645	1.617	1.579	1.540	1.523	1.499	1.480	1.468	1.462	1.457	1.454	1.452	1.448	1.445
37	1.739	1.703	1.669	1.640	1.602	1.563	1.547	1.523	1.504	1.492	1.486	1.481	1.478	1.476	1.472	1.468
38	1.771	1.735	1.701	1.673	1.635	1.596	1.580	1.556	1.537	1.525	1.519	1.514	1.511	1.509	1.505	1.502
39	1.798	1.762	1.729	1.701	1.663	1.624	1.608	1.584	1.565	1.554	1.547	1.542	1.539	1.537	1.534	1.530
40	1.818	1.783	1.749	1.721	1.684	1.645	1.629	1.605	1.586	1.575	1.568	1.563	1.560	1.558	1.555	1.551
41	1.837	1.802	1.768	1.741	1.703	1.665	1.649	1.625	1.606	1.595	1.588	1.584	1.580	1.578	1.575	1.571
42	1.852	1.817	1.784	1.756	1.719	1.680	1.665	1.641	1.622	1.610	1.604	1.599	1.596	1.594	1.590	1.587
43	1.874	1.840	1.807	1.779	1.742	1.704	1.688	1.665	1.646	1.634	1.628	1.623	1.620	1.618	1.614	1.611
44	1.886	1.852	1.819	1.791	1.754	1.716	1.701	1.677	1.658	1.647	1.640	1.636	1.633	1.631	1.627	1.623
45	1.902	1.867	1.835	1.808	1.771	1.733	1.717	1.694	1.675	1.663	1.657	1.652	1.649	1.647	1.643	1.640
46	1.912	1.878	1.845	1.818	1.782	1.744	1.728	1.705	1.686	1.674	1.668	1.663	1.660	1.658	1.655	1.651
47	1.928	1.894	1.862	1.835	1.799	1.761	1.745	1.722	1.703	1.692	1.686	1.681	1.678	1.676	1.672	1.669
48	1.937	1.904	1.871	1.845	1.808	1.771	1.755	1.732	1.713	1.702	1.696	1.691	1.688	1.686	1.682	1.679
49	1.960	1.926	1.894	1.868	1.831	1.794	1.779	1.756	1.737	1.725	1.719	1.715	1.711	1.710	1.706	1.702
50	1.976	1.943	1.911	1.885	1.849	1.812	1.796	1.773	1.755	1.743	1.737	1.733	1.729	1.728	1.724	1.720

1-fish annual limit, harvest = 76,943 halibut

Lower Limit (in)	Upper Length Limit (in)															
	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80
35	0.874	0.855	0.836	0.821	0.800	0.779	0.770	0.757	0.747	0.740	0.737	0.734	0.733	0.732	0.730	0.727
36	0.899	0.880	0.861	0.846	0.826	0.805	0.796	0.783	0.772	0.766	0.763	0.760	0.759	0.757	0.756	0.753
37	0.911	0.892	0.873	0.858	0.838	0.817	0.808	0.795	0.785	0.779	0.775	0.773	0.771	0.770	0.768	0.766
38	0.928	0.909	0.890	0.875	0.855	0.834	0.825	0.812	0.802	0.796	0.793	0.790	0.788	0.787	0.785	0.783
39	0.942	0.923	0.905	0.890	0.870	0.849	0.840	0.827	0.817	0.811	0.807	0.805	0.803	0.802	0.800	0.798
40	0.953	0.934	0.915	0.901	0.881	0.860	0.851	0.838	0.828	0.822	0.819	0.816	0.814	0.813	0.811	0.809
41	0.963	0.944	0.926	0.911	0.891	0.870	0.862	0.849	0.839	0.832	0.829	0.827	0.825	0.824	0.822	0.820
42	0.970	0.952	0.934	0.919	0.899	0.878	0.870	0.857	0.847	0.841	0.837	0.835	0.833	0.832	0.830	0.828
43	0.982	0.964	0.946	0.931	0.911	0.891	0.882	0.870	0.860	0.853	0.850	0.847	0.846	0.845	0.843	0.841
44	0.988	0.970	0.952	0.938	0.918	0.897	0.889	0.876	0.866	0.860	0.857	0.854	0.853	0.851	0.850	0.847
45	0.997	0.978	0.961	0.946	0.927	0.906	0.898	0.885	0.875	0.869	0.865	0.863	0.861	0.860	0.858	0.856
46	1.002	0.984	0.966	0.952	0.932	0.912	0.903	0.891	0.881	0.875	0.871	0.869	0.867	0.866	0.864	0.862
47	1.011	0.993	0.975	0.961	0.942	0.921	0.913	0.900	0.890	0.884	0.881	0.878	0.877	0.876	0.874	0.872
48	1.016	0.998	0.980	0.966	0.947	0.927	0.918	0.906	0.896	0.890	0.886	0.884	0.882	0.881	0.879	0.877
49	1.028	1.010	0.993	0.978	0.959	0.939	0.931	0.918	0.908	0.902	0.899	0.896	0.895	0.894	0.892	0.890
50	1.036	1.019	1.002	0.988	0.968	0.948	0.940	0.928	0.918	0.912	0.908	0.906	0.904	0.903	0.901	0.899

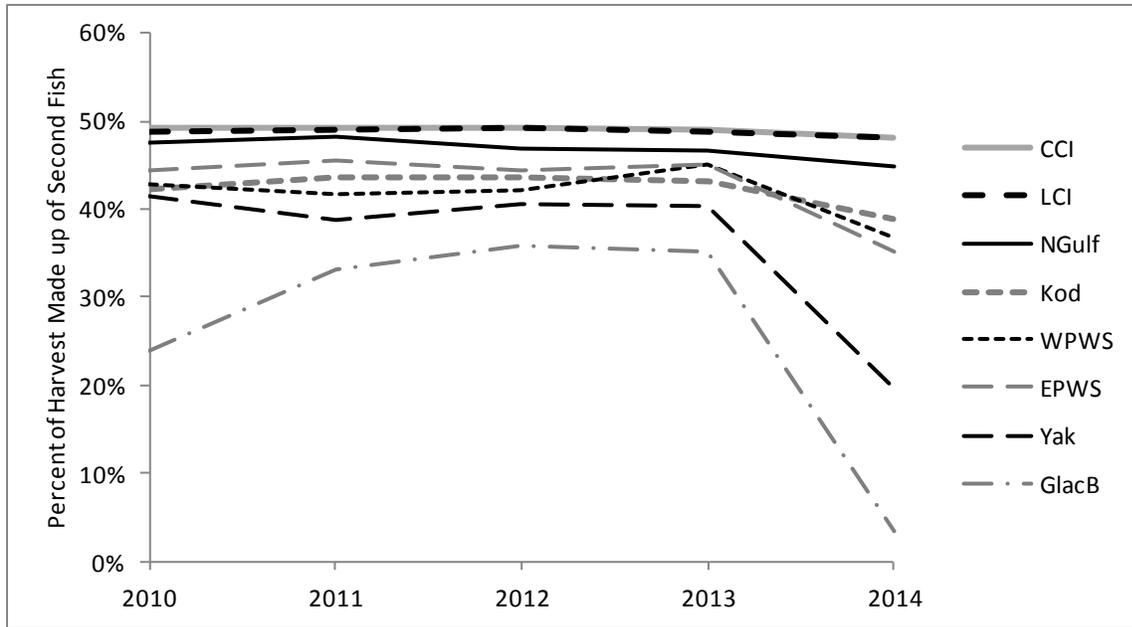


Figure 1. Percentages of charter halibut harvest in each subarea of Area 3A made up of second fish in the bag limit. Percentages for 2014 are estimates based on data through July 31.

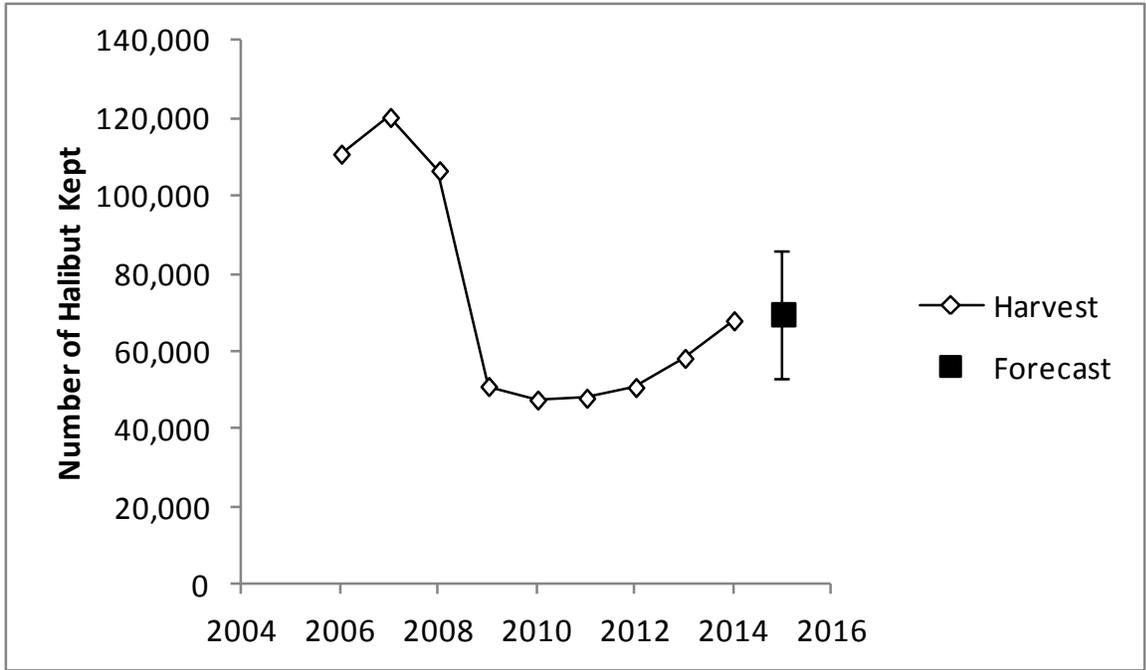


Figure 2. Preferred charter halibut harvest forecast for Area 2C for 2015 (69,637 fish). The harvest forecast was based on exponentially-weighted time series forecasts of bottomfish effort and harvest per unit effort (HPUE) by guided anglers. Vertical bars indicate the 95% confidence interval on the forecast.

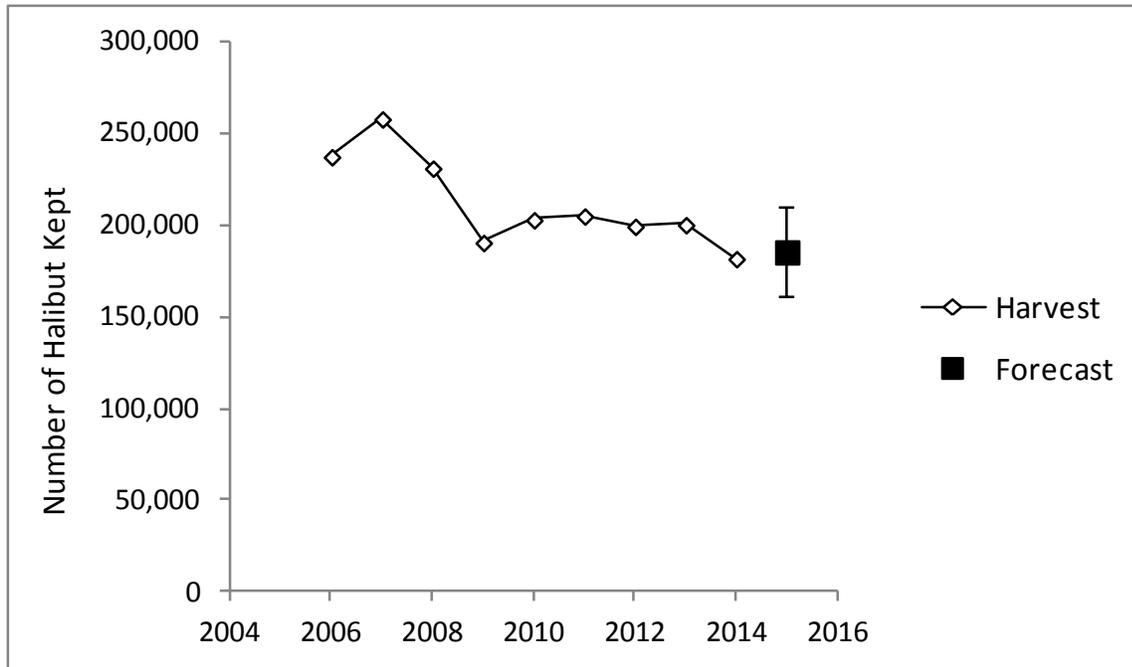


Figure 3. Preferred charter halibut harvest forecast for Area 3A in 2015 under a two-fish bag limit, trip limit, and no harvest by captain and crew (185,653 fish). The harvest forecast was based on exponentially-weighted time series forecasts of bottomfish effort and harvest per unit effort (HPUE) by guided anglers. Vertical bars indicate the 95% confidence interval on the forecast.

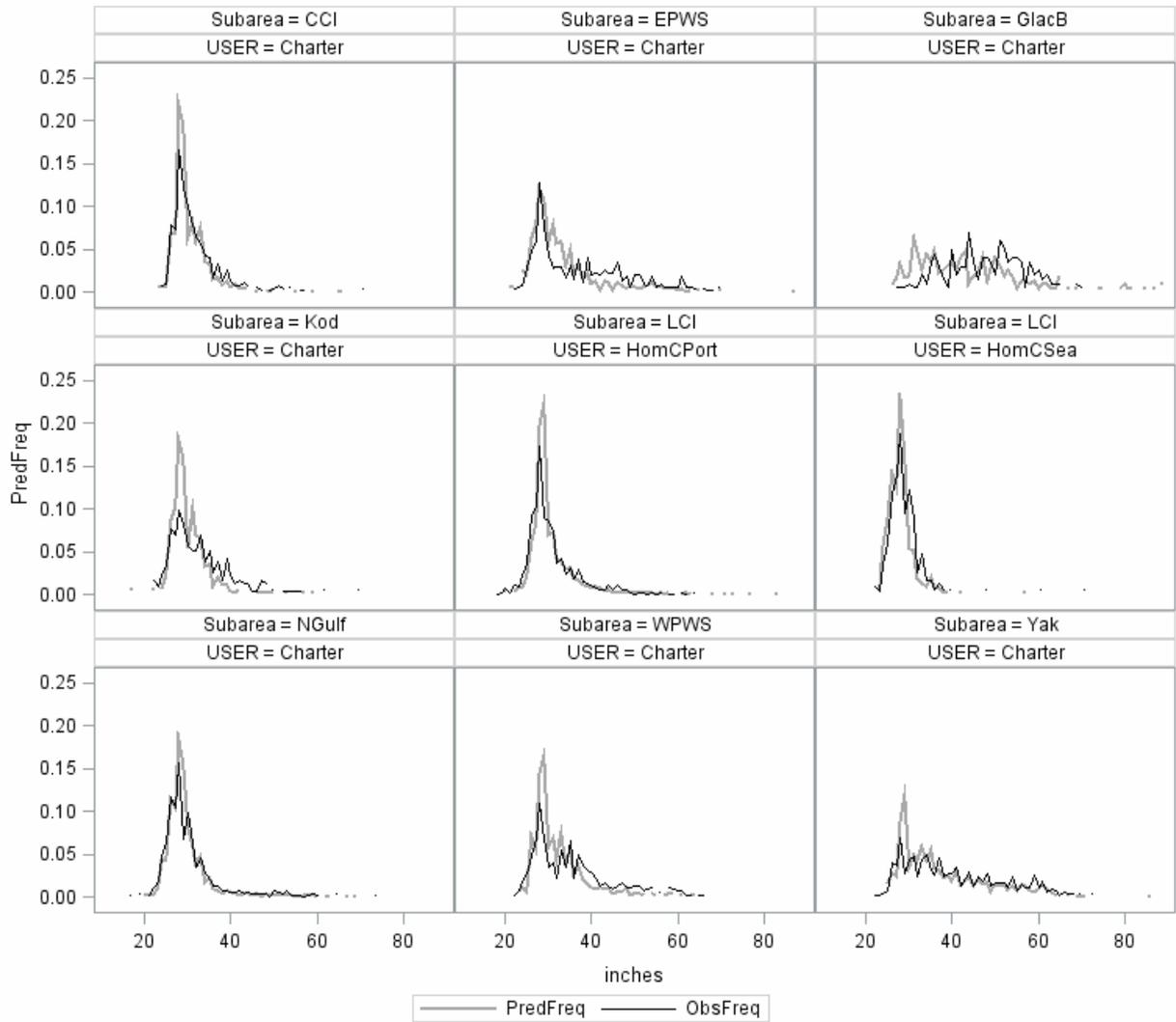


Figure 4. Comparisons of projected and observed length frequency distributions of charter harvest in Area 3A in 2014. The projected length frequencies use empirical proportions of second fish in the harvest from 2014, rather than the proportions used for projections made in 2013. Data for Homer show distributions of harvest for fish cleaned in port (“HomCPort”) and fish cleaned at sea with carcasses retained for measurements (“HomCSea”).

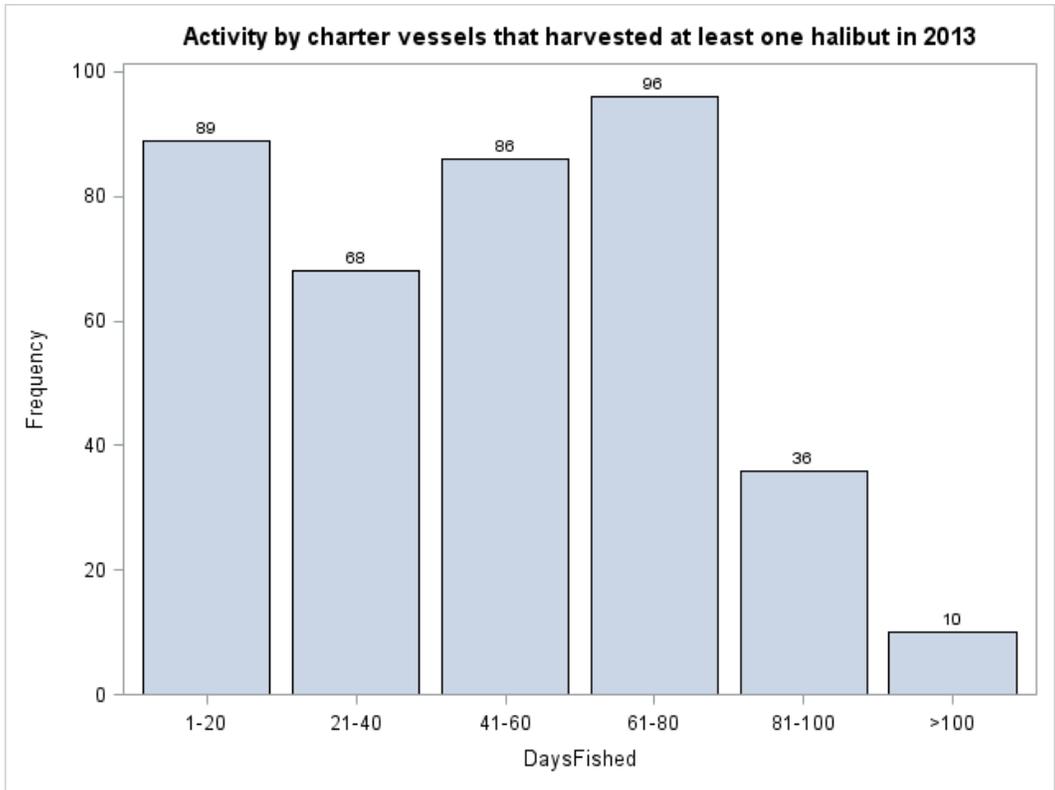


Figure 5. Frequency (number of vessels) distribution of days fished by charter vessels that harvested at least one halibut in 2013. For example, 89 vessels fished from 1-20 days in 2013.

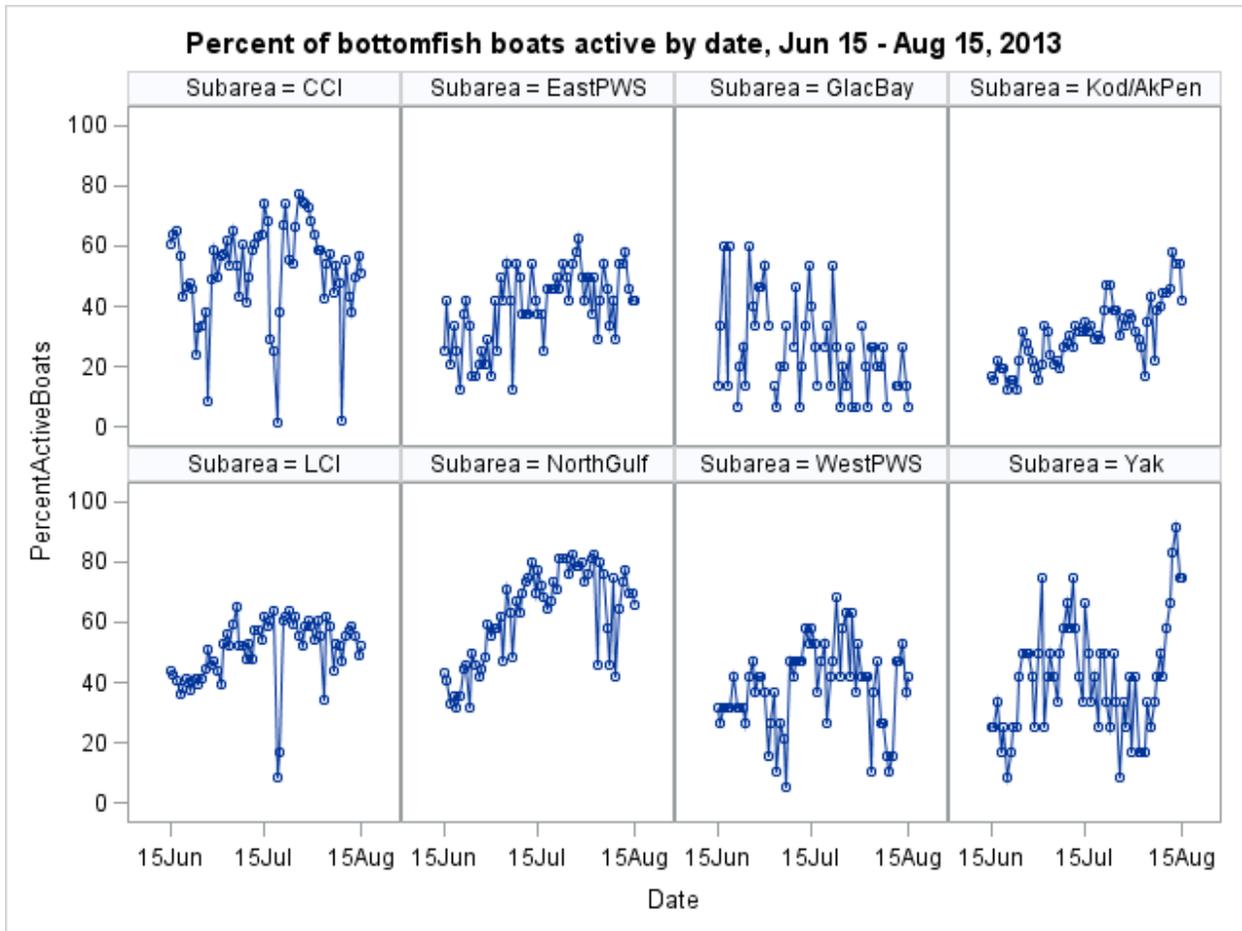


Figure 6. Relative vessel activity by day during the proposed day of the week closure window of June 15 – August 15 in 2013. Plots show the percentage of active boats that fished by date for each subarea. Active boats were defined as recording at least one bottomfish trip during the closure window.

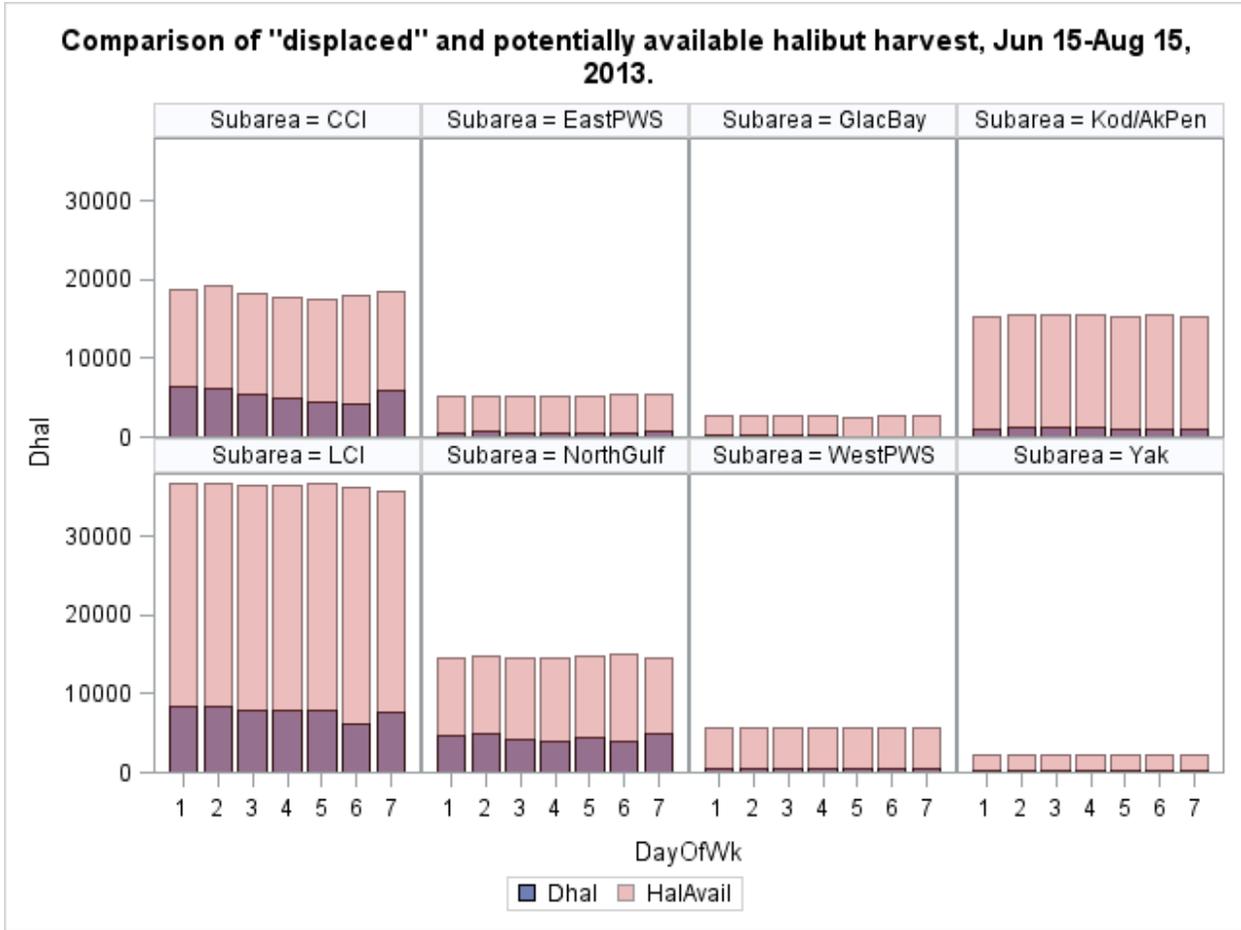


Figure 7. Comparison of halibut harvest that would have been displaced by a closure of one day per week (Dhal), and the potential availability of harvest on remaining days of the week (HalAvail). Days of the week are Sunday (1) through Saturday (7).