

Wastage of halibut in the commercial halibut fishery

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Abstract

Wastage in the commercial Pacific halibut fishery includes the mortality of legal-sized (32 inches and over, or O32) halibut killed by lost or abandoned longline gear and a proportion of the sublegal-sized (under 32 inches, or U32) halibut that must be released by regulation but subsequently die. Information on lost gear is collected through logbook interviews and fishing logs received by mail. The ratio of U32 to O32 halibut is determined from the International Pacific Halibut Commission stock assessment survey. Halibut wastage estimates of O32 (1985-2011) and U32 (1974-2011) from the commercial halibut fishery are presented. Wastage mortality of U32 halibut is further subdivided (1996 – 2011) into estimates for halibut between 26 and 32 inches and those under 26 inches.

Overview

The removals of Pacific halibut accounted for in the International Pacific Halibut Commission (IPHC) stock assessment include commercial and sport catch, personal use (ceremonial and subsistence), bycatch, and wastage. Commercial fishery wastage includes a proportion of the halibut smaller than the commercial minimum size (≤ 81.3 cm or < 32 inches) that must be released by regulation but subsequently die, and O32 halibut that die from lost or abandoned gear. Prior to 1997, wastage from the mortality of O32 and U32 (> 81.3 cm or ≤ 32 inches) halibut was deducted prior to calculating the fishery constant exploitation yield (CEY). From 1997 through 2009, only commercial fishery wastage from O32 halibut was deducted and the estimated mortality of discarded U32 halibut was accounted for when setting exploitation rates instead of being treated as a direct removal. Starting in 2010, for the IPHC staff catch limits recommendations, wastage mortality of O32 halibut and halibut between 26-32 inches were directly deducted to determine the fishery CEY and the mortality of halibut under 26 inches was accounted for when setting exploitation rates. The modification was to standardize the treatment of removals given that sport and personal use fishery removals, including halibut down to 26 inches, are directly deducted when setting catch limits.

Wastage can also occur if more gear is set than is needed to obtain fishing period limits in Area 2A, individual vessel quota (IVQ) in Area 2B, and individual fishing quota (IFQ) and community development quota (CDQ) in the Alaskan regulatory areas. Wastage occurs when the halibut above these limits are discarded and die. In addition, halibut may occasionally be discarded at sea due to poor fish quality, which can result from sand flea (Gammarid amphipod), shark, or other predators. The amount of O32 halibut caught in excess of quota, or catch limits, and discarded at sea is recorded during logbook interviews; however, this mortality is not currently included in the wastage removal.

Wastage from lost or abandoned gear

Information on the amount of gear lost or abandoned in the 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 from standardized gear. Gear types varied considerably as to the length of skates, hook size, and hook spacing but the data were standardized. Some log data could not be standardized because there were missing data or because the gear-type was assumed to fish differently than “standard” gear. With the concurrent halibut and sablefish (*Anoplopoma fimbria*) IFQ fisheries in Alaska there are directed halibut trips as well as trips which target sablefish and land incidentally-caught halibut. Sablefish gear (small hooks and short gangion/hook spacing) is considered a non-standard halibut gear that fishes differently, and therefore was not included in the calculations of wastage reported here.

Wastage was calculated from the ratio of effective skates lost to effective skates hauled, multiplied by total catch. Effective skates are skates where no data (skate length, hook spacing, number of hooks per skate) are missing and met the standardization criteria. The ratio was calculated using both fixed-hook and snap gear in all areas. Prior to 1998 the gear-standardization process described above was not conducted. Rather, the gear type used for the wastage calculation was the gear type used to calculate catch per unit effort (fixed hook gear was used in Alaska and a combination of fixed hook and snap gear was used in B.C. and Area 2A). The 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. Wastage from lost or abandoned gear was first calculated in 1985 and the wastage estimates by regulatory area are provided in Table 1. The 2011 data are preliminary and the 2010 data were recalculated using the final catch figures.

The 2011 ratios of effective skates lost to effective skates hauled by regulatory area were as follows: Areas 2A = 0.008; Area 2B = 0.003; Area 2C = 0.002; Area 3A = 0.002; Area 3B = 0.001; ratios within Regulatory Area 4 ranged from 0.002-0.007. Since the implementation of the quota share fisheries in 1995, the ratios have fluctuated slightly between years, but have remained lower than they were during the derby fisheries.

Wastage from discard mortality of sublegal-sized or U32 halibut

In 2007, U32 halibut mortality was re-estimated for all years back to 1974 using catch per skate data from IPHC standard stock assessment survey (SSA) stations that ranked in the top third for catch (by weight) in each regulatory area, on the assumption that the stations with higher catch rates would better represent commercial catches (Gilroy and Clark 2008). To confirm that the method is appropriate the top one-third of the survey stations were selected and the average weight per unit effort (WPUE) for those stations were compared to the commercial WPUE for the period of 2001-2011 (Figure 1). The magnitude and correlation of the commercial and top-third survey WPUEs was strong in Areas 3 and 4, and has been closer in the last four years in Area 2C. Exceptions were in Areas 2A and 2B, where the Area 2A commercial WPUE was approximately double the top one-third survey station WPUE; with the trend similar until 2011. These results generally support the use of the top one-third survey stations as a proxy for commercial catch rates for the purpose of estimating U32 wastage mortality; however, Areas 2A and 2B options should be further investigated.

The SSA survey ratio of U32 to O32 halibut is needed to estimate U32 halibut catch by the commercial fleet. For 2011, the average of the last three year's SSA survey ratios was used. This is less variable than a ratio based on only current year's data.

A mortality rate of 16% was applied to all discards in years since the beginning of individual quota fisheries (1991 in Canada, 1995 in Alaska). For the earlier years of derby fishing, and for all years in Area 2A, a 25% rate was applied (Gilroy 2007). The Area 2A commercial catch numbers used include the catch from the directed commercial fishery (and when open, the incidental halibut fishery during the sablefish season), but did not include catch from either the tribal fishery (because U32 halibut are accounted for as part of the ceremonial and subsistence fishery), or from the incidental halibut during the salmon fishery (because it is incidental to a troll fishery).

To estimate the pounds of U32 halibut captured in the commercial halibut fishery, the 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 halibut killed in the commercial fishery (Table 2).

As noted above, the mortality of U32 halibut needed to be further subdivided to standardize the treatment of halibut between the sizes of 26 and 32 inches (U32/O26) in the determination of catch limits. Estimates of the relative amounts of mortality require size-distribution data from the SSA survey; thus, the subdivision only dates back to 1996. Table 3 provides estimates of halibut mortality of halibut U26 and U32/O26 for 1996 – 2011.

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.

Table 1. Estimates of legal-sized, or O32, Pacific halibut, in thousands of pounds (net weight), killed by lost or abandoned longline gear in the commercial halibut fishery, by IPHC Regulatory Area, 1985 -2011.

Year	Regulatory Area						Total
	2A	2B	2C	3A	3B	4	
1985	n/a	n/a	n/a	n/a	n/a	n/a	1,600
1986	n/a	n/a	n/a	n/a	n/a	n/a	3,200
1987	3	173	368	1,580	341	257	2,722
1988	<1	49	206	1,506	122	69	1,952
1989	7	46	193	1,458	194	130	2,029
1990	15	117	327	1,110	216	238	2,023
1991	2	72	347	1,143	418	245	2,227
1992	7	53	245	643	181	126	1,255
1993	9	96	192	341	63	113	814
1994	1	69	228	845	39	107	1,289
1995	3	39	54	128	9	24	257
1996	1	29	44	177	22	74	347
1997	6	37	40	74	54	79	290
1998	1	53	41	154	56	54	359
1999	7	40	67	117	71	93	395
2000	7	28	38	59	58	69	257
2001	3	46	37	65	32	88	246
2002	5	36	26	139	34	51	290
2003	2	35	25	68	35	49	214
2004	0	36	31	76	15	40	199
2005	5	37	32	156	26	31	287
2006	2	36	21	51	11	18	139
2007	3	29	29	53	18	24	152
2008	<1	22	12	61	4	33	133
2009	1	20	10	44	21	34	131
2010	1	27	9	21	20	27	105
2011 ¹	4	20	5	29	7	34	99

¹ Preliminary as of Nov 14, 2011.

Table 2. Estimated sublegal, or U32, halibut discard mortality in thousands of net pounds, killed in the commercial halibut fishery, by IPHC regulatory area and year, 1974-2011.

Year	Regulatory Area											Total
	2A	2B	2C	3A	3B	4	4A	4B	4C	4D	4E	
1974	2	81	42	61	13	2	NA	NA	NA	NA	NA	2
1975	4	143	48	91	21	2	NA	NA	NA	NA	NA	309
1976	2	164	44	107	25	2	NA	NA	NA	NA	NA	344
1977	2	135	26	93	32	4	NA	NA	NA	NA	NA	291
1978	1	113	36	115	14	4	NA	NA	NA	NA	NA	284
1979	1	119	39	130	4	4	NA	NA	NA	NA	NA	297
1980	0	136	29	132	3	2	NA	NA	NA	NA	NA	302
1981	2	152	36	147	6	NA	4	2	2	0	0	352
1982	2	163	33	124	67	NA	10	0	2	0	0	402
1983	3	192	64	117	114	NA	23	9	4	0	0	527
1984	5	363	65	162	104	NA	10	8	6	1	0	724
1985	6	431	109	194	179	NA	17	10	6	1	0	953
1986	7	474	134	338	152	NA	36	2	7	3	0	1,153
1987	7	498	142	373	140	NA	41	13	10	2	1	1,227
1988	5	504	160	507	133	NA	22	15	8	1	0	1,355
1989	4	393	142	503	154	NA	12	26	7	2	0	1,243
1990	3	310	152	476	177	NA	31	13	7	3	1	1,173
1991	3	160	142	413	253	NA	29	16	9	4	1	1,030
1992	4	162	169	525	190	NA	36	26	11	2	1	1,126
1993	5	216	202	480	179	NA	35	23	11	2	1	1,154
1994	2	196	194	559	91	NA	26	24	10	2	2	1,106
1995	2	186	97	282	49	NA	15	13	6	1	1	652
1996	2	184	115	323	59	NA	16	17	7	1	1	725
1997	2	248	136	426	161	NA	29	29	11	2	3	1,047
1998	2	275	147	473	218	NA	39	25	14	3	2	1,198
1999	3	276	154	491	296	NA	55	31	22	4	3	1,335
2000	3	240	135	393	370	NA	72	41	24	4	5	1,287
2001	5	236	143	459	443	NA	80	38	26	6	8	1,444
2002	9	286	155	516	528	NA	92	32	22	8	10	1,658
2003	9	302	165	530	593	NA	104	29	18	11	9	1,770
2004	11	343	225	612	597	NA	85	18	23	12	8	1,934
2005	13	388	260	659	558	NA	93	12	15	22	10	2,030
2006	14	410	283	667	511	NA	101	9	15	25	11	2,046
2007	16	438	267	918	423	NA	132	18	32	32	10	2,286
2008	15	262	212	924	681	NA	133	19	17	60	14	2,337
2009	15	231	262	1,118	773	NA	139	12	14	50	10	2,624
2010	7	233	242	1,417	887	NA	138	32	20	52	10	3,038
2011	6	177	65	881	752	NA	127	33	40	109	23	2,213

Table 3. Estimated U26 and U32/O26 halibut discard mortality in thousands of net pounds, killed in the commercial halibut fishery, by IPHC regulatory area and year, 1996-2011.

Year	Regulatory Area (U26 wastage mortality)								Total
	2A	2B	2C	3A	3B	4A	4B	4CDE	
1996	0	4	7	9	3	1	1	0	25
1997	0	6	4	11	6	1	1	1	29
1998	0	3	4	9	6	1	1	1	26
1999	0	4	4	13	11	2	2	1	37
2000	0	3	6	9	14	3	3	1	39
2001	0	3	6	14	16	5	2	3	48
2002	0	6	5	16	25	10	1	2	65
2003	0	8	4	16	32	8	2	1	71
2004	0	17	10	17	38	10	1	1	95
2005	0	16	15	25	38	8	1	4	107
2006	0	17	22	33	43	14	1	5	136
2007	0	17	12	39	42	18	2	5	134
2008	0	7	11	33	74	20	1	5	1,517
2009	0	5	12	46	67	19	1	6	155
2010	0	4	9	48	80	20	2	6	169
2011	0	4	4	41	74	18	4	17	162

Year	Regulatory Area (U32/O26 wastage mortality)								Total
	2A	2B	2C	3A	3B	4A	4B	4CDE	
1996	2	180	108	314	56	15	16	9	700
1997	2	242	132	415	155	28	28	15	1,018
1998	2	272	143	464	211	38	24	18	1,172
1999	3	272	150	478	285	53	29	28	1,298
2000	3	237	129	384	356	69	38	32	1,248
2001	5	233	137	445	427	75	36	37	1,396
2002	9	280	150	500	503	82	31	38	1,593
2003	9	294	161	514	561	96	27	37	1,699
2004	11	326	215	595	559	75	17	42	1,839
2005	13	372	245	634	520	85	11	43	1,923
2006	14	393	261	634	468	87	8	46	1,910
2007	16	421	255	879	381	114	16	69	2,152
2008	15	255	202	891	607	113	18	86	2,186
2009	15	226	250	1,072	706	120	11	68	2,469
2010	7	229	233	1,369	807	118	30	76	2,869
2011	6	173	61	840	678	109	29	155	2,052

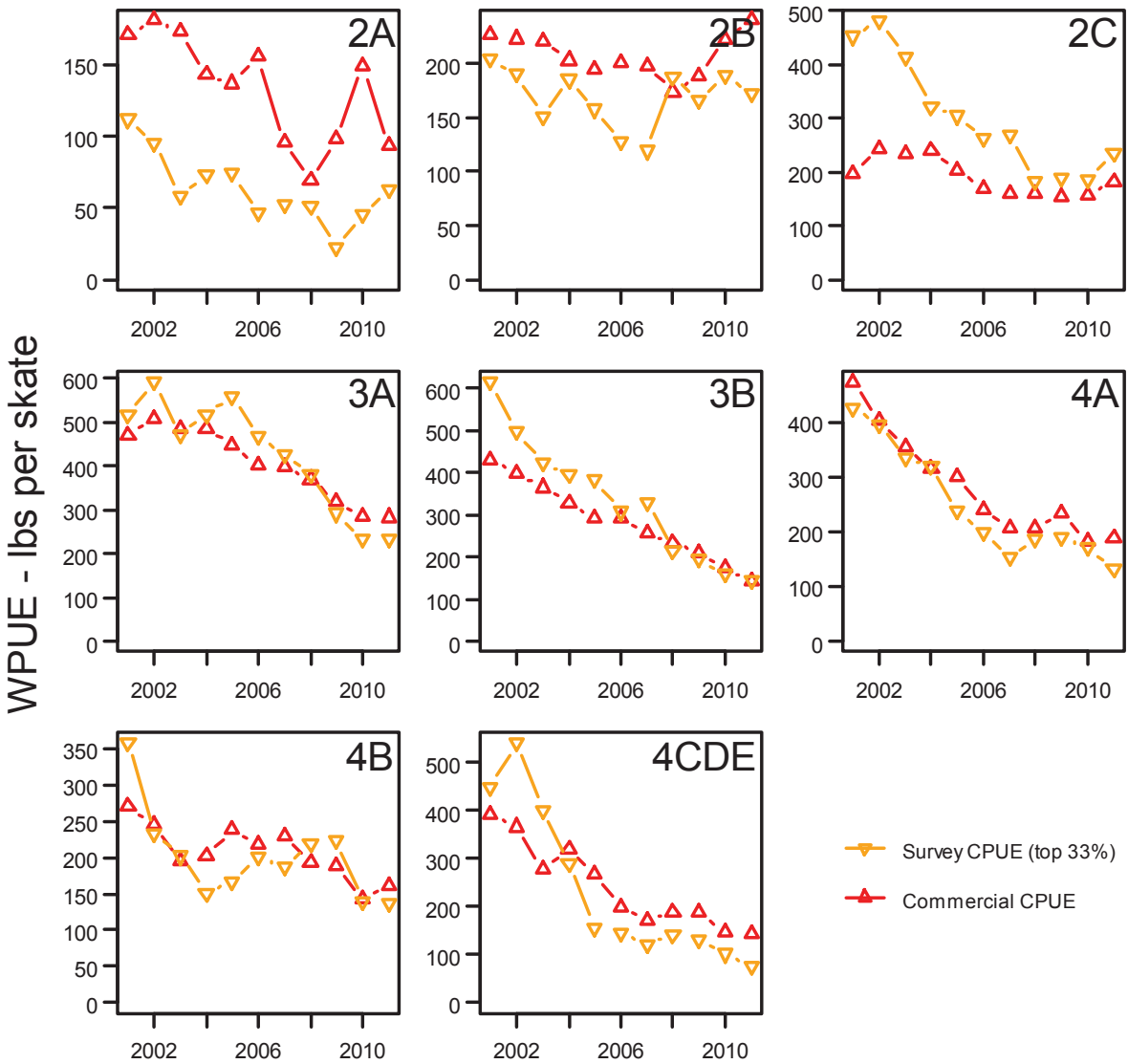


Figure 1. Comparison of commercial WPUE and top 1/3rd survey stations.

