Fishery statistics (2017)

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PURPOSE

To provide an overview of the key fishery statistics from fisheries catching Pacific halibut during 2017, including the status of landings compared to catch limits adopted by the Commission.

BACKGROUND

The International Pacific Halibut Commission (IPHC) estimates all Pacific halibut (*Hippoglossus stenolepis*) removals taken in the IPHC Convention Area and uses this information in its yearly stock assessment (see IPHC-2018-AM094-09) and other analyses. The data are compiled by the IPHC Secretariat and include data from Federal and State agencies of each Contracting Party. All 2017 data are in net weight (head-off, dressed, ice and slime deducted) and are considered preliminary at this time.

This paper includes Pacific halibut removals for:

- Commercial fisheries, including landings and discard mortality
- Recreational fisheries, including landings and discard mortality
- Subsistence fisheries
- Bycatch in other fisheries

Figure 1 shows the distribution of Pacific halibut removals (mortality) by these fishery sources in 2017. Table 1 provides estimates of total removals against catch limits by IPHC Regulatory Area (Figure 2).

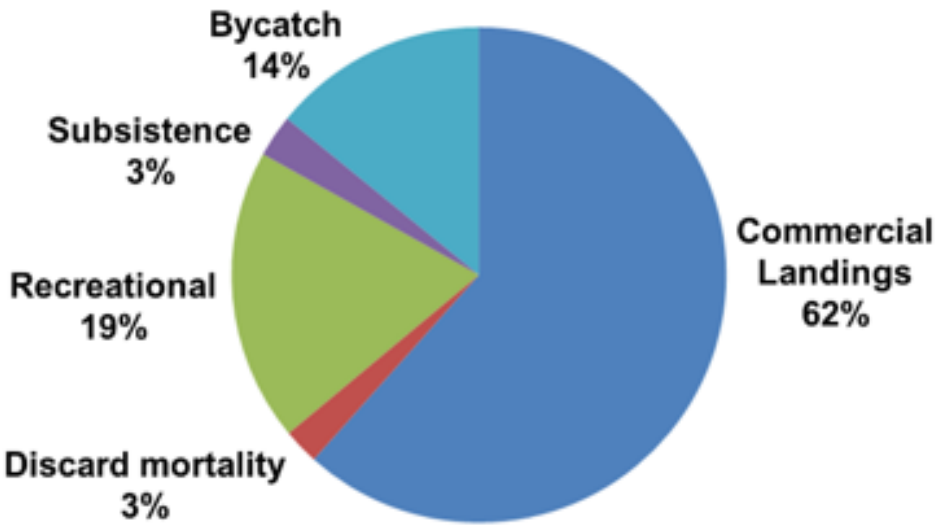

Figure 1. Distribution of Pacific halibut mortality by source in 2017.

Table 1. 2017 estimates of total removals (thousands of pounds, net weight), including catch limits and landings of Pacific halibut by IPHC Regulatory Area. Preliminary as of 9 November 2017. Shaded cells included in catch totals which are tracked against the catch limit. Totals have been rounded. Totals have also been provided in metric tons.

	IPHC Regulatory Area							
Removals	**2A**	**2B**	**2C**	**3A**	**3B**	**4**	**Total (,000 lb)**	**Total (t)**
Commercial landings [1]	737	6,193	4,108[13]	7,587	3,022	3,938	25,585	11,605.16
Commercial discard mortality [2]	19	175	87	347	234	126	988	448.15
Recreational landings [3]	515	1,172	2,294	3,904	8	15	7,908	3,587.01
Recreational landings from commercial leasing [4]	-	4	41	7	-	-	52	23.59
Recreational discard mortality [5]	4	42	59	52	-	-	157	71.21
Bycatch mortality [6]	111	251	17	1,390	885	3,342	5,996	2,719.74
Subsistence [7]	30	405	436	222	14	61	1,168	529.80
IPHC Research landings [8]	16	65	124	198	72	96	571	259.00
Total Removals	***1,432***	***8,307***	***7,166***	***13,707***	***4,235***	***7,578***	***42,425***	***19,243.66***
2017 Catch Limits [9]	1,330[10]	7,450[11]	5,250[12]	10,000[12]	3,140	4,230	31,400	14,242.80
2017 Catch Sharing Plan Total	1,286[10]	7,411[11]	6,589[12]	11,897[12]	3,030	3,953	34,166	15,497.44

[1] Commercial landings are of Pacific halibut that are 32" or greater (O32) in length from directed halibut fisheries using longline gear or in some cases pot gear. Commercial landings are reported on landing receipts and converted from head-on, gutted weight to net weight.

[2] Includes estimate of discard mortality from IPHC research.

[3] Recreational landings are of Pacific halibut that may be subject to a size limit and may vary by Regulatory Area (as described in domestic regulations). Data collection methods vary by Regulatory Area and are collated by IPHC from domestic and state agencies.

[4] Fish landed against transfers from commercial quota fisheries (XRQ in Area 2B, GAF in Areas 2C and 3A).

[5] Regulatory Area 2A based on previous 5-year average. Regulatory Area 2B is the value reported by DFO and differs from the value used in the 2017 stock assessment (53,161 lb). The stock assessment value is based on the method developed by the IPHC, which applies the rate of discarding from the Regulatory Area 2C charter fishery applied to 2B catch.

[6] Bycatch mortality is from fisheries targeting other fish and shellfish that inadvertently catch Pacific halibut. The bycatch mortality estimates are of Pacific halibut that are caught and released at sea but subsequently die.

[7] Includes 2016 Alaskan subsistence harvest estimates (tribal and rural SHARC holders). Area 4 includes 7,380 pounds of U32 Pacific halibut retained in the 2017 Regulatory Area 4DE Community Development Quota fishery.

[8] IPHC Research landings include landings from the fishery-independent setline survey and other research projects.

[9] Does not include pounds from the underage/overage programs in Area 2B or Alaska or pounds from the Annette Island Reserve fishery in Area 2C.

[10] Catch limit and landings reported include commercial, recreational, and treaty subsistence landings.

[11] Catch limit and landings reported include commercial and recreational (including commercial leasing) landings and recreational discard mortality.

[12] Catch limit and landings reported include commercial and recreational guided/charter (including commercial leasing) landings and discard mortality for all commercial and guided recreational. Unguided recreational landings and discard mortality are not included.

[13] Regulatory Area 2C commercial landings includes 64,363 pounds taken in the Metlakatla fishery within the Annette Islands Reserve.

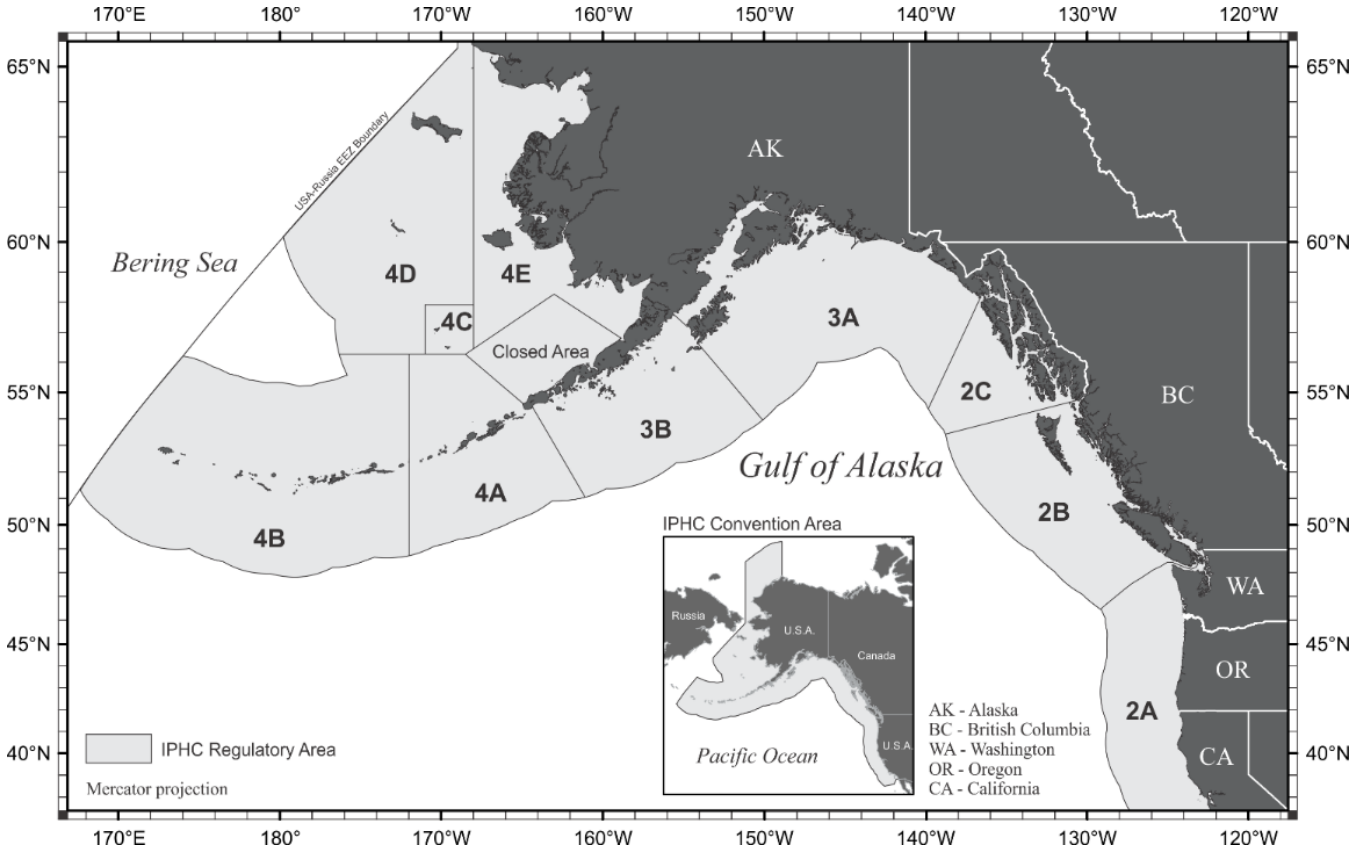

Figure 2. Map of the IPHC Convention Area and IPHC Regulatory Areas.

DEFINITIONS

Commercial fisheries: include commercial landings and discard mortality (formerly called "wastage" in IPHC reports). Commercial discard mortality continues to include estimates of sub-legal Pacific halibut (under 32 inches (81.3 cm), also called U32), fish that die on lost or abandoned fishing gear, and fish discarded for regulatory reasons.

Recreational fisheries (formerly called sport): include recreational landings (including landings from commercial leasing) and discard mortality.

Subsistence fisheries (formerly called personal use/subsistence): are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fisheries include:

i) ceremonial and subsistence (C&S) removals in the Regulatory Area 2A treaty Indian fishery,
ii) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia,
iii) federal subsistence fishery in Alaska that uses Alaska Subsistence Halibut Registration Certificate (SHARC), and
iv) U32 Pacific halibut retained in Regulatory Areas 4D and 4E by the CDQ fishery for personal use.

Bycatch: incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture.

COMMERCIAL FISHERIES

The IPHC's commercial fisheries span from northern California through to northern and western Alaska in USA and Canada waters of the northeastern Pacific Ocean. The IPHC sets annual limits for the catch of Pacific halibut in each IPHC Regulatory Area. Participants in these commercial fisheries use longline and pot gear to catch Pacific halibut for sale. The commercial Pacific halibut fisheries in IPHC Regulatory Area 2A consisted of the directed commercial fishery with fishing period limits, the incidental Pacific halibut catch during the salmon troll and limited-entry sablefish fisheries, and the treaty Indian fisheries. Farther north, the commercial fisheries consisted of the Individual Vessel Quota (IVQ) fishery in IPHC Regulatory Area 2B, the Individual Fishing Quota (IFQ) system in Alaska, the Community Development Quota (CDQ) fisheries in IPHC Regulatory Areas 4B and 4CDE, and the Metlakatla fishery in Southeast Alaska. All 2017 landing and discard mortality data presented in this document are preliminary.

Commercial Fishing Periods

The Canadian IVQ fishery in IPHC Regulatory Area 2B and the US IFQ and CDQ fisheries in IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E commenced at 12 noon local time on 11 March and closed at 12 noon local time on 7 November 2017 (Table 2). The IPHC Regulatory Area 2A commercial fisheries, including the treaty Indian commercial fisheries, occurred during the same calendar period (11 March to 7 November 2017). For IPHC Regulatory Area 2A, seven potential 10-hour fishing periods for the non-treaty directed commercial fishery were adopted: 28 June, 12 July, 26 July, 2 August, 16 August, 30 August, and 13 September 2017. All fishing periods began at 0800 and ended at 1800 local time, were further restricted by fishing period limits, and closed for the remainder of the year after the third opening on 26 July when the IPHC Regulatory Area 2A directed commercial fishery allocation was estimated to have been reached.

Table 2. Fishing periods for commercial Pacific halibut fisheries by IPHC Regulatory Area, 2008-17.

Regulatory Area	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A Treaty Indian	8 Mar-3 Jun (88) 17 Mar-15 Apr	21 Mar- 15 Jul (117) 21 Mar-9 May	6 Mar–20 Mar (14) 6 Mar-8 Apr	20-22 Mar (2) 1-2 May (19 h) 12-19 Mar 24-28 Mar (13)	24-26 Mar (2) 1 May (13 hrs) 17-19 Mar (55 hrs)	23-25 Mar (48 hrs) 2-4 Apr, 15-16 Apr, 8 May, 6 Jun, 13 Jul 20 Jul 3 Aug	11-13 Mar (48 hrs) 20-21Mar, 8May 8 May	16-18 Mar (48 hrs) 1-2 Apr	19-21 Mar,20-21 Mar, 21-23 Mar 1-2 Apr 1-2,11-12 May, 18 May-15 Aug, 25 Jul-2 Aug, 12 Sep-7 Nov	20 Mar, 15-16 Apr 1-2 May 19-20 May, 22-23 May 18-19 Jun 21-22 Jul
2A Commercial Directed	11 Jun (10 hrs) 25 Jun (10 hrs) 9 Jul (10 hrs) 23 Jul (10 hrs)	24 Jun (10 hrs) 8 Jul (10 hrs)	30 Jun (10 hrs)	29 Jun (10 hrs) 13 Jul (10 hrs)	27 Jun (10 hrs) 11 Jul (10 hrs)	26 Jun (10 hrs) 10 Jul (10 hrs)	25 Jun (10 hrs) 9 Jul (10 hrs)	24 Jun (10 hrs) 8 Jul (10 hrs)	22 Jun (10 hrs) 6 Jul (10 hrs) 20 Jul (10 hrs)	28 Jun (10 hrs) 12 Jul (10 hrs) 26 Jul (10 hrs)
2A Commercial Incidental	Salmon 1 May–15 Nov (199) Sablefish 1 May– 31 Oct (184)	Salmon 1 May–15 Nov (199) Sablefish 1 May– 31 Oct (184)	Salmon 1 May– 16 Jun (45) Sablefish No fishery	Salmon 1 May–28May (28) 29 Jul-31 Oct (94) Sablefish No fishery	Salmon 1 May – 3 Jul (64) Sablefish 1 May– 31 Oct (184)	Salmon 1 May–10 Aug (101) Sablefish 1 May– 31 Oct (184)	Salmon 1 Apr–11 Sep (163) Sablefish 1 Apr– 31 Oct (213)	Salmon 1 Apr–21 Aug (142) Sablefish 1 Apr– 31 Aug (152)	Salmon 1 Apr – 31 Oct (213) Sablefish 1 Apr – 31 Oct (213)	Salmon 1 Apr–3 Aug (124) Sablefish 1 Apr– 31 Oct (213)
2B	8 Mar–15 Nov (253)	21 Mar–15 Nov (240)	6 Mar–15 Nov (255)	12 Mar–18 Nov (252)	17 Mar–7 Nov (236)	23 Mar–7 Nov (230)	8 Mar–7 Nov (244)	14 Mar–7 Nov (238)	19 Mar–7 Nov (233)	11 Mar–7 Nov (241)
Alaska (2C, 3A, 3B, 4A, 4B, 4CDE)	8 Mar–15 Nov (253)	21 Mar–15 Nov (240)	6 Mar–15 Nov (255)	12 Mar–18 Nov (252)	17 Mar–7 Nov (236)	23 Mar–7 Nov (230)	8 Mar–7 Nov (244)	14 Mar–7 Nov (238)	19 Mar–7 Nov (233)	11 Mar–7 Nov (241)

Commercial Landings

Commercial landings (including IPHC research landings) and catch limits by IPHC Regulatory Area for the 2017 fishing season are shown in Table 3. Commercial catch limit, as referred to here, is the IPHC commercial catch limit set by the Commissioners at the Annual Meeting. The adjusted commercial catch limit represents the IPHC catch limit with adjustments from the underage and overage programs from the previous year's quota share programs, and in IPHC Regulatory Area 2B, it also includes relinquishment of quota and quota leasing programs among sectors and the Use of Fish allocation. Historical landings and catch limits from 2008 through 2017 are shown in Table 4.

The 2017 commercial fishery landings were spread over nine months of the year (Table 5). On a month-to-month comparison, August took the lead as the busiest month for total poundage (15%) landed from IPHC Regulatory Area 2B. On a month-to-month comparison, August was the busiest month for total poundage (17%) from Alaska.

Table 3. 2017 Pacific halibut commercial fishing periods, number of fishing days, catch limits, and landings (including research) (thousands of pounds, net weight) by IPHC Regulatory Area (preliminary, as of 9 November 2017).

Regulatory Area 2A	Fishing Period	Catch Limit	Length of Opening	Commercial Landings	Research Landings	Total Landings
Treaty Indian	Unrestricted:					
	20 Mar		11 hrs			
	15-16 Apr		39 hrs	264		
	Restricted:					
	1-2 May		35 hrs	41.6		
	Late Fishery:					
	19-20 May (WA coast)		34 hrs	126.9		
	22-23 May (PS)		34 hrs			
	18-19 Jun		34 hrs			
	21-22 Jul		34 hrs			
Total		435.9		432.5		432.5
Incidental in Salmon Fishery	1 Apr – 3 Aug	39.8	124 days	38.6		38.6
Incidental in Sablefish Fishery	1 Apr – 31 Oct	70	214 days	35.9		35.9
Directed[1]	28 Jun		10 hours	83		
	12 Jul		10 hours	77.5		
	26 Jul		10 hours	69.5		
Directed Total		225.6		230		230
2A Total		771.3		737	16	753

Regulatory Area	Fishing Period	Catch Limit	Adjusted Catch Limit[2]	Commercial Landings[3]	Research Landings	Total Landings[4]
2B	11 Mar – 7 Nov	6,272	6,364	6,193[4]	65	6,258
2C	11 Mar – 7 Nov	4,212	4,244	4,108[5]	124	4,232
3A	11 Mar – 7 Nov	7,739	7,788	7,587	198	7,785
3B	11 Mar – 7 Nov	3,140	3,151	3,022	72	3,094
4A	11 Mar – 7 Nov	1,390	1,402	1,270	28	1,298
4B	11 Mar – 7 Nov	1,140	1,165	1,048	44	1,092
4C	11 Mar – 7 Nov	752	754		9	
4D	11 Mar – 7 Nov	752	764	1,620[6,7]	15	1,644
4E	11 Mar – 7 Nov	196	196			
Alaska Total		19,321	19,464	18,655	490	19,145
Grand Total		**26,364[8]**	NA[8]	**25,585[8]**	**571[8]**	**26,156[8]**

[1] Fishing period limits by vessel class.
[2] Includes adjustments from the underage/overage programs, and in Regulatory Area 2B, quota held by DFO (Canada) for First Nations through relinquishment processes, and the Use of Fish allocation.
[3] Includes pounds from 7 November 2017 Prior Notice of Landings in Alaska and hail-ins from Fishery Operations System in Canada.
[4] Includes the pounds that were landed by Native communal commercial licenses (FL licenses).
[5] Includes the pounds taken in the Metlakatla fishery within the Annette Islands Reserve.
[6] Regulatory Area 4C IFQ and CDQ could be fished in Regulatory Area 4D by NMFS and IPHC Fishery Regulations.
[7] Regulatory Area 4D CDQ could be fished in Regulatory Area 4E by NMFS and IPHC Fishery Regulations.
[8] Includes IPHC Regulatory Area 2A catch limit and landings.

Table 4. Commercial landings, discard mortality, catch limits and percent of catch limit attained of Pacific halibut (in thousands of pounds, net weight) by IPHC Regulatory Area, 2008-17.

Regulatory Area	**Commercial Landings**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	675	485	407	524	556	526	510	551	642	737
2B	7,683	6,538	6,607	6,612	5,874	5,951	5,776	5,884	6,046	6,193
2C[1]	6,145	4,866	4,390	2,363	2,575	2,912	3,275	3,602	3,877	4,108
3A	24,166	21,399	20,186	14,379	11,735	10,852	7,383	7,722	7,308	7,587
3B	10,617	10,616	9,958	7,218	4,932	4,009	2,816	2,574	2,609	3,022
4A	2,973	2,464	2,265	2,316	1,543	1,207	833	1,336	1,346	1,270
4B	1,723	1,534	1,785	2,022	1,715	1,224	1,091	1,080	1,084	1,048
4CDE	3,852	3,279	3,288	3,413	2,328	1,759	1,243	1,173	1,463	1,620
Total	57,834	51,181	48,886	38,847	31,258	28,440	22,927	23,922	24,375	25,585
Regulatory Area	**Commercial Discard Mortality**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	44	52	27	25	25	25	21	31	37	19
2B	454	354	302	283	220	211	250	238	229	175
2C[1]	295	304	261	83	95	110	119	121	123	87
3A	1,004	1,175	1,450	930	593	519	443	521	378	347
3B	676	796	903	770	526	404	326	215	232	234
4A	149	157	138	144	95	70	35	79	54	67
4B	25	18	37	43	38	35	56	36	60	31
4CDE	111	90	95	191	75	56	52	52	65	28
Total	2,758	2,946	3,213	2,469	1,667	1,430	1,302	1,293	1,178	988
Regulatory Area	**Commercial Total Removals**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	719	537	434	549	581	551	531	582	679	756
2B	8,137	6,892	6,909	6,895	6,094	6,162	6,026	6,122	6,275	6,368
2C[1]	6,440	5,170	4,651	2,446	2,670	3,022	3,394	3,723	4,000	4,195
3A	25,170	22,574	21,636	15,309	12,328	11,371	7,826	8,243	7,686	7,934
3B	11,293	11,412	10,861	7,988	5,458	4,413	3,142	2,789	2,841	3,256
4A	3,122	2,621	2,403	2,460	1,638	1,277	868	1,415	1,400	1,337
4B	1,748	1,552	1,822	2,065	1,753	1,259	1,147	1,116	1,144	1,079
4CDE	3,963	3,369	3,383	3,604	2,403	1,815	1,295	1,225	1,528	1,648
Total	60,592	54,127	52,099	41,316	32,925	29,870	24,229	25,215	25,553	26,573
Regulatory Area	**Commercial Catch Limits**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	718.4	511.2	420	480.7	546.6	539.7	519.6	511.5	642.3	771.3
2B[2]	7,918	6,712	6,599	6,702	5,953	5,958	5,793	5,974	6,199	6,272
2C[2]	6,210	5,020	4,400	2,330	2,624	2,970	3,319	3,679	3,924	4,212
3A[2]	24,220	21,700	19,990	14,360	11,918	11,030	7,318	7,790	7,336	7,739
3B[2]	10,900	10,900	9,900	7,510	5,070	4,290	2,840	2,650	2,710	3,140
4A[2]	3,100	2,550	2,330	2,410	1,567	1,330	850	1,390	1,390	1,390
4B[2]	1,860	1,870	2,160	2,180	1,869	1,450	1,140	1,140	1,140	1,140
4CDE[2]	3,890	3,460	3,580	3,720	2,464	1,930	1,284	1,285	1,660	1,720
Total	58,816	52,723	49,379	39,693	32,012	29,498	23,064	24,420	25,001	26,364
Regulatory Area	**Commercial Limits – Percent Attained**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	94	95	97	109	102	97	98	108	100	96
2B	97	97	100	99	99	100	100	98	98	99
2C[1]	104	103	106	105	102	102	102	101	102	100
3A	104	104	108	107	103	103	107	106	105	103
3B	104	105	110	106	108	103	111	105	105	104
4A	101	103	103	102	105	96	102	102	101	96
4B	94	83	84	95	94	87	101	98	100	95
Total	102	97	94	97	98	94	101	95	92	96

[1] In Area 2C, includes the Metlakatla fishery landed catch.
[2] Additional carryover from the underage/overage plans is not included.

Table 5. The total pounds (thousands, net weight, preliminary) of 2017 commercial landings (not including research landings) of Pacific halibut for Alaska and British Columbia by IPHC Regulatory Area and month.

Regulatory Area	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
2B[1]	686	562	751	746	835	929	638	727	319	6,193
2C[2,3]	644	854	710	531	237	448	383	278	23	4,108
3A[2]	540	1,285	1,509	1,058	542	932	877	776	68	7,587
3B[2]	58	265	481	347	345	559	662	242	61	3,022
4A[2]		26[4]	136	186	162	276	237	198	48	1,270
4B[2]	-	60	97	248	184	250	107	102[5]		1,048
4CDE[2]			54	203	372	615	268	107[5]		1,620
Alaska Total	1,242	2,490	2,988	2,574	1,842	3,081	2,534	1,703	201	18,655
Grand Total	1,928	3,052	3,739	3,320	2,677	4,010	3,173	2,430	519	24,848

[1] Based on landings from DFO Fishery Operations System (FOS).
[2] Based on landings from NMFS Restricted Access Management (RAM) Division.
[3] Weights include landings from the Metlakatla Indian Community.
[4] Weight combined with the previous months for confidentiality purposes.
[5] Weight combined with the following month for confidentiality purposes.

Regulatory Area 2A (Washington, Oregon, California)

The 2017 IPHC Regulatory Area 2A fisheries and respective catch limits are listed in Table 3. The total IPHC Regulatory Area 2A catch (not including IPHC research) of 737,000 pounds (334 t) was within 1% of the catch limit. The total directed commercial landings of 230,000 pounds (104 t) were 2% over the catch limit of 225,591 pounds (102 t) after three 10-hour openers. The fishing period limits by vessel size class for each opener in 2017 are listed in Table 6. At the start of the season on 1 April, the allowable incidental landing ratio of Pacific halibut during the salmon troll fishery was one Pacific halibut per three Chinook (*Oncorhynchus tshawytscha*), plus an "extra" Pacific halibut per landing, and a vessel trip limit of 20 fish. The landing restrictions were changed to one Pacific halibut per four Chinook, plus an "extra" Pacific halibut per landing, and a vessel trip limit of 10 fish, effective 1 July 2017. The incidental Pacific halibut retention closed on 3 August, with total landings of 39,000 pounds (18 t) which was 3% under the catch limit (39,810 pounds (18 t)). Incidental Pacific halibut retention during the limited-entry sablefish fishery remained open from 1 April to noon on 31 October. The allowable landing ratio was 140 pounds (0.06 t) (net weight) of Pacific halibut to 1,000 pounds (0.45 t) (net weight) of sablefish, and up to two additional Pacific halibut in excess of the ratio limit. The total landings of 36,000 pounds (14 t) were 49% under the catch limit (70,000 pounds (32 t)).

In IPHC Regulatory Area 2A, north of Point Chehalis, the treaty Indian tribes manage the commercial landings by allocating 75% to an open access fishery and 25% to a restricted fishery with daily and vessel limits. There were two unrestricted, open access fisheries on 20 March and from 15 – 16 April and one restricted fishery, including a vessel per day limit of 500 pounds (0.23 t) for the 1-2 May opening. The 2017 tribal commercial season closed to all parties on 7 November, following the late fisheries, with total landings of 432,500 pounds (196 t), 1% under the catch limit (435,900 pounds (198 t)).

Table 6. The fishing periods and limits (pounds, dressed, head-on with ice/slime) by vessel class used in the 2017 directed commercial fishery in IPHC Regulatory Area 2A.

Vessel Class		Fishing Period & Limits		
Letter	**Feet**	**28 June**	**12 July**	**26 July**
A	≤25	860	860	670
B	26-30	1,075	1,075	835
C	31-35	1,715	1,715	1,335
D	36-40	4,735	4,735	3,680
E	41-45	5,090	5,090	3,960
F	46-50	6,095	6,095	4,740
G	51-55	6,800	6,800	5,290
H	56+	10,225	10,225	7,955

Regulatory Area 2B (British Columbia)

Under the IVQ fishery in British Columbia, Canada, the number of active Pacific halibut licences (L licences), and First Nations communal commercial licences (FL licences) was 160 in 2017. In addition, Pacific halibut can be landed as incidental catch in other licensed groundfish fisheries. Therefore, Pacific halibut was landed from a total of 231 active licences in 2017, with 71 of these licences from other fisheries. The 2017 commercial landings of 6,193,000 pounds (2,809 t) were 1% under the catch limit (6,272,000 pounds (2,845 t)) (Table 3).

Commercial trips from IPHC Regulatory Area 2B were delivered into 16 different ports in 2017. The ports of Port Hardy (including Coal Harbour and Port McNeill) and Prince Rupert/Port Edward were the major landing locations, receiving 92% of the commercial landings. Port Hardy received 38% while Prince Rupert received 54% (2,359,000 and 3,343,000 pounds (1,070 and 1,516 t), respectively) of the commercial landings. All of the IVQ landings were landed in IPHC Regulatory Area 2B. The 2017 landings of live Pacific halibut from IPHC Regulatory Area 2B was legally allowed by Fisheries and Oceans Canada (DFO) and resulted in a total landed weight of 202 pounds. Only Canadian vessels landed frozen, head-off Pacific halibut in 2017, and only in Canadian ports: 56 landings (70,272 net lbs; ~31.9 t) reported frozen-at-sea head-off product from 28 vessels.

Regulatory Areas 2C, 3, and 4 (Alaska)

In Alaska, USA, the National Marine Fisheries Service (NMFS) Restricted Access Management (RAM) allocated Pacific halibut quota share (QS) to recipients by IPHC Regulatory Area. Quota share transfers were permitted with restrictions on the amount of QS a person could hold and the amount that could be fished per vessel. In 2017, RAM reported that 3,076 persons held QS.

The total 2017 landings from the IFQ/CDQ Pacific halibut fishery for the waters off Alaska were 18,655,000 pounds (8,462 t), less than 3% under the catch limit (Table 3). By IPHC Regulatory Area, the landings were under the catch limit by 2% for Areas 2C and 3A, 4% for Area 3B, 9% for Area 4A, and 8% for Area 4B. The total combined IPHC Regulatory Area 4CDE commercial landings of 1,620,000 pounds (735 t) were 5% under the combined Area 4CDE catch limit (1,700,000 pounds (771 t)). The North Pacific Fishery Management Council's Catch Sharing Plan allowed IPHC Regulatory Area 4D CDQ to be harvested in IPHC Regulatory Areas 4D or 4E and Area 4C IFQ and CDQ to be fished in Areas 4C or 4D.

Kodiak received approximately 18% (3,258,000 pounds (919 t)) of the commercial landings of Alaskan catch making it the port that received the greatest number of pounds in 2017. Seward received the second and Homer the third largest landing volume at 12% (2,096,000 pounds, 951 t) and 11% (2,027,000 pounds, 919 t) of the Alaskan commercial landings, respectively. In Southeast Alaska, the three largest landing volumes were received in Petersburg (1,515,000 pounds (687 t)), Sitka (1,436,000 pounds (651 t)), and Juneau (1,003,000 pounds (455 t)), in that order, and their combined landings represented 22% of the commercial Alaskan landings. The Alaskan QS catch that was landed outside of Alaska was 3%.

The Metlakatla Indian Community (within IPHC Regulatory Area 2C) was authorized by the United States government to conduct a commercial Pacific halibut fishery within the Annette Islands Reserve. There were 13 two-day openings between 14 April and 8 October for total landings of 64,363 pounds (29 t) (Table 7). This was lower than the 2016 landings, and within the historical landing range that has varied over time from a low of 12,000 pounds (5 t) in 1998 to a high of 126,000 pounds (57 t) in 1996.

Table 7. Metlakatla community fishing periods, number of vessels, and preliminary Pacific halibut landings (net weight) in IPHC Regulatory Area 2C, 2017.

Fishing Period Dates	Number of Vessels	Catch (Pounds)
14 – 16 April	11	2,994
5 – 7 May	12	5,158
19 – 21 May	18	7,914
2 – 4 June	10	5,356
16 – 18 June	15	10,136
30 June – 2 July	8	5,076
14 – 16 July	11	5,778
28 – 30 July	10	4,227
11 – 13 August	10	4,682
25 – 27 August	6	3,118
8 – 10 September	13	6,703
22 – 24 September	7	2,125
6 – 8 October	3	1,096
13 Fishing Periods		64,363

Commercial Discard Mortality

Incidental mortality of Pacific halibut in the commercial Pacific halibut fishery is the mortality of all Pacific halibut that do not become part of the landed catch. This mortality, also called discard mortality, was previously termed wastage in many IPHC publications. The three main sources of discard mortality estimate include: 1) fish that are captured and discarded because they are below the legal size limit of 32 inches (81.3 cm), 2) fish that are estimated to die on lost or abandoned fishing gear, and 3) fish that are discarded for regulatory reasons (e.g., the vessels trip limit has been exceeded). The methods that are applied to produce each of these estimates differ due to the amount and quality of information available. Information on lost gear and regulatory discards is collected through logbook interviews and fishing logs received by mail. The ratio of U32 to O32 Pacific halibut (>32 inches in length) is determined from the IPHC fisheries-independent setline survey in most areas and by direct observation in the IPHC Regulatory Area 2B fishery. Different mortality rates are applied to each category: released Pacific halibut have a 16% mortality rate and Pacific halibut mortality from lost gear is 100%.

Pacific halibut discard mortality estimates from the commercial Pacific halibut fishery are summarized by IPHC Regulatory Area in Table 1 and over a series of years in Table 4. A more detailed description of commercial discard mortality, including methodology and longer term trends, is presented in Appendix I.

RECREATIONAL FISHERIES

The 2017 recreational removals of Pacific halibut, including discard mortality, was estimated at 8,127,000 pounds (3,686 t), an increase of the recreational harvest in 2016 by 751,000 pounds (341 t). Changes in harvests varied across areas; in some cases, in response to changes in size restrictions. Recreational catch limits and landings are detailed by IPHC Regulatory Area in Table 8, and summarized in Table 1.

Table 8. Recreational removals and limits of Pacific halibut (in thousands of pounds, net weight) by IPHC Regulatory Area, 2013-17.

Regulatory Area	Recreational Retained				
	2013	2014	2015	2016	2017
2A	501	476	445	504	515
2B – XRQ Leased	8	5	5	7	4
2B	814	913	981	1,021	1,172
2C – GAF Leased	-	54	28	39	41
2C – Charter Retained	762	783	768	789	882
2C – Noncharter Retained	1,361	1,171	1,327	1,246	1,412
2C	2,123	2,008	2,123	2,074	2,335
3A – GAF Leased	-	10	5	9	7
3A – Charter Retained	2,514	2,034	2,067	2,004	2,079
3A – Noncharter Retained	1,452	1,533	1,616	1,538	1,825
3A	3,966	3,577	3,688	3,551	3,911
3B	15	7	5	8	8
4A	9	9	7	15	15
4B and 4CDE	-	-	-	-	-
Total	7,428	6,926	7,216	7,125	7,908
Regulatory Area	**Recreational Discard Mortality**				
	2013	2014	2015	2016	2017
2A	4	4	4	4	4
2B	45	54	60	66	53
2C – Charter Discard Mortality	42	46	47	51	40
2C – Noncharter Discard Mortality	28	16	18	19	19
2C	70	62	65	70	59
3A – Charter Discard Mortality	49	43	36	29	22
3A – Noncharter Discard Mortality	30	26	37	27	30
3A	79	69	73	56	52
3B and 4	-	-	-	-	-
Total	198	189	202	196	168
Regulatory Area	**Recreational Total Removals**				
	2013	2014	2015	2016	2017
2A	505	480	449	508	518
2B	866	972	1,046	1,094	1,229
2C	2,193	2,070	2,188	2,144	2,394
3A	4,045	3,646	3,761	3,607	3,963
3B	15	7	5	8	8
4A	9	9	7	15	15
4B and 4CDE	-	-	-	-	-
Total	7,633	7,184	7,456	7,376	8,127
Regulatory Area	**Recreational Limits**				
	2013	2014	2015	2016	2017
2A	418	412	427	464	529
2B	1,080	1,057	1,064	1,101	1,118
2C	788	761	851	906	915
3A	2,734	1,782	1,890	1,814	1,890
3B and 4	-	-	-	-	-
Total	5,020	4,012	4,232	4,285	4,452
Regulatory Area	**Recreational Limit Percent Attained**				
	2013	2014	2015	2016	2017
2A	121	117	105	109	98
2B	80	92	98	99	110
2C	102	116	99	97	105
3A	94	117	112	113	112
3B and 4	-	-	-	-	-
Total	-	-	-	-	-

Recreational Landings

Regulatory Area 2A (Washington, Oregon, California)

The 2017 IPHC Regulatory Area 2A recreational allocation was 599,099 pounds (271.7 t) net weight and based on the Pacific Fishery Management Council's Catch Sharing Plan formula, which divides the overall fishery catch limit among all sectors. The recreational allocation was further subdivided to seven subareas, after 70,000 pounds (31.8 t) was allocated to the incidental Pacific halibut catch in the commercial sablefish fishery in Washington. This subdivision resulted in 230,868 pounds (104.7 t) being allocated to Washington subareas, 250,851 pounds (113.8 t) to Oregon subareas, and 12,799 pounds (5.8 t) shared in the Columbia River region. In addition, California received an allocation of 34,580 pounds (15.7 t). The IPHC Regulatory Area 2A recreational harvest totaled 514,781 pounds (233.5 t), 2% under the recreational allocation (Table 8).

Recreational fishery harvest seasons by subareas varied and were managed inseason with fisheries opening on 1 May. The Washington Inside Waters (i.e., Puget Sound) fishery closed after week 25 (18 June) along with the Washington North Coast fishery with one or two day openers each week. In the Washington South Coast subarea, the primary fishery closed after week 21 (21 May) with one or two day openers and re-opened 17 June for one day with no nearshore fishery. The Columbia River subarea fishery closed week 28 (25 May) after one to four day openings each week and reopened for a single day on 17 June. The Central Oregon subarea had fishery openings from May through October totaling 26 days in the all-depth fishery and 116 days in the <40-fathom fishery. The South of Humbug subarea closed after week 25 (on 15 June), reopened in August and again in September, and closed for the year on 10 September (85 days).

Regulatory Area 2B (British Columbia)

IPHC Regulatory Area 2B operated under a 133 cm (52.4 inch) maximum size limit, and one Pacific halibut had to be less than 83 cm (32.7 inch) when attaining the two fish possession limit with an annual limit of six per licence holder. The IPHC Regulatory Area 2B fishery closed on 6 September due to the allocation estimated to have been attained. Recreational fishing continued to be allowed after this closure in IPHC Regulatory Area 2B for any fish that was leased from commercial fishery quota shares for that area.

Canada and Alaska both have programs that allow recreational harvesters to land fish that is leased from commercial fishery quota share holders for the current season. In Canada, four thousand pounds (1.7 t) were leased from the commercial quota fishery and landed as recreational harvest.

Regulatory Areas 2C, 3, and 4 (Alaska)

A reverse slot limit allowing for the retention of Pacific halibut, if ≤ 44 inches (112 cm) or ≥ 80 inches (203 cm) (compared to ≤ 43 inches (109 cm) and ≥ 80 inches (203 cm) in 2016) in total length, was continued by the IPHC for the charter fishery in IPHC Regulatory Area 2C. In IPHC Regulatory Area 3A, charter anglers were allowed to retain two fish, but only one could exceed 28 inches in length, a four fish annual limit with a recording requirement, one trip per calendar day per charter permit, with no charter retention of Pacific halibut on Wednesdays throughout the season and 18 July, 25 July, and 1 August.

Similar to Canada, Alaska has programs that allow recreational harvesters to land fish that is leased from commercial fishery quota share holders for the current season. In IPHC Regulatory

Areas 2C and 3A, 41,000 pounds (18.6 t) and 7,000 pounds (3.2 t), respectively, were leased from the commercial quota fisheries in those areas and landed as recreational harvest.

Recreational Discard Mortality

Pacific halibut discarded for any reason suffer some degree of discard mortality, and impacts more of the stock with the increasing use of size restrictions, such as reverse slot limits. Current year estimates from contracting parties' agencies of recreational discard mortality have been received from Alaska, Oregon, and Canada, and are provided in Table 8.

SUBSISTENCE FISHERIES

Pacific halibut is taken throughout its range as subsistence harvest by several fisheries. Subsistence fisheries (formerly called personal use/subsistence) are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. The primary subsistence fisheries are the treaty Indian Ceremonial and Subsistence fishery in IPHC Regulatory Area 2A off northwest Washington State, the First Nations Food, Social, and Ceremonial (FSC) fishery in British Columbia, and the subsistence fishery by rural residents and federally-recognized native tribes in Alaska documented via Subsistence Halibut Registration Certificates (SHARC).

The coastwide subsistence estimate for 2017 is 1,169,000 pounds (530.2 t). Subsistence harvest by IPHC Regulatory Areas from 2008 through 2017 is available in Table 9.

Table 9. Subsistence Pacific halibut fisheries removals (thousands of pounds net weight) by IPHC Regulatory Area, 2008 - 2017.

Regulatory Area	Subsistence Fishery									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017[2]
2A	29.0	30.4	25.3	24.8	32.0	28.5	31.8	33.9	29.6	29.6
2B	405	405	405	405	405	405	405	405	405	405
2C	458.4	457.0	424.8	387.0	396.0	396.0	428.2	428.2	436.5	436.5
3A	337.4	328.5	312.7	266.1	253.5	253.5	231.3	231.3	222.5	222.5
3B	42.2	25.5	23.0	22.0	16.0	16.0	18.3	18.3	14.2	14.2
4A	19.6	33.5	14.5	13.6	9.5	9.5	7.2	7.2	8.1	8.1
4B	4.7	1.2	0.5	0.5	1.7	1.7	0.4	0.4	0.3	0.3
4C	5.7	6.3	10.9	1.6	1.2	1.2	4.3	4.3	4.3	4.3
4D	3.1	0.6	1.2	0.6	0.7	0.7	0.6	0.6	0.0	0.0
4E	15.9	8.7	10.1	6.2	8.4	8.4	70.1	70.1	41.4	41.4
4D/4E[1] (CDQ U32)	21.8	10.3	9.5	16.9	20.2	10.0	5.5	4.7	5.5	7.4
Total	1,342.8	1,307.0	1,237.5	1,144.3	1,144.2	1,130.5	1,202.7	1,204.0	1,167.4	1,169.3

[1] 2012 Alaska estimates were carried over for the 2013 catch estimate, with the exception that 4D/4E subsistence harvest in the CDQ fishery were updated. Similarly, 2014 Alaska estimates were carried over for the 2015, and 2017 for 2016.

Estimated subsistence harvests by area

The coastwide subsistence harvest of Pacific halibut was estimated by the IPHC at more than 2,000,000 pounds (907.2 t) in 1991, then declined rapidly through 1995, and became relatively stable in recent years (2008-present). Harvest estimation methods were revised in 1998, and the resulting estimates were somewhat higher than previous years but remained fairly stable through 2002. The estimates of harvest took another jump in 2003 following the implementation

of new subsistence fishery regulations in Alaska and a more comprehensive harvest estimation survey. Many of the changes seen in the harvest estimates from 2003 and prior were due primarily to changes in estimation methods and not necessarily actual changes in harvest levels. Methodology explained in the following sections has remained the same since 2003 and changes in estimates represent changes in harvest levels. For historical subsistence harvest levels since 1991, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.4).

In the commercial Pacific halibut fisheries coastwide, the state and federal regulations require that take-home Pacific halibut caught during commercial fishing be recorded as part of the commercial catch on the landing records (i.e., State fish tickets or Canadian validation records). This is consistent across areas, including the quota share fisheries in Canada and Alaska, and as part of fishing period limits and Pacific halibut ratios in the incidental fisheries in IPHC Regulatory Area 2A. Therefore, personal use fish or take-home fish within the commercial fisheries are accounted for as commercial catch and are not included here.

Regulatory Area 2A (Washington, Oregon, California)

The Pacific Fishery Management Council's Catch Sharing Plan allocates the Pacific halibut catch limit to commercial, recreational, and treaty Indian users in Regulatory Area 2A. The treaty tribal catch limit is further sub-divided into commercial and ceremonial and subsistence (C&S) fisheries. The 2016 final estimate of C&S was 29,600 pounds (13.4 t) and this catch estimate became the 2017 C&S allocation. The estimate of the 2017 catch is not available so it is assumed the treaty tribal C&S allocation was fully harvested.

Regulatory Area 2B (British Columbia)

The source of Pacific halibut subsistence harvest in British Columbia is the First Nations FSC fishery. The IPHC receives some logbook and landing data for this harvest from the DFO but those data have not been adequate for the IPHC to make an independent estimate of the FSC fishery harvest. DFO estimated the First Nations FSC harvest to be 300,000 pounds (136.1 t) annually until 2006, and since 2007, the yearly estimate has been provided as 405,000 pounds (183.7 t).

Regulatory Areas 2C, 3, and 4 (Alaska)

The IPHC began estimating the Pacific halibut subsistence harvest in Alaska in 1991. The available estimates indicated that subsistence harvest in Alaska totaled 1,950,000 pounds (884.5 t) that year. The estimate for 1992 dropped in half, to one million pounds (453.6 t). Estimates were subsequently made for each IPHC Regulatory Area independently and annually for most areas.

Trumble (1999) developed a new methodology to estimate personal use (now called subsistence) using Pacific halibut catch information gathered by household interviews and postal surveys conducted by the Alaska Department of Fish and Game (ADFG). The surveys did not distinguish between recreational and subsistence harvests, so Trumble made assumptions regarding the relative amount of recreational and subsistence catch in native and non-native households. The resulting estimates were used for Alaska for 1998-2002, with the only annual change being the amount of U32 (i.e. < 32 in or 81.3 cm) poundage retained by the IPHC Regulatory Area 4E CDQ fishers.

In 2003, the subsistence Pacific halibut fishery off Alaska was formally recognized by the North Pacific Fishery Management Council, and implemented by IPHC and NMFS regulations. The fishery allows the customary and traditional use of Pacific halibut by rural residents and members

of federally-recognized Alaska native tribes who can retain Pacific halibut for non-commercial use, food, or customary trade. The NMFS regulations define legal gear, number of hooks, and daily bag limits, and IPHC regulations set the fishing season. Prior to subsistence fishing, eligible persons registered with NMFS Restricted Access Management to obtain a SHARC. The Division of Subsistence at ADFG was contracted by NMFS to estimate the subsistence harvest in Alaska through a data collection program. Information has been provided for the years 2003-2012 (Fall and Koster 2014), 2014 (Fall and Lemons 2016), and draft 2016 (Fall and Koster 2017). Yearly reports are available at http://www.fakr.noaa.gov/ram/ subsistence/halibut.htm. Each year, the data collection program included an annual voluntary survey of fishers conducted by mail or phone, with some onsite visits. The 2012 estimate has been carried forward for the 2013 estimate and the 2014 estimate has been used for 2014 through 2015; a new 2016 estimate is used for 2016 through 2017. The 2014 estimates are about 10% higher than in 2012, and are noticeably higher in IPHC Regulatory Area 4E. To collect the 2014 harvest estimates, the ADFG staff conducted face to face interviews in two of the major subsistence harvesting communities within IPHC Regulatory Area 4E rather than relying on mailed returns. Face to face interviews likely resulted in more realistic harvest estimates than the mail survey alone, so it is likely that the IPHC Regulatory Area 4E harvest estimates between 2008 through 2013 were low.

In addition to the SHARC harvest, IPHC regulations allow Pacific halibut less than 32 inches or 81.3 cm in fork length (also called U32) to be retained in the IPHC Regulatory Area 4D and 4E commercial Pacific halibut CDQ fishery, under an exemption requested by the North Pacific Fishery Management Council, as long as the fish are not sold or bartered. The exemption originally applied only to CDQ fisheries in IPHC Regulatory Area 4E in 1998 but was expanded in 2002 to also include IPHC Regulatory Area 4D. The CDQ organizations are required to report to the IPHC the amounts retained during their commercial fishing operations. This harvest is not included in the SHARC program estimate so is reported separately. For more information on the history of U32 retained by CDQ organizations and methodology changes over the years, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.5).

Reports for 2017 were received from three organizations: Bristol Bay Economic Development Corporation (BBEDC), Coastal Villages Regional Fund (CVRF), and Norton Sound Economic Development Corporation (NSEDC). The reports are summarized below, and the reported amounts of retained U32 Pacific halibut are shown in Table 10. A total of 7,400 pounds (3.4 t) of retained U32 Pacific halibut was reported by CDQ organizations, the highest amount since 2013. Generally, annual changes are a reflection of the amount of effort by the local small boat fleets and the availability of fish in their nearshore fisheries.

Table 10. Reported annual amount (pounds, net weight) of U32 (<32 inches in fork length) Pacific halibut retained by Community Development Quota harvesters fishing in IPHC Regulatory Areas 4D and 4E.

Organization	U32 CDQ Landings									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
BBEDC	1,816	922	2,155	2,752	5,095	3,493	3,456	2,460	3,456	5,261
CVRF	12,926	4,277	3,924	9,909	10,424	5,250	963	0	0	0
NSEDC	6,924	6,060	3,438	4,206	4,668	1,290	1,114	2,206	2,001	2,119
Total	21,666	11,259	9,517	16,867	20,187	10,033	5,533	4,666	5,457	7,380

CDQ - Bristol Bay Economic Development Corporation

BBEDC requires their fishers to record the lengths of retained U32 Pacific halibut in a separate log, which are tabulated by BBEDC at the conclusion of the season. The lengths were converted to weights using the IPHC length/weight relationship and summed to estimate the total retained U32 weight. Pacific halibut were landed by BBEDC vessels primarily at Togiak, with a lesser amount landed in Dillingham and a minor amount landed in Naknek. BBEDC reported 22 harvesters landed 513 U32 Pacific halibut (5,261 pounds; 2.4 t).

CDQ - Coastal Villages Regional Fund

CVRF reported that no Pacific halibut were landed by their fishers or received by their facilities.

CDQ - Norton Sound Economic Development Corporation

NSEDC required their fishers to offload the U32 Pacific halibut for weighing. Ice was removed but the fish were not washed nor the heads removed. The U32 Pacific halibut were then returned to the harvester. NSEDC reported 247 U32 Pacific halibut weighing 2,119 pounds (1.0 t) were caught in the local CDQ fishery and landed at the Nome plant.

BYCATCH IN OTHER FISHERIES

Bycatch in other fisheries are incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture. The IPHC accounts for bycatch mortality in other fisheries by IPHC Regulatory Area and sector. Table 11 provides these estimates from 2008 through 2017. For historical bycatch mortality by IPHC Regulatory Area since 1990 and bycatch mortality trends by gear, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.6). Additional background information on discard mortality rates and Alaska bycatch limits is available in Appendix II.

Estimates of the bycatch mortality of Pacific halibut in other (non-Pacific halibut) fisheries in 2017 totaled 5,996,000 pounds (2,720.0 t) net weight, representing a decrease of approximately 500 t from 2016 (Table 11). Bycatch increased in some areas and decreased in others from 2016 values. In IPHC Regulatory Area 2A, bycatch mortality rose 16%. Estimated bycatch in the IPHC Regulatory Area 2B bottom trawl fishery in 2016 decreased by 7%. Bycatch trends were varied among Alaskan areas, with bycatch in IPHC Regulatory Areas 3B, 4B, and 4CDE with the Closed Area being up, while bycatch mortality in IPHC Regulatory Areas 2C, 3A, and 4A was down.

Table 11. Bycatch mortality estimates of Pacific halibut (thousands of pounds, net weight) by year, IPHC Regulatory Area, and fishery, for 2008-17. Estimates for 2017 are preliminary.[1]

IPHC Reg Area and Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA 2A										
Groundfish Trawl	351	416	302							
IFQ Bottom Trawl				52	60	54	44	55	55	71
Other Groundfish Trawl				2	2	4	3	1	1	2
Groundfish Pot				1	1	0	0	1	1	0
Hook & Line	80	98	45	34	56	8	53	23	39	38
Shrimp Trawl	0	0	0	0	0	0	0	0	0	0
Total	431	513	347	90	119	66	99	80	96	111
AREA 2B										
Groundfish Bottom Trawl	143	213	181	232	189	225	245	326	271	251
Total	143	213	181	232	189	225	245	326	271	251
AREA 2C										
Crab Pot	19	7	18	10	21	13	1	1	1	1
Groundfish Trawl	0	0	0	0	0	0	0	0	0	0
Hook & Line (non-IFQ)	7	5	4	3	8	8	8	12	15	7
Hook & Line (IFQ)	3	3	3	3	12	13	9	7	13	10
Chatham Str. Sablefish	8	8	8	8	n/a	n/a	n/a	n/a	n/a	n/a
Clarence Str. Sablefish	25	25	25	25	n/a	n/a	n/a	n/a	n/a	n/a
Total	62	48	58	49	41	34	17	19	29	17
AREA 3A										
Scallop Dredge	3	9	14	12	10	12	24	24	24	24
Groundfish Trawl	2,381	2,141	2,030	2,232	1,422	1,336	1,680	1,792	1,493	1,190
Hook & Line (non-IFQ)	293	197	111	92	238	216	155	223	210	132
Hook & Line (IFQ)	119	119	119	119	25	31	16	33	26	33
Groundfish Pot	13	5	12	23	29	34	12	25	40	10
Pr Wm Sd Sablefish	10	10	10	10	n/a	n/a	n/a	n/a	n/a	n/a
Total	2,819	2,481	2,296	2,488	1,724	1,630	1,888	2,098	1,793	1,390
AREA 3B										
Crab Pot	0	0	0	0	0	0	0	0	0	0
Scallop Dredge	0	4	0	5	4	8	14	0	0	0
Groundfish Trawl	979	865	676	806	989	733	809	537	708	754
Hook & Line (non-IFQ)	190	256	269	172	105	88	115	96	124	99
Hook & Line (IFQ)	116	116	116	116	24	14	18	15	8	18
Groundfish Pot	18	7	36	21	20	44	18	10	31	13
Total	1,303	1,247	1,097	1,120	1,142	887	974	658	871	885

…cont'd

Table 11 (cont'd). Bycatch mortality estimates of Pacific halibut (thousands of pounds, net weight) by year, IPHC Regulatory Area, and fishery, for 2008-17. Estimates for 2017 are preliminary.[1]

IPHC Reg Area and Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016
AREA 4A										
Scallop Dredge	0	0	0	0	0	0	0	0	0	0
Crab Pot	7	5	22	14	12	27	0	0	0	0
Groundfish Trawl	1,021	1,315	800	789	1,314	606	615	483	466	288
Hook & Line (non-IFQ)	178	220	213	145	130	204	160	149	99	104
Hook & Line (IFQ)	15	15	15	15	5	4	3	3	2	2
Groundfish Pot	8	2	7	8	10	32	27	7	5	7
Total	1,229	1,557	1,058	971	1,472	873	805	642	572	400
AREA 4B										
Crab Pot	2	0	0	1	0	3	0	0	0	0
Groundfish Trawl	206	299	371	402	215	116	101	202	137	175
Hook & Line (non-IFQ)	114	119	65	32	27	6	24	20	5	18
Hook & Line (IFQ)	40	40	40	40	12	10	5	2	2	0
Groundfish Pot	2	1	1	1	1	5	2	0	0	2
Total	364	459	477	476	255	140	132	223	144	195
AREA 4CDE+CA										
Scallop Dredge	0	0	0	0	0	0	0	0	0	0
Crab Pot	54	33	63	49	29	29	0	37	37	37
Groundfish Trawl	3,469	3,160	3,429	2,496	3,458	4,110	4,205	3,003	2,895	2,427
Hook & Line (non-IFQ)	978	821	684	472	768	668	538	384	311	281
Hook & Line (IFQ)	5	5	5	5	1	151	11	0	0	0
Groundfish Pot	2	1	1	2	4	18	13	2	2	2
Total	4,508	4,021	4,182	3,024	4,260	4,977	4,767	3,425	3,245	2,747
AREA 4 Subtotal										
Scallop Dredge	0	1	0	0	0	0	0	0	0	0
Crab Pot	63	39	85	65	41	59	0	37	37	37
Groundfish Trawl	4,696	4,774	4,600	3,687	4,987	4,832	4,921	3,687	3,499	2,890
Hook & Line (non-IFQ)	1,270	1,160	962	649	925	878	722	552	415	403
Hook & Line (IFQ)	60	60	60	60	18	165	19	5	3	2
Groundfish Pot	12	4	9	11	15	55	42	8	7	10
Total	6,101	6,037	5,717	4,472	5,987	5,989	5,704	4,290	3,961	3,342
GRAND TOTAL	**10,859**	**10,539**	**9,695**	**8,450**	**9,202**	**8,832**	**8,927**	**7,470**	**7,021**	**5,996**

[1]Note that some totals may not sum precisely due to rounding.

Estimating Bycatch Mortality

Bycatch of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. Agencies estimate the amount of bycatch that will not survive, called discard mortality.

The IPHC relies upon information supplied by observer programs run by domestic agencies for bycatch estimates in most fisheries. Non-IPHC research survey information is used to generate estimates of bycatch in the few cases where fishery observations are unavailable. The NMFS operates observer programs off the U.S. West Coast and Alaska, which monitor the major groundfish fisheries. Data collected by those programs are used to estimate bycatch. Trawl fisheries off British Columbia (BC) are comprehensively monitored and bycatch information is provided to IPHC by DFO.

Off the U.S. West Coast, an individual quota (IQ) program was implemented in 2011 for the domestic groundfish trawl fisheries. The program is quite similar to the program for the BC trawl fishery, in that it contains an individual bycatch quota component for managing and reducing Pacific halibut bycatch mortality. Fishery monitoring is required at 100% coverage levels, so all vessels carry an observer to record the vessel's catch. Bycatch is reported to IPHC by NMFS (Jannot et al. 2017). Bycatch estimates for the shrimp trawl fishery have been provided by Oregon Department of Fish and Wildlife (ODFW) staff from examinations of Pacific halibut bycatch during gear experiments. Updated estimates were provided by ODFW in 2011.

The amount of information varies for fisheries conducted off BC. For the trawl fishery, bycatch is managed with an individual bycatch quota program implemented by DFO in 1996. Fishery observers sample the catch on each bottom trawler, collecting data to estimate bycatch and discard mortality. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish hook-and-line fisheries, was largely unknown until the inception of the Integrated Fisheries Management Program in 2006. The program has requirements for full accounting and accountability of all bycatch, and includes 100% at-sea monitoring, either by human observers or electronic monitoring. Estimates of trawl bycatch were provided by DFO staff at the Pacific Biological Station, based on data collected by observers. Reporting of bycatch from the non-trawl programs is being developed with DFO staff and will be provided in future reports.

Estimates of bycatch off Alaska in federally managed fisheries were provided by the NMFS Alaska Region. Several fishery programs have a mandatory 100% monitoring requirement, including the CGOARP, the BSAI CDQ fisheries, the AFA pollock cooperatives, and the BSAI A80 fishery cooperatives. NMFS Alaska Fisheries Science Center's Annual Deployment Plan (ADP) provides the scientific guidelines which determine how vessels not involved in these full coverage programs are chosen for monitoring, including vessels in the directed Pacific halibut IFQ fishery. Additional details about the ADP can be found in NMFS (2016). The NMFS projections were provided in metric tons, round weight, and were converted to pounds net weight using net weight = round weight x 0.75 * 2,204.62.

Estimates of Pacific halibut bycatch in scallop dredge and crab fisheries are obtained from the ADFG, but not on an annual basis. The catch estimates are based on fishery data collected by on-board observers. The most recent estimates were summarized by Williams (2016) and current year estimates were simply rolled forward for 2017. Work is underway to develop an annual approach to updating these data.

Bycatch Mortality by Area

Regulatory Area 2A (Washington, Oregon, California)

Groundfish fisheries off Washington, Oregon, and California are managed by the NMFS, following advice and recommendations developed by the Pacific Fishery Management Council. The final estimate of bycatch mortality in IPHC Regulatory Area 2A was 111,000 pounds (50.3 t) (Table 11). As in prior years, the bottom trawl fishery and hook-and-line fishery for sablefish were responsible for the bulk of the bycatch mortality. Pacific halibut bycatch in the trawl IFQ fishery (also called trawl catch shares) in this area are capped at 100,000 pounds (45 t) (net weight) of O32 Pacific halibut. For 2017, the bycatch mortality for the trawl IFQ fishery was 71,000 pounds (32.2 t) of Pacific halibut.

Regulatory Area 2B (British Columbia)

In Canada, Pacific halibut bycatch in trawl fisheries are capped at 750,000 pounds net weight (453.6 t round weight) by DFO. Non-trawl bycatch is handled under an IFQ system within the directed Pacific halibut fishery cap.

For 2017, bycatch mortality in the BC bottom trawl fishery was estimated at 251,000 pounds (113.9 t) (Table 11). The reported bycatch mortality data were complete through September. Projections for the full calendar year 2017 were made by extrapolating to the full 12 months.

Regulatory Areas 2C, 3, and 4 (Alaska)

Groundfish fisheries in Alaska are managed by the NMFS, following advice and recommendations developed by the North Pacific Fishery Management Council. The North Pacific Fishery Management Council sets limits on the amount of Pacific halibut bycatch mortality which is allowed to occur annually in the groundfish fisheries, known as the Prohibited Species Catch (PSC) limits. These PSC limits are published in metric tons (t) (round weight) and are shown in Table 12, with their equivalent net weight (millions of pound). If a fishery's PSC limit is reached, the fishery is closed. Certain gear types, e.g., pots or jigs, are exempted from closures due to their low bycatch properties and to encourage their use. Bycatch mortality estimates for Alaskan areas in Table 11 were provided by NMFS; projections were made for the full year based on fishery data through 24 October 2017.

Table 12. Pacific halibut bycatch limits in the Alaska groundfish fishery 2008-17**.**

Geographical Area	**Sector**	**Bycatch Limits** (metric tons (t), round weight)									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gulf of Alaska	Trawl	2,000	2,000	2,000	2,000	2,000	1,973	1,848	1,759	1,706	1,706
	Fixed Gears	300	300	300	300	300	300	279	270	266	266
Bering Sea/	Trawl	3,675	3,625	3,625	3,575	3,525	3,525	3,525	3,525	2,805	2,805
Aleutian Islands	Fixed Gears	900	900	900	900	900	900	900	900	710	710
Geographical Area	**Sector**	**Bycatch Limits** (millions of pounds, net weight)									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gulf of Alaska	Trawl	3.30	3.30	3.30	3.30	3.30	3.26	3.06	2.91	2.82	2.82
	Fixed Gears	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.45	0.44	0.44
Bering Sea/	Trawl	6.10	6.00	6.00	5.90	5.80	5.80	5.80	5.80	4.64	4.64
Aleutian Islands	Fixed Gears	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.17	1.17

Regulatory Area 2C – Southeast Alaska

For the federal waters of IPHC Regulatory Area 2C, only bycatch by hook-and-line vessels fishing in the outside waters were reported by NMFS. These vessels are primarily targeting

Pacific cod and rockfish (*Sebastes* spp.) in open access fisheries, and sablefish in the IFQ fishery. In aggregate, these fisheries resulted in approximately 17,000 pounds (7.7 t) of bycatch mortality in 2017.

Fisheries occurring within state waters and resulting in Pacific halibut bycatch include pot fisheries for red and golden king crab, and tanner crab. Information is provided periodically by ADFG (last examined in Williams (2016)), and the estimate was again rolled forward for 2017.

Regulatory Area 3 – Eastern, Central and Western Gulf of Alaska

IPHC Regulatory Area 3 is comprised of Areas 3A and 3B. IPHC tracks bycatch for each IPHC Regulatory Area due to assessment and stock management needs, while groundfish fisheries operate throughout both areas. Trawl fisheries are responsible for the majority of the bycatch in these IPHC Regulatory Areas, with hook-and-line fisheries a distant second (Table 11) for a total of 2,275,000 pounds (1,031.9 t). State-managed crab and scallop fisheries are also known to take Pacific halibut as bycatch, but at low levels.

IPHC Regulatory Area 3 remains the area where bycatch mortality is estimated most poorly. Observer coverage for most fisheries is relatively low. Tendering, loopholes in trip cancelling, and safety considerations likely result in observed trips not being representative of all trips (observed and unobserved) in many regards (e.g. duration, species composition, etc.. This, plus low coverage, lead to increased uncertainty in these bycatch estimates and to potential for bias.

Regulatory Area 4 – Bering Sea and Aleutian Islands

Bycatch mortality for all IPHC Regulatory Areas within Area 4 was estimated at 3,342,000 pounds (1,515.9 t), with the groundfish trawl fishery being most of that at 2,890,000 pounds (1,310.9 t).

Hook-and-line fishery bycatch mortality was estimated at 405,000 pounds (183.7 t). Pacific cod is the major fishery in this IPHC Regulatory Area with Pacific halibut bycatch, which is conducted in the late winter/early spring and late summer. Almost all of the vessels are required to have 100% observer coverage because of the vessel's size and requirements of their fishery cooperative; very few small vessels fish Pacific cod in this IPHC Regulatory Area. Because of this high level of observer coverage, bycatch estimates for this and other IPHC Regulatory Area 4 fisheries are considered reliable.

Pots are used to fish for Pacific cod and sablefish and fish very selectively. Bycatch rates are quite low and survival is relatively high. Annual bycatch mortality estimates are typically low, usually less than 15,000 pounds (6.8 t).

Within the Bering Sea, bycatch mortality estimates have typically been the highest in IPHC Regulatory Area 4CDE (Table 11). This is due to the groundfish fisheries which operate in the area, i.e., those for flatfish. The bycatch mortality estimate in IPHC Regulatory Area 4CDE accounted for 82% of the total Bering Sea bycatch.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-04 which provides preliminary fishery statistics from fisheries catching Pacific halibut during 2017, including the status of removals compared to catch limits adopted by the Commission.

REFERENCES

Fall, J. A. and Koster, D. 2017. DRAFT Subsistence harvests of Pacific halibut in Alaska, 2016. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 436. Anchorage, AK.

Fall, J. A. and Lemons, T. 2016. Subsistence harvests of Pacific halibut in Alaska, 2014. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 414. Anchorage, AK.

Fall, J. A. and Koster, D. S. 2014. Subsistence harvests of Pacific halibut in Alaska, 2012. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 388. Anchorage, AK.

Jannot, J.E., Somers, K., Riley, N.B., Tuttle, V., and McVeigh, J. 2017. Pacific Halibut Bycatch in the US West Coast Fisheries (2002-2016). NOAA Fisheries, NWFSC Observer Program, 2725 Montlake Blvd E., Seattle, WA 98112. 100 p. Available online at: http://www.pcouncil.org/wp-content/uploads/2017/08/E1b_NMFS_NWFSC_Rpt_3_E-Only_Pacific_halibut_Bycatch_Rpt_2002_2016_SEPT2017BB.pdf

NMFS. 2016. 2017 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Published December 2016. 30 p. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/2017finaladp.pdf

Trumble, R. J. 1999. 1998 estimates of personal use. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 1998: 61-64.

Report of Assessment and Research Activities 2016. Int. Pac. Halibut Comm. IPHC2016-RARA-26-R

APPENDICES

Appendix I: Discard mortality of Pacific halibut in the directed commercial halibut fishery

Appendix II: Additional background information on bycatch mortality of Pacific halibut in other fisheries

Appendix I:

Discard mortality of Pacific halibut
in the directed commercial halibut fishery

Overview

The removals of Pacific halibut (*Hippoglossus stenolepis*) accounted for in the International Pacific Halibut Commission (IPHC) stock assessment include commercial and recreational fisheries landings, discard mortality from the commercial Pacific halibut fisheries, discard mortality from the recreational Pacific halibut fisheries, subsistence removals, and discard mortality of Pacific halibut from other commercial fisheries (bycatch mortality). Commercial fishery discard mortality is 1) Pacific halibut that are smaller than the commercial minimum size of 32 inches (81.3 cm), known as U32s, that must be released by regulation and subsequently die, 2) fish of all sizes estimated to have been captured by fishing gear that were subsequently lost or abandoned during fishing operations, 3) fish that are discarded for regulatory reasons (e.g. the vessel's trip limit has been exceeded). Different mortality rates are applied to each category: released Pacific halibut have a 16% mortality rate and Pacific halibut mortality from lost gear is 100%. The methods applied to produce each of these estimates differ due to the amount and quality of the information available. The discard mortality of Pacific halibut 26 inches and longer (O26), including O32 Pacific halibut (>32 inches in length) and Pacific halibut between 26 and 32 inches (U32/026), is directly deducted to determine the fishery constant exploitation yield (FCEY); and the mortality of U26 Pacific halibut is accounted for in the removals in the stock assessment and in the exploitation rates in the harvest policy. The intent of the division of U26/O26 is to standardize the treatment of removals, given that recreational and subsistence fishery removals are directly deducted when setting catch limits.

Discard mortality of U32 Pacific halibut

In the directed commercial Pacific halibut fishery, direct observations by fisheries observers or electronic monitoring information are not available coastwide, so in most IPHC Regulatory Areas the weight of discarded U32 Pacific halibut must be estimated by indirect methods. In the IPHC Regulatory Area 2B fishery (since 2006), fishers are required to record in their logbooks the number of U32 Pacific halibut discarded, which is verified for accuracy via analysis of electronic monitoring video from fishing activities. Therefore, for the IPHC Regulatory Area 2B fishery, there exists a direct estimate of the total number of U32 Pacific halibut discarded. The percent of U32 fish (in numbers) in the IPHC setline surveys and the IPHC Regulatory Area 2B logbooks is shown in Figure 3. To convert this number for the IPHC Regulatory Area 2B logbooks into a weight, the average observed weight of U32 Pacific halibut in the Area 2B setline survey is used.

In all other cases, since the setline survey uses similar fishing gear, it has been used as a proxy for the expected encounter rates by IPHC Regulatory Area and year. Previous analyses recognized that some survey stations produce a much lower catch rate of O32 Pacific halibut than observed for the average commercial set (Gilroy and Clark 2008). Therefore, to make them more comparable, the setline survey stations are filtered to stations with a higher catch rate (by weight) of O32 Pacific halibut. Following the previous analyses, the top 33% was used for IPHC Regulatory Areas 3A-4CDE, and individually estimated percentages for IPHC Regulatory Areas 2A, 2B, and 2C (Figure 4). These percentages make the observed O32 Pacific halibut catch

rates of filtered stations reasonably similar to those reported in commercial fishery logbooks. It is then inferred that the catch rate of U32 Pacific halibut would also be similar; however, this inference cannot be directly tested. Although the comparison is useful, there is considerable uncertainty with regard to the actual spatial and temporal patterns of the directed fishery, and direct estimates of U32 discards would be considerably better.

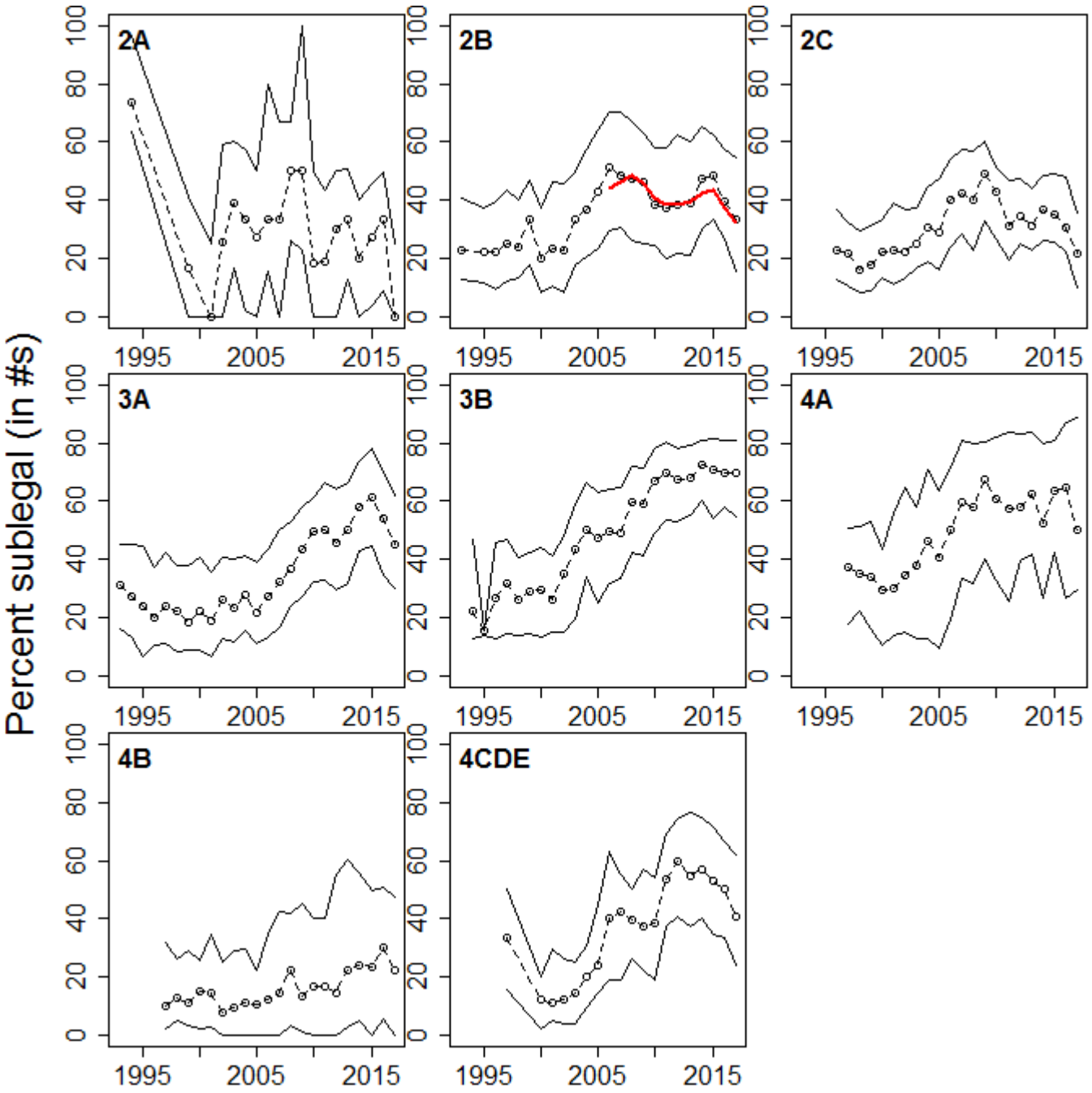

Figure 3. Setline survey percentage U32 by number, 1996-2017. Circles represent the median station observed each year in the setline survey and the lines indicate the 25th and 75th percentiles. The thick solid line in IPHC Regulatory Area 2B since 2006 represents the percent U32 reported in the logbooks.

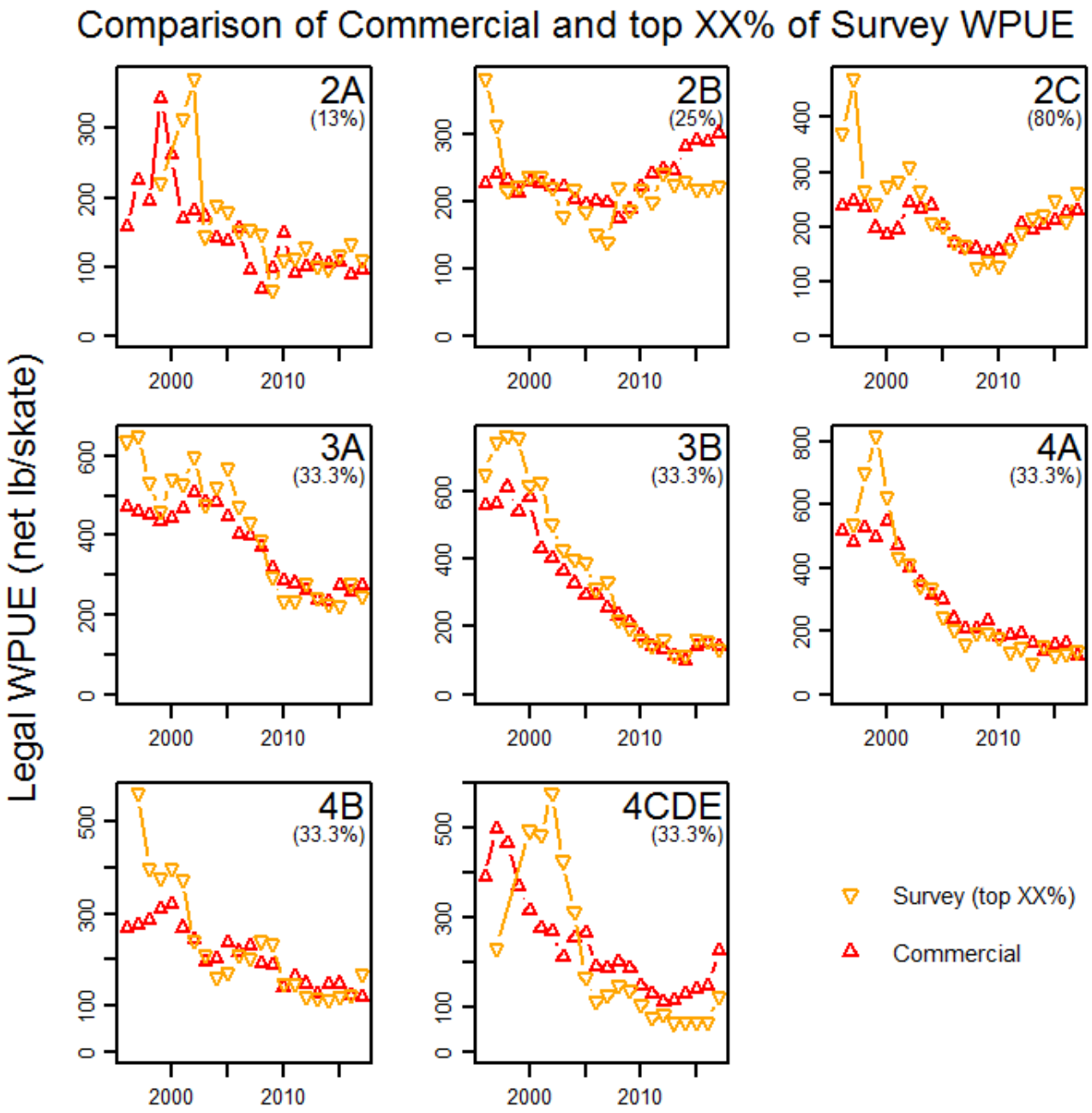

Figure 4. O32 WPUE for the commercial fishery versus setline survey filtered to the top XX%, 1997-2017.

A mortality rate of 16% was applied to all commercial fishery Pacific halibut discards since the beginning of individual quota fisheries (1991 in Canada, 1995 in Alaska). During the era of the derby fishery and for all years in IPHC Regulatory Area 2A, a 25% rate was applied (Gilroy 2007). The IPHC Regulatory Area 2A commercial catch numbers include the U32 estimates from the tribal and non-tribal commercial fisheries.

To estimate the pounds of U32 Pacific halibut captured in the commercial Pacific halibut fishery, the IPHC Regulatory Area specific U32:O32 ratio was multiplied by the estimated commercial catch in each regulatory area for each year. The resulting poundage was then multiplied by the discard mortality rate to obtain the estimated poundage of U32 Pacific halibut killed in the commercial fishery.

Discard mortality from lost or abandoned gear

Since the implementation of the quota share fisheries, lost gear is much less common. During the derby fishery of the 1980s and early 1990s in Alaska and B.C., extremely short fishing periods resulted in a competitive race to catch as many Pacific halibut as fast as possible, leading to a considerable quantity of longline gear being lost on the fishing grounds. Information on the amount of gear lost or abandoned by the Pacific halibut longline fishery was collected through logbook interviews or from fishing logs received via mail. Fishery-wide estimates were then extrapolated to total catch values using logbook catch and effort statistics.

Discard mortality for O32 Pacific halibut was calculated from the ratio of effective skates lost to effective skates hauled, multiplied by total landed catch. Effective skates are skates for which no data (skate length, hook spacing, number of hooks per skate) are missing and gear type meets the standardization criteria. The ratio was calculated using both fixed-hook and snap gear in all IPHC Regulatory Areas. The IPHC Regulatory Area 2A catch has always included the non-treaty directed commercial catch, treaty commercial catch, and, when open, incidental catch during the longline sablefish fishery. In addition, the quantity of U32 Pacific halibut captured by lost gear is also estimated using the method described above. All fish estimated to have been captured by lost gear are assumed to die. Discard mortality from lost gear was first calculated in 1985. The amount of gear lost varies by year and it is much lower since the inception of the quota share fisheries. In some instances, very few to no skates are reported lost, which was the case in IPHC Regulatory Areas 4C and 4E in 2016. The 2016 data are preliminary and it is expected that some gear was lost in those IPHC Regulatory Areas and when final log data are available the numbers will be updated. We will be reviewing the procedure for determining the mortality of Pacific halibut from the lost gear in the future.

Discard mortality for regulatory reasons

The directed commercial fisheries in IPHC Regulatory Area 2A are still managed using derby fishing seasons, in which the quantity of Pacific halibut for a vessel is limited by a fishing period limit. This results in catches that may exceed the vessel or trip limits, and therefore regulatory discards of O32 Pacific halibut, which are reported in the fishery logbooks. The ratio of discards to landings from the trips with logbook records available is used to estimate the O32 discards for all landings reported on fish tickets. In addition, the quantity of U32 Pacific halibut captured along with these discarded fish is estimated following the methods described above. The estimates for regulatory discards vary most likely due to the number of fishery openings, the number of vessels fishing, and the vessel trip limits. The IPHC Regulatory Area 2A incidental Pacific halibut retention fisheries during the salmon and sablefish fisheries are not included as they are accounted for under bycatch mortality estimates.

Discards from the quota share fisheries in Alaska and B.C. are not included at present; however, they are under review with the intent to include them in the future.

Total discard mortality in the commercial Pacific halibut fishery

Based on these methods, discard mortality in the commercial fishery for Pacific halibut is estimated to have been highest in the early 1980s, subsequently declined (particularly in IPHC Regulatory Area 3A in 1995 when the derby fishery was converted to a quota system), and then increased from 1995 to 2010 as the size-at-age of Pacific halibut declined and more fish at older ages remained below the minimum size limit. The estimates of discard mortality cannot be delineated within IPHC Regulatory Area 4 prior to 1981 (Table 1), but there is very little discard mortality estimated prior to that time. In addition, there is currently no direct accounting for whale depredation in this calculation.

Table 1. Discard mortality of Pacific halibut in the commercial halibut fishery since 1974 by IPHC Regulatory Area, in millions of pounds net weight.

	Regulatory Area											
Year	2A[a]	2B	2C	3A	3B	4	4A	4B	4C	4D	4E	Total
1974	0.002	0.081	0.042	0.061	0.013	0.002	NA	NA	NA	NA	NA	0.201
1975	0.004	0.143	0.048	0.091	0.021	0.002	NA	NA	NA	NA	NA	0.309
1976	0.002	0.164	0.044	0.107	0.025	0.002	NA	NA	NA	NA	NA	0.344
1977	0.002	0.135	0.026	0.093	0.032	0.004	NA	NA	NA	NA	NA	0.292
1978	0.001	0.113	0.036	0.115	0.014	0.004	NA	NA	NA	NA	NA	0.283
1979	0.001	0.119	0.039	0.130	0.004	0.004	NA	NA	NA	NA	NA	0.297
1980	0.000	0.136	0.029	0.132	0.003	0.002	NA	NA	NA	NA	NA	0.302
1981	0.002	0.152	0.036	0.147	0.006	NA	0.004	0.002	0.002	0.000	0.000	0.351
1982	0.002	0.163	0.033	0.124	0.067	NA	0.010	0.000	0.002	0.000	0.000	0.401
1983	0.003	0.192	0.064	0.117	0.114	NA	0.023	0.009	0.004	0.000	0.000	0.526
1984	0.005	0.363	0.065	0.162	0.104	NA	0.010	0.008	0.006	0.001	0.000	0.724
1985	0.011	0.542	0.344	1.213	0.398	NA	0.082	0.056	0.031	0.028	0.001	2.705
1986	0.016	0.695	0.606	2.374	0.591	NA	0.231	0.016	0.048	0.077	0.002	4.657
1987	0.014	0.686	0.543	2.105	0.513	NA	0.188	0.071	0.047	0.031	0.005	4.204
1988	0.007	0.557	0.384	2.158	0.267	NA	0.052	0.039	0.019	0.009	0.000	3.493
1989	0.020	0.443	0.352	2.102	0.366	NA	0.041	0.098	0.024	0.022	0.000	3.469
1990	0.038	0.437	0.508	1.693	0.414	NA	0.148	0.073	0.033	0.052	0.004	3.401
1991	0.008	0.238	0.520	1.666	0.711	NA	0.127	0.080	0.040	0.070	0.005	3.466
1992	0.020	0.220	0.436	1.230	0.388	NA	0.090	0.072	0.028	0.018	0.002	2.504
1993	0.033	0.320	0.411	0.854	0.248	NA	0.084	0.059	0.028	0.019	0.002	2.058
1994	0.010	0.271	0.442	1.477	0.134	NA	0.064	0.065	0.026	0.018	0.004	2.512
1995	0.008	0.228	0.156	0.420	0.058	NA	0.024	0.022	0.009	0.004	0.002	0.932
1996	0.010	0.211	0.175	0.535	0.083	NA	0.043	0.042	0.024	0.025	0.005	1.152
1997	0.013	0.291	0.185	0.529	0.246	NA	0.057	0.049	0.033	0.033	0.007	1.445
1998	0.019	0.329	0.229	0.676	0.289	NA	0.068	0.052	0.025	0.026	0.004	1.716
1999	0.018	0.321	0.232	0.546	0.322	NA	0.067	0.074	0.029	0.031	0.004	1.644
2000	0.024	0.190	0.197	0.475	0.384	NA	0.092	0.059	0.013	0.014	0.003	1.452
2001	0.024	0.245	0.229	0.456	0.481	NA	0.132	0.076	0.018	0.020	0.005	1.688
2002	0.022	0.204	0.174	0.646	0.515	NA	0.103	0.036	0.008	0.011	0.003	1.722
2003	0.043	0.344	0.201	0.676	0.646	NA	0.105	0.042	0.008	0.016	0.004	2.085
2004	0.016	0.311	0.367	0.758	0.716	NA	0.078	0.034	0.009	0.016	0.003	2.309
2005	0.039	0.335	0.344	0.724	0.572	NA	0.139	0.018	0.007	0.034	0.005	2.218
2006	0.050	0.605	0.443	0.741	0.476	NA	0.102	0.013	0.009	0.044	0.007	2.491
2007	0.040	0.529	0.381	0.966	0.454	NA	0.135	0.023	0.011	0.053	0.012	2.604
2008	0.044	0.454	0.295	1.004	0.676	NA	0.149	0.025	0.021	0.073	0.017	2.757
2009	0.052	0.354	0.304	1.175	0.796	NA	0.157	0.018	0.018	0.060	0.012	2.946
2010	0.027	0.302	0.261	1.450	0.903	NA	0.138	0.037	0.023	0.061	0.011	3.214
2011	0.025	0.283	0.083	0.930	0.770	NA	0.144	0.043	0.044	0.121	0.026	2.468
2012	0.025	0.220	0.095	0.593	0.526	NA	0.095	0.038	0.018	0.045	0.012	1.667
2013	0.025	0.211	0.110	0.519	0.404	NA	0.070	0.035	0.016	0.030	0.010	1.432
2014	0.021	0.250	0.119	0.443	0.326	NA	0.035	0.056	0.016	0.030	0.006	1.302
2015	0.031	0.238	0.121	0.521	0.215	NA	0.079	0.036	0.017	0.031	0.004	1.293
2016	0.037	0.229	0.123	0.378	0.232	NA	0.054	0.060	0.016	0.044	0.005	1.177
2017	0.019	0.175	0.087	0.347	0.234	NA	0.067	0.031	0.009	0.016	0.003	0.989

[a] Regulatory Area 2A includes O32 regulatory discards.

Additional data sources

We do not currently utilize the North Pacific Observer Program's (NPOP) growing data set on discards (reference the NPOP's annual report) in the directed Pacific halibut fishery due to the very low coverage rates, the lack of coverage on vessels less than 40 feet, and the lack of a conversion from numbers to weight for discarded Pacific halibut. However, it is anticipated that stratification by depth, gear, and other fishing characteristics could improve the representativeness of these data for estimating Pacific halibut discard in the future, and we plan to explore using these data in the near future.

Ongoing and future research on discard mortality rates may be helpful to refine the current rates used in this analysis. (Planas and IPHC Staff 2017).

References

Gilroy, H. L. 2007. Wastage in the 2006 Pacific halibut fishery. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2006: 55-58.

Gilroy, H. L. and Clark, W. G. 2008. Re-estimation of sublegal discard mortality in the halibut fishery. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2007: 69-73.

Planas, J. V. and IPHC Staff. 2017. 2017 IPHC Biological and Ecosystem Science Research Plan. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2016. IPHC-2016- RARA-26-R: 10-24

Williams, G. H. 2016. A reexamination of halibut bycatch in Alaska state-managed shellfish fisheries. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2015: 361-380.

Appendix II:

Additional background information on
bycatch mortality of Pacific halibut in other fisheries

Pacific halibut bycatch limits

The North Pacific Fishery Management Council adopts Pacific halibut bycatch mortality limits for the Alaskan groundfish fisheries during its annual specification process in the fall of the preceding year. Currently, the limits are set by management area: the Gulf of Alaska (GOA) (Figure 1) and Bering Sea and Aleutian Islands (BSAI) (Figure 2). The limits, also called Prohibited Species Catch (PSC) limits, are fixed in regulation and can only be changed through a formal amendment, which can take up to a year. For both regions, regulations allow the North Pacific Fishery Management Council to apportion the trawl and fixed-gear limits into seasonal amounts and by fishery, to enable the groundfish fisheries to maximize their groundfish catch within the specified limits. A history of the Pacific halibut bycatch limits for both regions is in Table 12 of the main body of this paper (IPHC-2018-AM094-05).

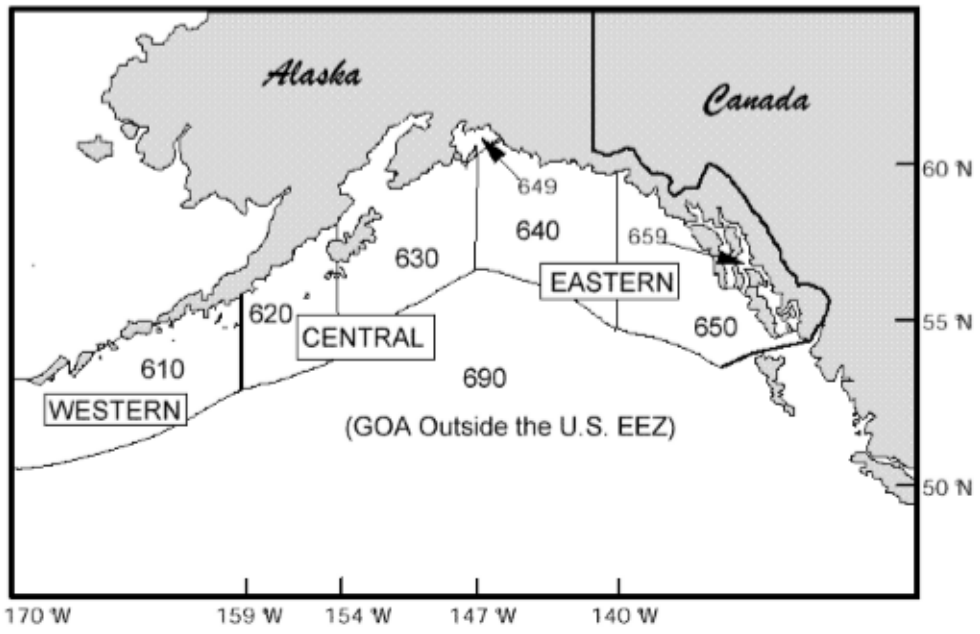

Figure 1. NMFS statistical and management areas for the Gulf of Alaska.

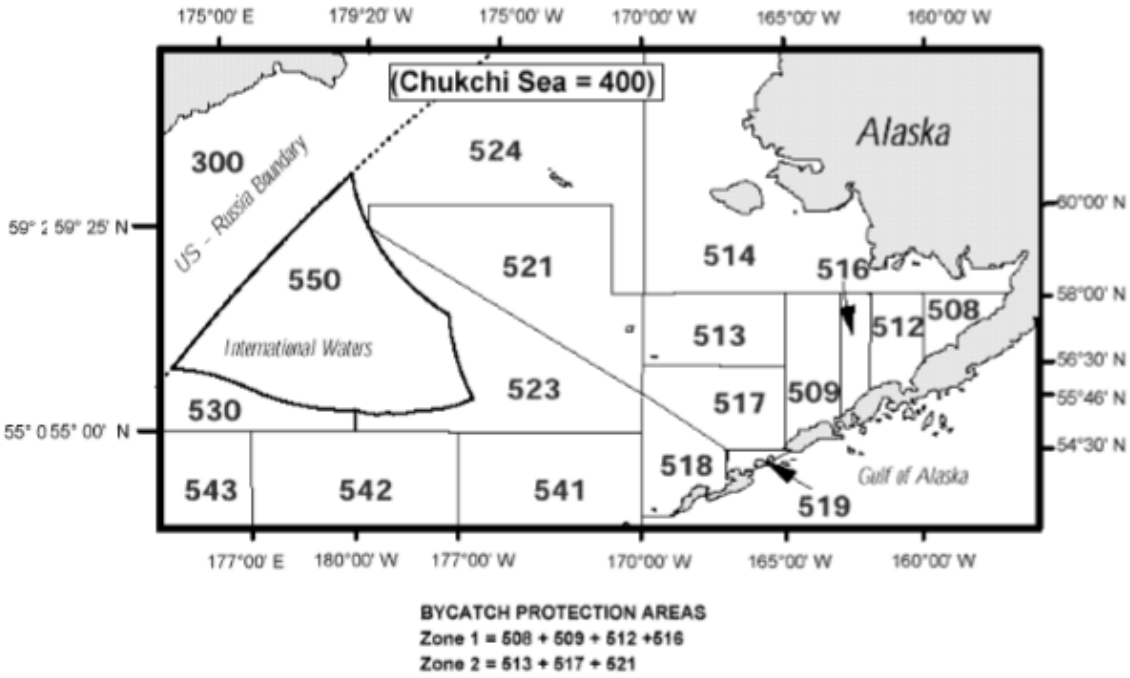

Figure 2. NMFS statistical and management areas for the Bering Sea/Aleutian Islands.

Gulf of Alaska

The final year of a phased three-year reduction in GOA bycatch limits occurred in 2016. The reduction for the trawl sector was implemented through a 7% reduction in 2014, an additional 5% in 2015 (to 12%), and finally 3% for 2016, thereby totaling 15% across three years. The reductions resulted in new trawl fishery limits of 1,848 t in 2014, 1,759 t in 2015, and 1,706 t in 2016 and beyond for all trawl vessels. For the hook-and-line fleet, the reduction varied by vessel type. The bycatch limit for the hook-and-line catcher/processor (CP) fleet was reduced 7%, which was implemented as one step in 2014. The hook-and-line catcher vessel (CV) bycatch limit was reduced by 15%, on the same 3-year reduction schedule as the trawl sector. The trawl limit was divided by season for shallow water and deep water fisheries, as has been the practice since 1991.

Bycatch management in the GOA fisheries was similar to previous years in that limits were assigned to specific sectors. The bycatch limit was set at 266 t round weight (0.44 million pounds net weight) for all fixed-gear fisheries and at 1,706 t round weight (282 million pounds net weight) for all trawl gear fisheries. The fixed-gear fisheries target primarily Pacific cod in the central and western GOA during the winter and rockfish in the eastern GOA in the spring. The fixed-gear limit is divided between the catcher vessel (CV) and catcher-processor (CP) sectors; the sector limits are further divided seasonally. All pot and jig gear fisheries, as well as the sablefish IFQ fishery, were exempted from the bycatch limits.

Several programs exist in the GOA for which the North Pacific Fishery Management Council has allocated specific Pacific halibut bycatch limits from the overall limit. The Central GOA Rockfish Program (CGOARP) isolates fishing for certain rockfish species from other fisheries within the

fishery management system. Fishery cooperatives ("co-ops") are formed under the program, and a portion of the overall rockfish quotas and Pacific halibut bycatch limit are specified for the program.

Another program for Pacific halibut bycatch management in the GOA applies to vessels that participate in the fishery co-ops in the BSAI. Briefly, the BSAI Plan Amendment 80 (A80) permits vessels to form fishery co-ops, which allows for a more efficient prosecution of their fisheries. Although A80 does not require vessels to join a co-op, all eligible A80 vessels belonged to one of the two co-ops.

The final apportionment of Pacific halibut bycatch in the GOA is a result of the 1998 American Fisheries Act (AFA). The AFA specified that certain trawl CP vessels fishing for pollock in the BSAI were prohibited from fishing for certain other groundfish species in the GOA. The AFA also specified limits on the amounts of other non-pollock groundfish species those vessels were allowed to catch; these limits are also termed sideboards.

Bering Sea/Aleutian Islands

The Pacific halibut bycatch mortality limits for the BSAI trawl and fixed-gear fisheries totaled 3,515 t round weight (5.8 million pounds net).

The BSAI fixed-gear fisheries were allocated a total bycatch limit of 710 t (1.17 million pounds net weight), with 7.5% reassigned to CDQ fisheries, leaving 657 t round weight (1.09 million pounds net weight). This was divided between the hook-and-line fishery for Pacific cod and all other fixed-gear fisheries. The Pacific cod fishery bycatch limit was further divided between CPs and CVs. All pot and jig fisheries were exempted from Pacific halibut mortality closures. The sablefish IFQ hook-and-line fishery was also exempted from the bycatch limit.

The trawl fishery bycatch mortality limit was 2,805 t round weight (4.64 million pounds net weight). By regulation, a fixed amount of 315 t round weight (0.52 million pounds net weight) is reallocated to CDQ fisheries (gear-nonspecific), leaving 2,490 t round weight (4.12 million pounds net weight) for all remaining trawl fisheries. A80 separated the trawl fleet into an A80 sector and a Limited Access sector. The latter group includes the pollock co-ops created by the AFA. Within the A80 fleet, the bycatch limit was assigned to the Alaska Seafood Cooperative and the Alaska Groundfish Cooperative.

In addition, the North Pacific Fishery Management Council created bycatch limit sideboards for the AFA vessels which apply to these vessels when they fish in non-AFA fisheries, i.e., any target species other than pollock.

Discard mortality rates and assumptions

Discard mortality rates (DMRs), used to determine the fraction of the estimated bycatch that dies, vary by fishery and IPHC Regulatory Area. Where observers are used for fishery monitoring, DMRs are calculated from data collected on the release viability or injury of Pacific halibut. For IPHC Regulatory Areas without observers, assumed DMRs are used, which are based on the similarity of fisheries to those in other areas where data are available. The mortality models used to calculate these rates have been presented by Clark et al. (1993) and Williams (1997).

Observer data are used to calculate DMRs in fisheries in three major IPHC Regulatory Areas. In IPHC Regulatory Areas 2A and 2B, observers deployed on the bottom trawl vessels examine each Pacific halibut to determine release viability. The bycatch mortality reported to IPHC incorporates these release viability observations. Data to determine DMRs for some fisheries are not available. Therefore, assumptions are made on likely DMRs based on similar fisheries with known DMRs. For the U.S. west coast, NMFS uses a DMR of 16% for the sablefish hook-and-line fishery, based on an analysis of observer data from the sablefish fishery off Alaska prior to the implementation of IFQ in 1995. The DMR for pot fisheries is assumed to be 18%. Bycatch mortality in the CP midwater fishery for Pacific hake is based on a 100% DMR.

NMFS manages the groundfish fisheries off Alaska according to a schedule of DMRs developed during the North Pacific Fishery Management Council NMannual specification process (based on recent years' realized fishery specific DMRs obtained from observer data).

References

Clark, W. G., Hoag, S. H., Trumble, R. J., and Williams, G. H. 1993. Re-estimation of survival for trawl caught halibut released in different condition factors. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 1992: 197-206.

Williams, G. H. 1997. Pacific halibut discard mortality rates in the 1990-1995 Alaskan groundfish fisheries, with recommendations for monitoring in 1997. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 1997: 211-227.