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of **ALASKA**  
GOVERNOR MIKE DUNLEAVY

## Department of Fish and Game

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October 28, 2019

Lara Erikson  
International Pacific Halibut Commission  
2320 West Commodore Way  
Salmon Bay, Suite 300  
Seattle, WA 98199-1287

Dear Ms. Erikson:

This letter represents our report on the Alaska recreational halibut fishery in support of the annual IPHC stock assessment. This year's letter provides:

1. Final 2018 estimates of sport fishery harvest and yield by IPHC regulatory area,
2. Preliminary 2019 estimates of harvest and yield by IPHC area,
3. Final 2018 and preliminary 2019 estimates of sport fishery release mortality by IPHC area, and
4. Final 2018 estimates of sport fishery yield prior to the mean IPHC longline survey date in Areas 2C and 3A.

Each section includes a summary of the methods used and basic results. More detailed information on methods can be found in the following project operational plans:

Southeast Region creel sampling: <http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.1J.2019.01.pdf>

Southcentral Region creel sampling: <http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.2A.2016.20.pdf>

Statewide halibut estimation: <http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.4A.2014.08.pdf>

We hope this information satisfies the IPHC's needs. Please feel free to contact us if you require clarification or additional information.

Sincerely;

*(sent via email)*

Sarah Webster, Mike Jaenicke, Diana Tersteeg, Martin Schuster, and Marian Ford  
Fishery Biologists

## **Final Estimates of 2018 Sport Harvest and Yield**

In October 2018 we provided preliminary estimates of the 2018 sport harvest for Areas 2C, 3A, 3B, and 4. This letter provides final estimates of the 2018 sport harvest based on Alaska Department of Fish and Game (ADF&G) saltwater logbook data as of October 12, 2019, and final estimates from the ADF&G Statewide Harvest Survey (SWHS). The final estimates for Area 2C and 3A will also be posted on the North Pacific Fishery Management Council web site.

The Area 2C charter fishery regulations for 2018 included a one-fish daily bag limit and reverse slot (or “protected slot”) limit that allowed harvest of halibut less than or equal to 38 inches and halibut greater than or equal to 80 inches. The Area 3A charter regulations included a two-fish bag limit with a maximum size on one of the fish of 28 inches, a limit of one trip per charter vessel per day (on which halibut are harvested), a limit of one trip per Charter Halibut Permit (CHP) per day, a closure of halibut retention on Wednesdays all year, six Tuesday closures (7/10 thru 8/14), and a 4-fish annual limit with a harvest recording requirement. Charter captains and crew were not allowed to retain halibut while guiding clients in Area 2C or Area 3A under regulations of the North Pacific Fishery Management Council’s Catch Sharing Plan (CSP) for these areas. Charter fishery regulations in the remainder of the state included a daily bag limit of two fish of any size, and there was no prohibition on retention of halibut by captains or crew. Unguided fisheries statewide were managed under a two-fish bag limit with no size limit.

### Methods:

For Areas 2C and 3A, sport fishery yield was calculated separately for the charter and unguided sectors as the product of the number of fish harvested and average weight of harvested halibut. Yield estimates do not include release mortality (provided later in this document). Estimates were done for six subareas in Area 2C and eight subareas in Area 3A and summed. Charter harvest was based entirely on logbook data, per the provisions of the CSP. Unguided harvest was estimated through the SWHS. Standard errors of the SWHS estimates for the unguided sector were obtained by bootstrapping. Average net weight was estimated by applying the IPHC length-weight relationship to length measurements of harvested halibut sampled at major ports in Areas 2C and 3A. All fish from each vessel-trip selected for sampling were measured. Bootstrapping was used to estimate the standard errors of average weight. The estimate of charter average weight for Homer was stratified to account for differences in sizes of halibut cleaned at sea and cleaned onshore. Length measurements from sites in the Glacier Bay subarea included fish caught in Areas 3A and 2C; average weights were calculated separately for each area and sector. All unguided harvest in the Glacier Bay subarea was assumed to have occurred in Area 2C. Charter-caught halibut taken under a Guided Angler Fish (GAF) permit from the National Marine Fisheries Service were not included in charter harvest calculations because the CSP specifies that this harvest accrues toward the commercial catch limit.

Final estimates of sport fishery yield for Areas 3B and 4 are for the charter and unguided sectors combined and are based entirely on the SWHS. Because ADF&G does not sample the sport harvest in these areas, we followed past practices of the IPHC and used the average weight of Kodiak sport harvest as a proxy for average weight in Areas 3B and 4. Specifically, we used the average weight from the unguided sector because it was unaffected by size limits. Even so, use of the Kodiak average weight may bias the yield estimates for these areas.

As has been done historically, harvest from SWHS Area R (Alaska Peninsula and Aleutian Islands south of Cape Douglas) was apportioned to IPHC Areas 3B and 4 using specific locations reported in the survey. In some years, Area R harvest estimates have included harvests for sites that are actually in Area 3A. Since 1991, the estimated harvest of Area 3A halibut included in Area 3B estimates has ranged from 0 to 728 fish per year (average = 122). In 2018, no halibut were estimated from Area 3A locations in Area R.

### Results:

The 2018 Area 2C estimated sport harvest (excluding release mortality) was 127,680 fish, for a yield of 1.873 million pounds (Table 1). Charter yield represented 35% of the total. Average net weight was estimated at

14.67 lb overall and was lower for the charter sector due to size limit restrictions. Average weight was estimated from samples of 4,426 charter halibut and 4,156 unguided halibut.

The Area 3A estimated sport harvest was 242,192 fish, for a yield of 3.429 Mlb (Table 1). The charter sector accounted for 55% of the total yield. Average net weight was estimated at 14.16 lb overall and was slightly lower for the charter sector. Average weight was estimated from samples of 4,647 charter halibut and 2,924 unguided halibut.

The final estimates of charter halibut yield were about 1.7% lower than last year's preliminary estimate in Area 2C and 1.3% higher than the preliminary estimate in Area 3A. These differences were largely due to errors in estimating the proportions of harvest taken through July 31, the cutoff date for using logbook data. The final estimates of unguided yield were 10.7% lower than the preliminary estimate in Area 2C and 10.8% lower in Area 3A. The preliminary estimates were derived from simple exponential time series forecasts (SAS ESM procedure) and large forecasting errors are expected due to high annual variability in the harvest time series.

The final harvest estimates for western areas were 269 halibut in Area 3B and 900 halibut in Area 4 (Table 1). Applying the Kodiak unguided average weight of 14.08 lb resulted in yield estimates of 0.004 Mlb in Area 3B and 0.013 Mlb in Area 4. These final estimates were up from last year's preliminary estimates of 0.002 in Area 3B and 0.011 in Area 4.

## **Preliminary 2019 Estimates of Harvest and Yield**

### Methods:

Sport charter fishery mortality for Areas 2C and 3A is based on numbers of halibut reported harvested and released in ADF&G mandatory charter logbooks. Harvest and release estimates from the SWHS are still used for all unguided fishery estimates as well as total sport fishery estimates for Areas 3B and 4. Neither complete logbook data nor SWHS estimates are available yet for the current year, and creel sampling is not designed to produce estimates of harvest. A variety of methods were used to provide preliminary estimates of the numbers of fish harvested by each sector or regulatory area.

Charter harvest for Areas 2C and 3A was projected from partial-year logbook data. Logbook data were entered and available in mid-October for most trips taken through July 31. Areas 2C and 3A are divided into several subareas closely corresponding to state management areas. Harvest data were corrected to account for late logbook submissions and other reporting errors based on past data. This adjusted the harvest in each area by less than 2%. The harvest data were then expanded by forecasting the proportion of harvest taken through July in each subarea. Forecasts and their standard errors were obtained from a simple exponential smoother using 2006-2018 logbook data as of October 12, 2019.

Unguided harvest in Areas 2C and 3A, and overall sport harvests for Areas 3B and 4 were projected from the existing time series of SWHS estimates using simple exponential smoother forecasts. Charter and unguided yield were estimated by multiplying the subarea harvest forecasts by the corresponding estimates of average weight. Average weights were estimated by applying the IPHC length-weight relationship to length measurements of harvested halibut obtained through sampling of the recreational harvest. No sampling was conducted in Areas 3B or 4 in 2019, so the Kodiak area average weight from the unguided fishery was again substituted for these areas.

### Results:

The preliminary estimate of 2019 sport halibut harvest in Area 2C (excluding release mortality) was 128,608 halibut, or 1.770 Mlb (Table 2). Charter harvest was estimated using a projection that 66% of the harvest was taken through the end of July. Average weight was estimated at 13.76 lb. The charter average weight was more than 9 lbs lower than the unguided average weight due to the charter fishery size limit. Average weights for Area 2C were based on length measurements of 4,158 charter halibut and 3,771 unguided halibut.

The preliminary estimate for Area 3A was 251,658 halibut, for a total sport fishery yield of 3.636 Milb (Table 2). Charter harvest was estimated using a projection that 69% of the harvest was taken through the end of July. The estimated average weights in Area 3A was 14.45 lb overall. Average weights were estimated from samples of 4,756 charter and 2,449 unguided halibut.

The preliminary harvest estimates for 2019 were 243 halibut in Area 3B and 810 halibut in Area 4. Applying the unguided average weight of 16.92 lb from Kodiak resulted in yield projections of 0.004 Milb in Area 3B and 0.014 Milb in Area 4 (Table 2). Although the levels of sport harvest are low, there is large uncertainty in the time series forecasts as well as use of the Kodiak unguided average weight as a proxy for average weight in these areas.

### **Final 2018 and Preliminary 2019 Estimates of Release Mortality**

#### Methods:

Release mortality ( $R$ ) was calculated in pounds net weight for each subarea of Areas 2C and 3A as:

$$R = \hat{N} \cdot DMR \cdot \hat{w}$$

where

$\hat{N}$  = the number of fish released,

$DMR$  = the assumed short-term discard mortality rate due to capture, handling, and release, and

$\hat{w}$  = the estimated average net weight (in pounds) of released fish.

The numbers of halibut released ( $\hat{N}$ ) in the charter sector in 2018 were based on final logbook data. The numbers of halibut released in 2019 were projected using logbook data through July 31. The projections used simple exponential forecasts of the proportion of releases through July 31 from 2006-2018 data. For the unguided fishery, and the overall sport fisheries in Areas 3B and 4, the estimated number of fish released in each subarea in 2018 was obtained from the SWHS. The projections for 2019 were simple exponential time series forecasts using previous release numbers from the SWHS.

Assumed mortality rates ( $DMRs$ ) were 5% for Area 3A charter-caught halibut, 6% for Area 2C charter and Area 3A unguided, and 7% for Area 2C unguided halibut. These rates were developed by assuming a 3.5% mortality rate for halibut released on circle hooks and a 10% mortality rate for halibut released on all other hook types. The hook type data were collected in 2007 and 2008 in Area 2C, and every year since 2007 in Area 3A. These rates were applied to the reported number of fish released on each hook type to calculate a weighted mean mortality rate for each user group in each subarea. These weighted mean rates were then rounded up to the next whole percentage point to address uncertainty and account for possible cumulative effects of multiple recaptures. A discard mortality rate of 6% was assumed for Areas 3B and 4, as no data on hook use were collected.

For most IPHC regulatory areas, the average weights of released fish in each subarea were estimated using a logistic model of the proportion of catch retained at length, as described in the operational plan for statewide halibut estimation (see cover page for link). The model uses the length composition of the retained fish to infer the length distribution of released fish. The resulting length distributions are partitioned into U26 (<26 inch) and O26 ( $\geq 26$  inch) components, and average weight was calculated using the IPHC length-weight relationship. The U26 and O26 separation was done for consistency with how these two size classes of waste have been handled by the IPHC and because O26 discard mortality is included in the charter allocation for areas 2C and 3A.

For the Area 2C charter fishery, additional steps were needed to estimate release mortality due to the reverse slot limits in place in 2018 and 2019. In both years, charter anglers were prohibited from harvesting fish between 38 and 80 inches in length. This required partitioning the released fish into size categories as follows:

the 2018 size classes were U38 ( $\leq 38$  inches) and O38 ( $> 38$  inches). The 2019 size classes were U38 ( $\leq 38$  inches), 38-80, and O80 ( $\geq 80$  inches). The proportions of fish in each size class were obtained from creel survey interviews where anglers were asked to report the numbers of released fish by size class. The average weight of released fish in the U38 size class was estimated using the model described above. The average weights of released fish in the protected slot and above the upper limit were estimated as the average weight of fish in these size ranges in 2010, the most recent year without a charter size limit.

The North Pacific Fishery Management Council's Scientific and Statistical Committee reviewed the logistic modeling approach in 2007 and concluded that it provided "reasonable" estimates of average weight given the lack of data. One problem inherent in this method is that the size distribution of released fish is truncated at the size of the smallest fish measured in the harvest sample. It is likely that some halibut are released that are smaller than the smallest halibut retained and measured. Therefore, the method may in effect underestimate the numbers of U26 fish released but overestimate their average weight. Because the model assumes that the percent of fish kept at length never exceeds 95%, it may also overestimate the numbers of O26 fish released, but probably has little effect on their average weight.

#### Results:

For 2018, estimated U26 release mortality was 0.005 Mlb in Area 2C, 0.012 Mlb in Area 3A, and virtually zero in Areas 3B and 4 (Table 3). Estimated O26 release mortality was 0.072 Mlb in Area 2C, with 0.060 Mlb from the charter fishery. The size class breakdown of the Area 2C charter O26 release mortality indicated that while the majority of fish released were in the length range 26-38 inches, the poundage of release mortality was greatest in the O38 range because of the higher average weight (Table 4). Estimated O26 release mortality in Area 3A was 0.027 Mlb, with 0.013 Mlb from the charter fishery (Table 3). Areas 3B and 4 each had negligible amounts of release mortality from the sport fishery.

For 2019, estimated release mortality of U26 halibut was 0.006 Mlb in Area 2C, 0.013 Mlb in Area 3A, and virtually zero in Areas 3B and 4 (Table 5). Mortality of O26 releases in Area 2C was estimated at 0.042 Mlb, with 0.031 Mlb from the charter fishery. The size class breakdown of the Area 2C charter O26 release mortality indicated that while the majority of fish released were in the length range 26-38 inches, the poundage of release mortality was greatest in the 38-80 inch range because of the higher average weight (Table 4). Mortality of O26 releases in Area 3A was 0.033 Mlb, with most (0.020 Mlb) coming from the unguided fishery (Table 5). The O26 release mortality was negligible in Area 3B and Area 4.

The 2018 total sport fishery removals, including harvest and all sizes of release mortality, added up to 1.950 Mlb in Area 2C and 3.468 Mlb in Area 3A. Release mortality made up 3.9% of all Area 2C removals and 1.1% of Area 3A removals. For 2019, the preliminary estimates of total sport removals are 1.818 Mlb in Area 2C and 3.682 Mlb in Area 3A. Release mortality accounted for 2.6% of Area 2C removals and 1.2% of Area 3A removals in 2018.

#### **Sport Fishery Yield Prior to the Mean IPHC Survey Dates in 2018 (Areas 2C and 3A only)**

This information is provided to aid the IPHC's adjustment to survey CPUE that is used to apportion estimated exploitable biomass among regulatory areas. The mean survey dates for 2018 were July 20 in Area 2C and June 29 in Area 3A.

#### Methods:

The proportions of harvest prior to the mean survey date were calculated separately for the charter and unguided sectors. For the charter sector, the proportion of harvest taken prior to the mean survey date in 2018 was obtained from logbook harvest data. For the unguided sector, the proportions were calculated based on harvest reported in dockside interviews. These proportions were calculated separately for each subarea of Area 2C and 3A and weighted by the 2018 final estimated harvests in each subarea to derive the overall proportions. The total sport yield taken prior to the mean survey date was calculated by multiplying the charter and unguided proportions by their respective final or projected yields and summing.

Results:

In 2018, an estimated 0.930 Mlb of halibut were taken by the sport fishery in Area 2C prior to July 20, and an estimated 0.880 Mlb were taken in Area 3A prior to June 29 (Table 6).

Table 1. Final estimates of the 2018 sport halibut harvest (numbers of fish), average net weight (pounds), and yield (millions of pounds net weight) in Areas 2C, 3A, 3B, and 4. “NA” indicates no estimate is available.

IPHC Area	Sector	Harvest (no. fish)	Average Net Wt. (lb)	Yield (Mlb)	95% CI for Yield (Mlb)
Area 2C	Charter	69,992	9.37	0.656	0.618 – 0.694
	Unguided	57,688	21.09	1.216	1.079 – 1.354
	Total	127,680	14.67	1.873	1.730 – 2.015
Area 3A	Charter	136,312	13.75	1.874	1.761 – 1.986
	Unguided	105,880	14.69	1.555	1.369 – 1.742
	Total	242,192	14.16	3.429	3.211 – 3.647
Area 3B	Total	269	14.08 <sup>a</sup>	0.004	NA
Area 4	Total	900	14.08 <sup>a</sup>	0.013	NA

<sup>a</sup> – No size data were available from Areas 3B and 4, so the unguided average weight from Kodiak was substituted.

Table 2. Preliminary estimates of the 2019 sport halibut harvest (numbers of fish), average net weight (pounds), and yield (millions of pounds net weight) in Areas 2C, 3A, 3B, and 4. “NA” indicates no estimate is available.

IPHC Area	Sector	Harvest (no. fish)	Average Net Wt. (lb)	Yield (Mlb)	95% CI for Yield (Mlb)
Area 2C	Charter	67,529	9.39	0.634	0.606 – 0.662
	Unguided	61,079	18.59	1.136	0.903 – 1.368
	Total	128,608	13.76	1.770	1.535 – 2.004
Area 3A	Charter	137,731	14.52	2.000	1.846 – 2.153
	Unguided	113,927	14.36	1.636	1.343 – 1.930
	Total	251,658	14.45	3.636	3.305 – 3.968
Area 3B	Total	243	16.92 <sup>a</sup>	0.004	NA
Area 4	Total	810	16.92 <sup>a</sup>	0.014	NA

<sup>a</sup> – No size data were available from Areas 3B and 4, so the unguided average weight from Kodiak was substituted.

Table 3. Final estimates of release mortality for sport fisheries in Areas 2C, 3A, 3B, and 4 in 2018. Some columns may not appear to add correctly due to rounding.

IPHC Area	Size Class	Sector	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
Area 2C	U26	Charter	8,118	6.0%	487	3.69	0.002
		Unguided	12,838	7.0%	899	3.57	0.003
		Total	20,957		1,386	3.61	0.005
	O26	Charter	29,664	6.0%	1,780	33.56	0.060
		Unguided	15,660	7.0%	1,096	10.74	0.012
		Total	45,324		2,876	24.86	0.072
Area 3A	U26	Charter	33,991	5.0%	1,700	3.54	0.006
		Unguided	29,582	6.0%	1,775	3.22	0.006
		Total	63,573		3,474	3.38	0.012
	O26	Charter	24,281	5.0%	1,214	10.28	0.013
		Unguided	26,261	6.0%	1,576	9.11	0.014
		Total	50,542		2,790	9.62	0.027
Area 3B	U26	Total	150	6.0%	9	3.75	0.000
	O26	Total	363	6.0%	22	8.84	0.000
Area 4	U26	Total	107	6.0%	6	3.56	0.000
	O26	Total	181	6.0%	11	9.48	0.000

Table 4. Breakdown of Area 2C estimates of O26 charter release mortality by size class for 2018 (final) and 2019 (preliminary). Some columns may not appear to add correctly due to rounding.

Year	Size Class (inches)	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
2018	O26U38	13,176	6.0%	791	8.98	0.007
	O38	16,487	6.0%	989	53.21	0.053
	Total O26	29,664	6.0%	1,780	33.56	0.060
2019	O26U38	15,987	6.0%	959	8.41	0.008
	O38U80	6,934	6.0%	416	47.84	0.020
	O80	227	6.0%	14	244.70	0.003
	Total O26	23,147	6.0%	1,389	22.53	0.031

Table 5. Preliminary estimates of release mortality for sport fisheries in Areas 2C, 3A, 3B, and 4 in 2019. Some columns may not appear to add correctly due to rounding.

IPHC Area	Size Class	Sector	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
Area 2C	U26	Charter	9,015	6.0%	541	3.71	0.002
		Unguided	14,307	7.0%	1,002	3.69	0.004
		Total	23,323		1,542	3.69	0.006
	O26	Charter	23,147	6.0%	1,389	22.53	0.031
		Unguided	15,768	7.0%	1,104	9.78	0.011
		Total	38,915		2,493	16.88	0.042
Area 3A	U26	Charter	31,513	5.0%	1,576	3.59	0.006
		Unguided	37,043	6.0%	2,223	3.46	0.008
		Total	68,018		3,798	3.51	0.013
	O26	Charter	23,471	5.0%	1,174	10.75	0.013
		Unguided	37,546	6.0%	2,253	8.88	0.020
		Total	61,018		3,426	9.52	0.033
Area 3B	U26	Total	62	6.0%	4	4.47	0.000
	O26	Total	285	6.0%	17	9.88	0.000
Area 4	U26	Total	184	6.0%	11	4.28	0.000
	O26	Total	356	6.0%	21	8.78	0.000

Table 6. Final estimated sport harvest prior to the mean IPHC survey dates in 2018 in Areas 2C and 3A.

Area	Mean Survey Date	Charter		Unguided		Total	
		Percent	Harvest (Mlb)	Percent	Harvest (Mlb)	Percent	Harvest (Mlb)
2C	July 20	51.3%	0.337	48.8%	0.593	49.7%	0.930
3A	June 29	28.8%	0.539	21.9%	0.340	25.7%	0.880