Bycatch

Incidental catch and mortality of Pacific halibut, 1962-2005

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Abstract

Estimates of the bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) in 2005 totaled 12.08 million pounds (net weight), a decrease from 2004 and the lowest seen since 1987. Bycatch mortality decreased in Areas 3 and 4, and increased slightly in Area 2, compared to 2004. Changes in fishery scheduling, closure of some Alaskan fishing grounds to protect Steller sea lions, and lower halibut bycatch rates in certain fisheries resulted in lower halibut bycatch off Alaska. The closure of areas off Oregon and Washington to bottom trawling reduced bycatch mortality in that area, in contrast to increased trawl effort for arrowtooth flounder off B.C. which increased bycatch mortality in that area.

Introduction

Fisheries targeting on other fish and shellfish inadvertently catch Pacific halibut (*Hippoglossus stenolepis*). Information collected by at-sea observers has indicated the incidental catch, or bycatch, is substantial. Regulations require that halibut be returned to the sea with no additional injury. However, some fish do die from being caught and handled. The preliminary estimate of bycatch mortality (i.e., those fish that die) in 2005 is 12.08 million pounds, a decrease from 2004 and the lowest seen since 1987. This document provides an overview of areas and fisheries which contributed to halibut bycatch mortality in 2005.

Sources of bycatch information and estimates

For most fisheries, the International Pacific Halibut Commission (IPHC) relies upon information supplied by observer programs for bycatch estimates. Research survey information is used to generate estimates of bycatch in the few cases where fishery observations are unavailable. The U.S. National Marine Fisheries Service (NMFS) oversees observer programs covering the groundfish fisheries off Alaska and the U.S. west coast, and provides IPHC with estimates of bycatch. Estimates of bycatch off Alaska for 2005 were based on bycatch reported from fishing conducted through mid-November and projections for fishing for the remainder of the year.

Estimates of bycatch mortality in crab pot and shrimp trawl fisheries off Alaska have been made by IPHC staff from previous studies and are based on bycatch rates observed on research surveys because direct fishery observations are lacking.

The amount of information varies for fisheries conducted off British Columbia. For the trawl fishery, bycatch is managed with an individual bycatch quota program instituted in 1996 by Canada's Department of Fisheries and Oceans (DFO). Fishery observers sample the catch on each bottom trawler, collecting data to estimate bycatch. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish hook-&-line fisheries, is largely unknown but is believed to be relatively low, particularly for the shrimp trawl fishery (Boutillier et al. 1999).

Halibut bycatch in the domestic groundfish trawl fishery operating in Area 2A is estimated from information collected by at-sea observers. Bycatch rates (number per hour) are derived from

the observer data, and applied to commercial fishery effort from logbooks (Wallace and Methot 2001). Most recent estimates have been provided by Wallace and Hastie (2005). Shrimp trawl fishery bycatch estimates are provided by Oregon Department of Fish and Wildlife (ODFW) staff from examinations of halibut bycatch during gear experiments. The estimates are considered rough approximations given the limited amount of data available, but appear reasonable and are updated every few years. Bycatch in the hook-&-line fishery has been determined through comparisons with the Alaskan sablefish fishery (Williams et al. 1998).

Discard mortality rates and assumptions

Discard mortality rates (DMRs), used to determine the fraction of the estimated bycatch that dies, vary by fishery and area. Where observers are used for fishery sampling, DMRs are calculated from data collected on the release viability or injury of halibut. For 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. (1992) and Williams (1997).

Observer data are used to estimate DMRs in fisheries in two major areas. NMFS manages the groundfish fisheries off Alaska according to a schedule of DMRs; the 2005 schedule is summarized in Table 1. DMRs for previous years can be found in Williams and Chen (this volume). In Area 2B, observers monitoring the Canadian trawl fishery examine each halibut to determine survival.

Data to determine DMRs for other fisheries are not available, so assumptions are made on likely DMRs based on similar fisheries where DMRs are known. For Area 2A, the domestic groundfish trawl and shrimp trawls are assumed to have a 50% mortality rate, whereas the unobserved hook-&-line fishery for sablefish is assigned an assumed DMR of 25%. The midwater fishery for whiting is assumed to have a 75% rate, based on the large catches of whiting typical of this type of fishery.

Bycatch mortality by regulatory area

Halibut bycatch mortality was relatively small until the 1960s, when it increased rapidly due to the sudden development of the foreign trawl fisheries off the North American coast. The total bycatch mortality (excluding the Japanese directed fishery in the eastern and western Bering Sea) peaked in 1965 at about 21 million pounds (Fig. 1). Bycatch mortality declined during the late 1960s, but increased to about 20 million pounds in the early 1970s. During the late 1970s and early 1980s, it dropped to roughly 13 million pounds, as foreign fishing off Alaska came under increasing control. By 1985, bycatch mortality had declined to 7.2 million pounds, the lowest level since the IPHC began its monitoring nearly 25 years earlier. Bycatch mortality increased in the late 1980s, due to the growth of the U.S. groundfish fishery off Alaska, and peaked at 20.3 million pounds in 1992. Bycatch mortality has since declined; preliminary estimates for 2005 total 12.08 million pounds, representing a slight 4% decrease from 2004 and a 40% decrease from the peak in 1992 of 20.3 million pounds. Most of the decrease is attributed to the introduction of Individual Fishing Quotas (IFQs) in the Alaskan sablefish fishery, the Careful Release program for the Alaskan hook-&-line fishery, and Individual Vessel Bycatch Quotas (IVBQs) in the Canadian trawl fishery.

Estimates of bycatch mortality by fishery and major IPHC regulatory area for 1996 through 2005 are shown in Table 2 and discussed in the following sections. Tables 3 through 5 provide

bycatch mortality estimates by various area groupings. Table 6 provides estimates of bycatch mortality in the federally-managed Alaskan groundfish fisheries.

Area 2

Bycatch mortality in Area 2 in 2005 was estimated at 0.98 million pounds, up about nine percent from 2004 but below the 10-year average of 1.26 million pounds recorded since 1996 (Table 2). The primary sources for bycatch mortality in Area 2 are the groundfish trawl fisheries in 2A and 2B, and the crab and shrimp fisheries in 2C. NMFS estimated halibut bycatch mortality for the 2004 west coast trawl fishery at 245,000 pounds, using observer data, which is a 47% decline from 2003. The drop is attributed to the movement of trawl effort to shallower water as a product of the closure of certain areas for rockfish conservation (Wallace and Hastie 2005). The 2004 estimate has been rolled over for 2005, but will be updated when an actual estimate for 2005 is obtained. Trawl fishery effort has been declining annually for the past few years in Area 2A and will likely decline even further in response to large-scale area closures instituted by the Pacific Fishery Management Council. These closures significantly affect trawl effort and the impact on bycatch is just now being seen. No new estimate is available for the shrimp trawl fishery, so the most recent estimate has been rolled forward to 2005.

In Area 2B, trawl fishery bycatch was estimated at 0.36 million pounds, an increase of 42 percent from the 0.25 million pounds estimated for 2004. The increase is a result of increased effort directed towards arrowtooth flounder in 2005. The 2005 estimate is significantly above the average of 0.24 million pounds which has occurred since the Individual Bycatch Quota program began in 1996.

In Area 2C, crab pot fishing and shrimp trawling occur in various locations and harvests have held steady over the years. These fisheries have not been reviewed since the early 1990s, but we are assuming mortality has been relatively unchanged since then.

Area 3

Bycatch mortality in Area 3 was estimated at 4.26 million pounds in 2005 (Table 2), a 14 percent decrease from 2004. The groundfish fishery continued to be affected by fishery closures inside sea lion critical habitat, which forced vessels to fish in less productive areas and ultimately reduced effort. Total allowable catches (TACs) for Pacific cod were lower in 2005, which helped to reduce halibut bycatches. Pot effort for cod continues to grow, with pots accounting for 41% of the 2004 cod harvest (trawls took 43% and 16% went to the longline fleet). The total 2004 Area 3 bycatch is well below the 10-year average of 4.5 million pounds.

Bycatch mortality decreased in both Areas 3A and 3B. In Area 3A, trawl mortality dropped from the abnormally high level seen in 2004 of 3.0 million pounds to 2.5 million pounds in 2005. The 2005 trawl fishery bycatch also declined in Area 3B but only by five percent.

Area 4

Bycatch mortality in Area 4 increased a modest 1.7 percent in 2005, to 6.85 million pounds. Since 2003, bycatch mortality has not varied very much, averaging roughly 6.8 million pounds annually. For 2005, total bycatch mortality was lower for Community Development Quota (CDQ) trawl and longline fisheries, and higher for the open access trawl fisheries than in 2004. The open access (non-CDQ) longline fishery bycatch was quite a bit below the halibut bycatch mortality limit in 2005, but the open access trawl fisheries took their entire bycatch limit. The 2005 quotas

for cod were lower than in past years. Halibut mortality in the pot fishery for cod dropped to 5,000 pounds, the lowest seen since the inception of pot fishing for cod in the early 1990s. The Community Development Quota (CDQ) fishery targeted primarily pollock and resulted in about 107,000 pounds of bycatch mortality, less than in 1999 when the CDQ fishery focused more on cod.

References

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Table 1. Preseason assumed discard mortality rates used by NMFS for monitoring halibut bycatch mortality in 2004-2006 in the Alaskan groundfish fisheries. From Williams and Chen (this volume).

Bering Sea/Aleutian Target Fishery	Used in 2004-2006	Gulf of Alaska Target Fishery	Used in 2004-2006
Trawls		***Trawls***	
Atka mackerel	81	Atka mackerel	57
Bottom trawl pollock	76	Bottom trawl pollock	61
Pacific cod	66	Pacific cod	63
Other flatfish	75	Deep water flatfish	56
Rockfish	64	Shallow water flatfish	69
Flathead sole	64	Rockfish	66
Other species	66	Flathead sole	57
Midwater pollock	87	Other species	66
Rock sole	79	Midwater pollock	75
Sablefish	23	Sablefish	71
Turbot	81	Arrowtooth flounder	55
Yellowfin sole	81	Rex sole	53
Pots		***Pots***	
Pacific cod	9	Pacific cod	14
Other species	9	Other species	14
Hook & Line		***Hook & Line***	
Pacific cod	11	Pacific cod	17
Rockfish	28	Rockfish	11
Other species	11	Other species	17
Turbot	20		

CDQ Target Fishery	Used in 2005
Trawl	
Atka mackerel	85
Bottom pollock	85
Flathead sole	90
Pelagic pollock	89
Rockfish	90
Yellowfin sole	82
Longline	
Pacific cod	11
Turbot	7
Pot	
Pacific cod	5
Sablefish	36

Table 2. Estimates (thousands of pounds, *net weight*) of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) by year, area, and fishery for 1996 through 2005. Estimates for 2005 are preliminary and subject to change as new information becomes available.

Region and Area	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
AREA 2A										
Groundfish Trawl	548	548	1,041	946	781	796	512	462	245	245
Shrimp Trawl	50	50	25	25	25	25	25	25	25	25
Hook & Line	16	16	16	16	16	16	16	16	16	16
Total	614	614	1,082	987	822	837	553	503	286	286
AREA 2B										
Domestic Trawl	299	215	213	193	230	177	244	244	251	356
Total	299	215	213	193	230	177	244	244	251	356
AREA 2C										
Crab Pot/Shrimp Trawl	303	303	303	303	303	303	303	303	303	303
Groundfish Trawl	2	46	4	1	0	0	0	0	0	0
Hook & Line (non-IFQ)	4	12	18	18	56	2	1	2	23	1
Hook & Line (IFQ)	3	3	3	3	3	3	3	3	3	3
Scallop Trawl	0	0	0	0	0	0	0	0	0	0
Chatham Str. Sablefish	8	8	8	8	8	8	8	8	8	8
Clarence Str. Sablefish	25	25	25	25	25	25	25	25	25	25
Total	345	397	361	358	395	341	340	341	362	340
AREA 2 Subtotal	**1,258**	**1,226**	**1,656**	**1,538**	**1,447**	**1,355**	**1,137**	**1,088**	**899**	**982**
AREA 3A										
Crab Pot/Shrimp Trawl	250	250	250	250	250	250	250	250	250	250
Groundfish Trawl	2,198	2,044	1,908	2,148	2,222	2,404	1,685	2,407	3,033	2,500
Hook & Line (non-IFQ)	159	534	360	317	281	203	128	389	244	218
Hook & Line (IFQ)	119	119	119	119	119	119	119	119	119	119
Groundfish Pot	7	8	15	41	10	23	2	5	15	33
Scallop Trawl	0	0	0	0	0	0	0	0	0	0
Pr Wm Sd Sablefish	10	10	10	10	10	10	10	10	10	10
Total	2,743	2,965	2,662	2,885	2,892	3,009	2,194	3,180	3,671	3,130
AREA 3B										
Crab Pot/Shrimp Trawl	50	50	50	50	50	50	50	50	50	50
Groundfish Trawl	1,690	1,201	1,130	1,184	1,194	1,320	1,508	1,341	866	825
Hook & Line (non-IFQ)	97	71	89	281	143	171	248	198	205	99
Hook & Line (IFQ)	116	116	116	116	116	116	116	116	116	116
Groundfish Pot	4	5	4	106	7	18	2	29	37	35
Total	1,957	1,443	1,389	1,737	1,510	1,675	1,924	1,734	1,274	1,125
AREA 3 Subtotal	**4,700**	**4,408**	**4,051**	**4,622**	**4,402**	**4,684**	**4,118**	**4,914**	**4,945**	**4,255**
AREA 4										
Crab Pot/Shrimp Trawl	300	300	300	300	300	300	300	300	300	300
Groundfish Trawl	6,582	5,947	5,795	5,972	5,379	5,322	5,591	5,589	5,499	5,620
Hook & Line (non-IFQ)	1,535	1,564	1,409	982	1,508	1,300	1,058	556	617	686
Hook & Line (IFQ)	60	60	60	60	60	60	60	60	60	60
Groundfish Pot	30	9	11	11	24	13	17	28	6	5
CDQ Trawl	-	-	150	187	64	57	131	187	176	107
CDQ Longline	-	-	-	172	106	68	116	102	77	69
Scallop Trawl	0	0	0	0	0	0	0	0	0	0
AREA 4 Subtotal	**8,507**	**7,880**	**7,725**	**7,684**	**7,441**	**7,120**	**7,273**	**6,822**	**6,735**	**6,847**
GRAND TOTAL	**14,465**	**13,514**	**13,432**	**13,844**	**13,290**	**13,159**	**12,528**	**12,824**	**12,579**	**12,084**

Table 3. Estimates (thousands of pounds, *net weight* and metric tons, *round weight*) of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) from all sources by IPHC regulatory area for 1962 through 2005. Estimates for 2005 are preliminary and subject to change as new information becomes available.

	Thousands of Pounds, net weight				*Metric Tons, round weight*			
Year	**Area 2**	**Area 3**	**Area 4**	**Total**	**Area 2**	**Area 3**	**Area 4**	**Total**
1962	1,383	3,083	4,143	8,609	834	1,860	2,499	5,192
1963	1,283	6,102	2,038	9,423	774	3,681	1,229	5,683
1964	1,310	11,639	2,965	15,914	790	7,020	1,788	9,599
1965	1,640	16,539	3,182	21,361	989	9,976	1,919	12,884
1966	1,879	12,495	3,400	17,774	1,133	7,537	2,051	10,721
1967	2,091	9,528	4,718	16,337	1,261	5,747	2,846	9,854
1968	2,478	7,053	5,685	15,216	1,495	4,254	3,429	9,178
1969	2,651	4,980	7,599	15,230	1,599	3,004	4,584	9,186
1970	2,032	6,230	8,028	16,290	1,225	3,758	4,842	9,825
1971	2,284	4,341	13,095	19,720	1,377	2,618	7,899	11,894
1972	2,506	7,099	9,675	19,280	1,512	4,282	5,836	11,629
1973	2,357	7,147	8,029	17,533	1,422	4,311	4,843	10,575
1974	2,738	8,667	7,620	19,025	1,651	5,228	4,596	11,475
1975	3,025	5,231	3,650	11,906	1,825	3,155	2,202	7,181
1976	3,249	5,938	4,564	13,751	1,960	3,582	2,753	8,294
1977	2,874	5,988	2,914	11,776	1,733	3,612	1,758	7,103
1978	2,325	4,895	5,023	12,242	1,402	2,952	3,029	7,384
1979	3,149	6,715	5,419	15,282	1,899	4,050	3,269	9,218
1980	2,368	7,099	9,235	18,702	1,428	4,282	5,570	11,280
1981	2,169	6,282	6,408	14,859	1,308	3,789	3,865	8,963
1982	1,644	5,972	4,756	12,373	992	3,602	2,869	7,463
1983	1,723	4,892	4,269	10,883	1,039	2,951	2,575	6,564
1984	1,851	3,647	4,692	10,189	1,116	2,199	2,830	6,146
1985	1,915	1,578	4,207	7,700	1,155	952	2,538	4,644
1986	1,940	1,246	5,576	8,762	1,170	752	3,363	5,285
1987	2,428	3,113	5,738	11,279	1,465	1,878	3,461	6,803
1988	2,389	3,415	8,858	14,662	1,441	2,060	5,343	8,844
1989	2,278	4,085	7,282	13,646	1,374	2,464	4,393	8,231
1990	2,943	6,159	8,580	17,682	1,775	3,715	5,175	10,665
1991	3,133	6,514	10,022	19,669	1,890	3,929	6,045	11,864
1992	2,925	6,650	10,718	20,293	1,764	4,011	6,465	12,240
1993	2,847	5,353	7,764	15,964	1,717	3,229	4,683	9,629
1994	2,191	5,294	9,466	16,951	1,322	3,193	5,710	10,224
1995	2,484	4,723	8,726	15,933	1,498	2,849	5,263	9,610
1996	1,258	4,700	8,507	14,465	759	2,835	5,131	8,725
1997	1,226	4,408	7,880	13,514	739	2,659	4,753	8,151
1998	1,656	4,051	7,725	13,432	999	2,443	4,660	8,102
1999	1,538	4,622	7,684	13,844	928	2,788	4,635	8,350
2000	1,447	4,402	7,441	13,290	873	2,655	4,488	8,016
2001	1,355	4,684	7,120	13,159	817	2,825	4,295	7,937
2002	1,137	4,118	7,273	12,528	686	2,484	4,387	7,556
2003	1,088	4,914	6,822	12,824	656	2,964	4,115	7,735
2004	899	4,945	6,735	12,579	542	2,983	4,062	7,587
2005	982	4,255	6,847	12,084	592	2,567	4,130	7,289

Table 4. Estimates (thousands of pounds, *net weight* and metric tons, *round weight*) of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) from all sources by IPHC regulatory subarea for 1962 through 2005. Estimates for 2005 are preliminary and subject to change as new information becomes available.

	Thousands of Pounds, net weight							*Metric Tons, round weight*						
Year	Area 2A	Area 2B	Area 2C	Area 3A	Area 3B	Area 4	TOTAL	Area 2A	Area 2B	Area 2C	Area 3A	Area 3B	Area 4	TOTAL
1962	-	1,176	207	1,919	1,164	4,143	8,609	-	709	125	1,157	702	2,499	5,192
1963	-	1,077	206	3,314	2,788	2,038	9,423	-	649	124	1,999	1,682	1,229	5,683
1964	-	1,105	205	9,370	2,269	2,965	15,914	-	667	124	5,652	1,369	1,788	9,599
1965	-	1,435	205	6,097	10,442	3,182	21,361	-	866	124	3,678	6,298	1,919	12,884
1966	-	1,666	213	4,513	7,982	3,400	17,774	-	1,005	128	2,722	4,815	2,051	10,721
1967	-	1,652	439	4,633	4,895	4,718	16,337	-	996	265	2,795	2,953	2,846	9,854
1968	-	1,963	515	5,476	1,577	5,685	15,216	-	1,184	311	3,303	951	3,429	9,178
1969	-	2,183	468	3,806	1,174	7,599	15,230	-	1,317	282	2,296	708	4,584	9,186
1970	-	1,470	562	3,389	2,841	8,028	16,290	-	886	339	2,044	1,714	4,842	9,825
1971	-	1,745	539	2,974	1,367	13,095	19,720	-	1,052	325	1,794	825	7,899	11,894
1972	-	1,750	756	5,406	1,693	9,675	19,280	-	1,056	456	3,261	1,021	5,836	11,629
1973	-	1,509	848	4,452	2,695	8,029	17,533	-	910	511	2,685	1,626	4,843	10,575
1974	477	1,729	532	5,247	3,420	7,620	19,025	288	1,043	321	3,165	2,063	4,596	11,475
1975	477	1,909	639	3,158	2,073	3,650	11,906	288	1,151	385	1,905	1,250	2,202	7,181
1976	477	2,064	708	3,495	2,443	4,564	13,751	288	1,245	427	2,108	1,474	2,753	8,294
1977	477	1,817	580	4,094	1,894	2,914	11,776	288	1,096	350	2,469	1,142	1,758	7,103
1978	477	1,471	377	3,055	1,840	5,023	12,242	288	887	227	1,843	1,110	3,029	7,384
1979	476	1,852	821	5,780	935	5,419	15,282	287	1,117	495	3,486	564	3,269	9,218
1980	476	1,372	520	5,852	1,246	9,235	18,702	287	828	314	3,530	752	5,570	11,280
1981	475	1,188	507	4,720	1,563	6,408	14,859	287	716	306	2,847	942	3,865	8,963
1982	475	867	302	3,797	2,175	4,756	12,373	287	523	182	2,290	1,312	2,869	7,463
1983	476	943	304	2,957	1,935	4,269	10,883	287	568	183	1,784	1,167	2,575	6,564
1984	475	1,074	302	2,140	1,507	4,692	10,189	287	648	182	1,290	909	2,830	6,146
1985	475	1,139	301	1,001	577	4,207	7,700	287	687	182	604	348	2,538	4,644
1986	476	1,161	303	836	410	5,576	8,762	287	700	183	504	247	3,363	5,285
1987	476	1,649	303	2,240	873	5,738	11,279	287	995	183	1,351	527	3,461	6,803
1988	477	1,609	303	3,365	50	8,858	14,662	288	971	183	2,030	30	5,343	8,844
1989	477	1,498	303	3,267	818	7,282	13,646	288	904	183	1,971	494	4,393	8,231
1990	408	1,679	856	4,114	2,045	8,580	17,682	246	1,013	516	2,481	1,233	5,175	10,665
1991	408	1,992	733	4,843	1,671	10,022	19,669	246	1,202	442	2,921	1,008	6,045	11,864
1992	444	1,745	736	4,668	1,982	10,718	20,293	268	1,053	444	2,816	1,195	6,465	12,240
1993	444	1,661	742	4,291	1,062	7,764	15,964	268	1,002	448	2,588	641	4,683	9,629
1994	444	1,219	528	3,907	1,387	9,466	16,951	268	735	318	2,357	837	5,710	10,224
1995	614	1,522	348	2,963	1,760	8,726	15,933	370	918	210	1,787	1,062	5,263	9,610
1996	614	299	345	2,743	1,957	8,507	14,465	370	180	208	1,655	1,180	5,131	8,725
1997	614	215	397	2,965	1,443	7,880	13,514	370	130	239	1,788	870	4,753	8,151
1998	1,082	213	361	2,662	1,389	7,725	13,432	653	128	218	1,606	838	4,660	8,102
1999	987	193	358	2,885	1,737	7,684	13,844	595	116	216	1,740	1,048	4,635	8,350
2000	822	230	395	2,892	1,510	7,441	13,290	496	139	238	1,744	911	4,488	8,016
2001	837	177	341	3,009	1,675	7,120	13,159	505	107	206	1,815	1,010	4,295	7,937
2002	553	244	340	2,194	1,924	7,273	12,528	334	147	205	1,323	1,161	4,387	7,556
2003	503	244	341	3,180	1,734	6,822	12,824	303	147	206	1,918	1,046	4,115	7,735
2004	286	251	362	3,671	1,274	6,735	12,579	173	151	218	2,214	768	4,062	7,587
2005	286	356	340	3,130	1,125	6,847	12,084	173	215	205	1,888	679	4,130	7,289

Table 5. Estimates (thousands of pounds, *net weight* and metric tons, *round weight*) of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) from all sources by geographic region of the coast for 1962 through 2005. Estimates for 2005 are preliminary and subject to change as new information becomes available.

	Thousands of Pounds, net weight					*Metric Tons, round weight*				
Year	Wash., Oreg., Calif.	British Columbia	Gulf of Alaska	Bering Sea & Aleu.	Total	Wash., Oreg., Calif.	British Columbia	Gulf of Alaska	Bering Sea & Aleu.	Total
1962	-	1,176	3,290	4,143	8,609	-	709	1,984	2,499	5,192
1963	-	1,077	6,308	2,038	9,423	-	649	3,805	1,229	5,683
1964	-	1,105	11,844	2,965	15,914	-	667	7,144	1,788	9,599
1965	-	1,435	16,744	3,182	21,361	-	866	10,100	1,919	12,884
1966	-	1,666	12,708	3,400	17,774	-	1,005	7,665	2,051	10,721
1967	-	1,652	9,967	4,718	16,337	-	996	6,012	2,846	9,854
1968	-	1,963	7,568	5,685	15,216	-	1,184	4,565	3,429	9,178
1969	-	2,183	5,448	7,599	15,230	-	1,317	3,286	4,584	9,186
1970	-	1,470	6,792	8,028	16,290	-	886	4,097	4,842	9,825
1971	-	1,745	4,880	13,095	19,720	-	1,052	2,943	7,899	11,894
1972	-	1,750	7,855	9,675	19,280	-	1,056	4,738	5,836	11,629
1973	-	1,509	7,995	8,029	17,533	-	910	4,822	4,843	10,575
1974	477	1,729	9,199	7,620	19,025	288	1,043	5,549	4,596	11,475
1975	477	1,909	5,870	3,650	11,906	288	1,151	3,541	2,202	7,181
1976	477	2,064	6,646	4,564	13,751	288	1,245	4,009	2,753	8,294
1977	477	1,817	6,568	2,914	11,776	288	1,096	3,962	1,758	7,103
1978	477	1,471	5,272	5,023	12,242	288	887	3,180	3,029	7,384
1979	476	1,852	7,536	5,419	15,282	287	1,117	4,545	3,269	9,218
1980	476	1,372	7,619	9,235	18,702	287	828	4,595	5,570	11,280
1981	475	1,188	6,789	6,408	14,859	287	716	4,095	3,865	8,963
1982	475	867	6,274	4,756	12,373	287	523	3,784	2,869	7,463
1983	476	943	5,196	4,269	10,883	287	568	3,134	2,575	6,564
1984	475	1,074	3,949	4,692	10,189	287	648	2,382	2,830	6,146
1985	475	1,139	1,879	4,207	7,700	287	687	1,133	2,538	4,644
1986	476	1,161	1,549	5,576	8,762	287	700	934	3,363	5,285
1987	476	1,649	3,416	5,738	11,279	287	995	2,060	3,461	6,803
1988	477	1,609	3,718	8,858	14,662	288	971	2,243	5,343	8,844
1989	477	1,498	4,388	7,282	13,646	288	904	2,647	4,393	8,231
1990	408	1,679	7,015	8,580	17,682	246	1,013	4,231	5,175	10,665
1991	408	1,992	7,247	10,022	19,669	246	1,202	4,371	6,045	11,864
1992	444	1,745	7,386	10,718	20,293	268	1,053	4,455	6,465	12,240
1993	444	1,661	6,095	7,764	15,964	268	1,002	3,676	4,683	9,629
1994	444	1,219	5,822	9,466	16,951	268	735	3,512	5,710	10,224
1995	614	1,522	5,071	8,726	15,933	370	918	3,059	5,263	9,610
1996	614	299	5,045	8,507	14,465	370	180	3,043	5,131	8,725
1997	614	215	4,805	7,880	13,514	370	130	2,898	4,753	8,151
1998	1,082	213	4,412	7,725	13,432	653	128	2,661	4,660	8,102
1999	987	193	4,980	7,684	13,844	595	116	3,004	4,635	8,350
2000	822	230	4,797	7,441	13,290	496	139	2,893	4,488	8,016
2001	837	177	5,025	7,120	13,159	505	107	3,031	4,295	7,937
2002	553	244	4,458	7,273	12,528	334	147	2,689	4,387	7,556
2003	503	244	5,255	6,822	12,824	303	147	3,170	4,115	7,735
2004	286	251	5,307	6,735	12,579	173	151	3,201	4,062	7,587
2005	286	356	4,595	6,847	12,084	173	215	2,772	4,130	7,289

Table 6. Estimates (thousands of pounds, *net weight* and metric tons, *round weight*) of the bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) from the Alaskan groundfish fishery for 1990 through 2005. Estimates for 2005 are preliminary and subject to change as new information becomes available. All federally managed fisheries are represented, including the IFQ sablefish fishery and Community Development Quota (CDQ) fisheries. However, fisheries occurring entirely in state waters (e.g., Chatham Strait sablefish fishery) are excluded.

	Gulf of Alaska							
	Thousands of Pounds, net weight				*Metric Tons, round weight*			
Year	Trawls	H&L	Pot	Total	Trawls	H&L	Pot	Total
1990	4,331	2,012	52	6,395	2,612	1,214	31	3,857
1991	4,538	2,081	7	6,626	2,737	1,255	4	3,997
1992	4,060	2,684	26	6,770	2,449	1,619	16	4,083
1993	3,548	1,900	19	5,467	2,140	1,146	19	3,305
1994	3,619	1,512	23	5,154	2,183	912	14	3,109
1995	3,745	645	35	4,425	2,259	389	21	2,669
1996	3,890	498	11	4,399	2,346	300	7	2,653
1997	3,291	855	13	4,159	1,985	516	8	2,509
1998	3,042	705	19	3,766	1,835	425	11	2,272
1999	3,333	854	147	4,334	2,010	515	89	2,614
2000	3,416	718	17	4,151	2,060	433	10	2,504
2001	3,724	614	41	4,379	2,246	370	25	2,641
2002	3,193	615	4	3,812	1,926	371	2	2,299
2003	3,748	827	34	4,609	2,261	499	21	2,780
2004	3,899	710	52	4,661	2,352	428	31	2,811
2005	3,325	556	68	3,949	2,006	335	41	2,382

	Bering Sea/Aleutians							
	Thousands of Pounds, net weight				*Metric Tons, round weight*			
Year	Trawls	H&L	Pot	Total	Trawls	H&L	Pot	Total
1990	6,309	627	4	6,940	3,805	378	2	4,186
1991	8,254	1,464	4	9,722	4,979	883	2	5,864
1992	7,622	2,775	21	10,418	4,597	1,674	13	6,284
1993	6,603	861	tr	7,464	3,983	519	tr	4,502
1994	7,199	1,944	9	9,152	4,342	1,173	5	5,520
1995	6,610	1,731	25	8,366	3,987	1,044	15	5,046
1996	6,582	1,535	30	8,147	3,970	926	18	4,914
1997	5,947	1,564	9	7,520	3,587	943	5	4,536
1998	5,945	1,409	11	7,365	3,586	850	7	4,442
1999	6,159	1,214	11	7,384	3,715	732	7	4,454
2000	5,443	1,674	24	7,141	3,283	1,010	14	4,307
2001	5,379	1,428	13	6,820	3,244	861	8	4,114
2002	5,722	1,234	17	6,973	3,451	744	10	4,206
2003	5,776	718	28	6,522	3,484	433	17	3,934
2004	5,675	754	6	6,435	3,423	455	4	3,881
2005	5,727	815	5	6,547	3,454	492	3	3,949

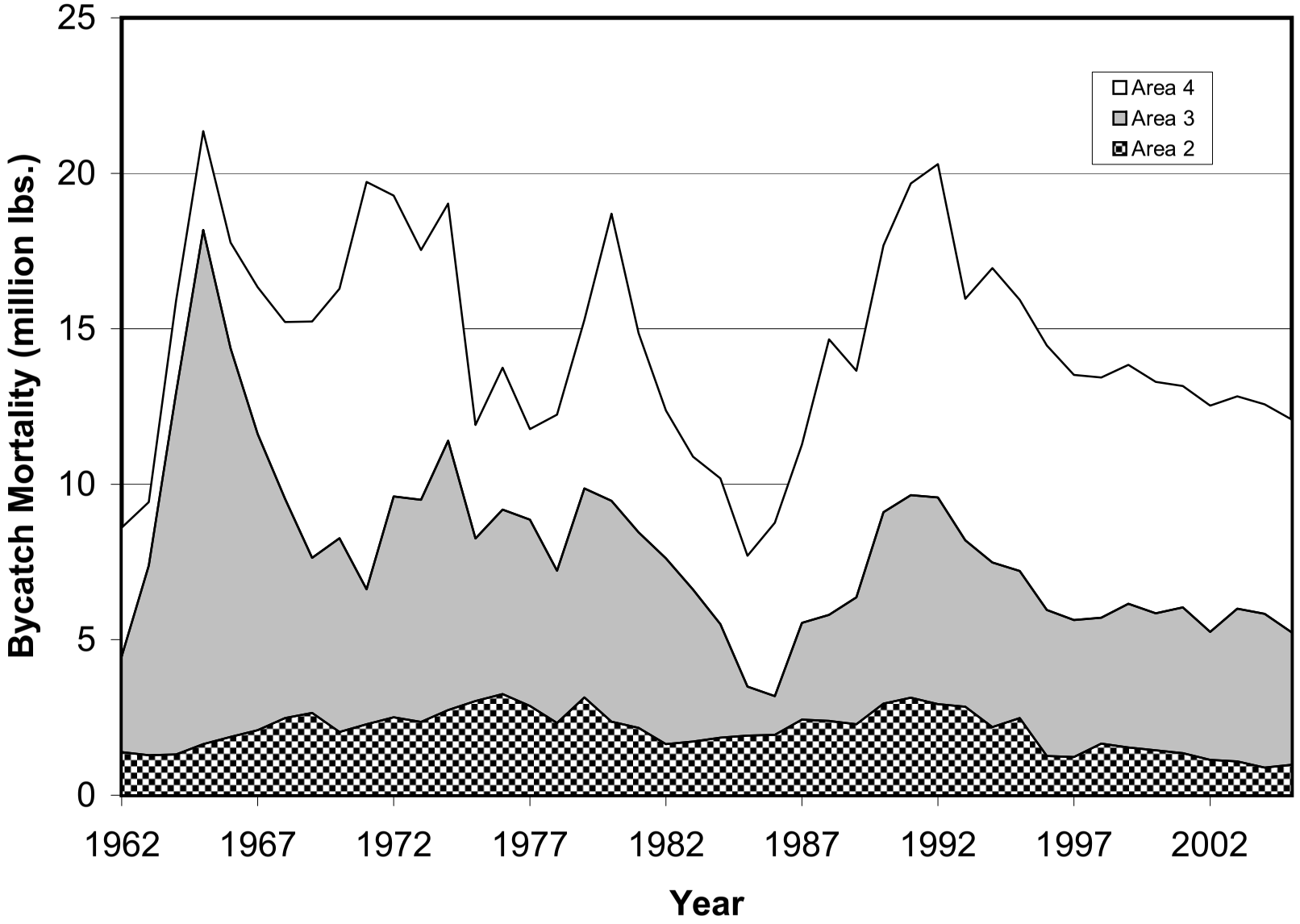

Figure 1. Historical trend in bycatch mortality of Pacific halibut by IPHC regulatory area.

Pacific halibut discard mortality rates in the 2004 CDQ groundfish fisheries, with recommendations for monitoring in 2006

Gregg H. Williams and Din G. Chen

Abstract

Results from analysis of halibut release condition and injury data collected in the 2004 open access and Community Development Quota (CDQ) groundfish fisheries off Alaska are presented. Halibut discard mortality rates are calculated, and the results vary by gear and fishery target. Mean annual rates are calculated as a basis for recommendations for monitoring halibut bycatch mortality in the 2006 CDQ trawl, longline and pot operations in the Bering Sea/Aleutian Islands region. The mean rates differ very little from rates used in 2005. Bycatch monitoring in the open access fisheries continues in 2006 using the same rates as used in 2005.

Introduction

Pacific halibut discard mortality rates (DMRs) in the Alaskan groundfish fisheries are estimated from viability data collected by National Marine Fisheries Service (NMFS) observers. Analysis by staff of the International Pacific Halibut Commission (IPHC) results in recommendations to the North Pacific Fishery Management Council (NPFMC or Council) for managing halibut bycatch in subsequent seasons. This paper presents the results from an analysis of data collected from the 2004 groundfish fisheries off Alaska and includes DMR recommendations for monitoring halibut bycatch mortality in the 2006 Community Development Quota (CDQ) fishery.

Data used and methods

Observer haul-by-haul data from the NMFS groundfish observer database were used for this analysis. The data records included the catch of groundfish by species or species group, estimates of the number and weight of halibut bycatch, and the number and length of halibut sampled for release viability or injury by category (excellent/poor/dead for trawl and pot gear, minor/moderate/severe/dead for longline gear). Records for all hauls sampled by observers in 2004 were obtained; hauls not sampled for species composition were excluded.

The first task was to partition the records into target fishery categories. The catch composition for each sampled haul was summed, and the target assigned based on the percentage of particular species within the haul catch composition (Williams 1997).

The targeting determination was based on a series of assumptions about the total catch and retained catch. Midwater pollock hauls were identified and coded if that species comprised 95% of the total catch. The determination for the remaining targets assumes that all arrowtooth flounder caught in a haul were discarded; the remaining species are assumed retained. Target determination was based on the species/species group comprising the greatest percentage of the "retained" catch. Flatfish targets in the Bering Sea/Aleutian Islands (BSAI) were determined in a succession of

comparisons of individual flatfish species compositions in the catch. Table 1 shows the target codes and definitions used in this analysis.

NMFS observers examine halibut for the release viability or injury upon return to the sea. Each fish is judged according to a set of criteria (Williams and Chen 2003), which are used to determine internal and external injuries, and body damage from predators (e.g., sand fleas and others). Beginning in 2000, a dichotomous key was provided to reduce subjectivity in the determinations of condition. Observers record the number of excellent, poor, and dead condition (trawls and pots) or minor, moderate, severe, and dead (longlines) halibut for each haul/set sampled. Viability samples are only collected on hauls sampled for species composition. The species composition sampling provides an estimate of the total number of halibut caught in the haul, as well as the catch of groundfish, necessary for determining the target. Observers are instructed to limit the number of fish examined to a maximum of 20, although this is occasionally exceeded by enthusiastic observers.

Next, the viability distribution is calculated. For each haul, the proportion of halibut in each category is extrapolated up to the total number of halibut caught. The extrapolated numbers of excellent, poor, and dead halibut are then summed within each region/gear/target strata.

The general model for calculating the DMR for halibut caught by gear ***g*** is of the form:

$$DMR_g = \sum_{i=1}^{4} \left(m_{i,g} \times P_i \right)$$

where ***m*** is the mortality rate for gear ***g***, and ***P*** is the proportion of halibut in condition ***i***, where 1 is excellent/minor, 2 is poor/moderate, 3 is dead/severe, and 4 is dead.

The mortality rate ***m*** varies among gear types (see Clark et al. (1992) for trawls, Williams (1996) for pots, and Kaimmer and Trumble (1998) for longlines) and represents the aggregate effects of external and internal injuries to the fish and the presence of predation by amphipods or marine mammals. There can be many sources of injuries, which vary by gear type. For longlines, injuries are most frequently caused by improper release methods used by vessel crews. Other significant factors include the length of the soak time, which can exacerbate the mortality caused by hooking injuries and also increase the potential for amphipod predation. Halibut mortality rates by gear and condition/injury are shown in the following table:

Gear (*g*)	m_{exc}	m_{poor}	m_{dead}	
Trawl	0.20	0.55	0.90	
Pot	0.00	1.00	1.00	
	m_{minor}	$m_{moderate}$	m_{severe}	m_{dead}
Longlines	0.035	0.363	0.662	1.00

Mean fishery DMRs and associated standard errors have been estimated by assuming that each vessel was a separate sampling unit, enabling a DMR to be calculated for each individual vessel in a target fishery. The DMR for a target fishery is then estimated as the mean of vessel DMRs, where the vessel's proportion of the total number of bycaught halibut is used as a weighting factor as follows:

Let DMR_v = observed DMR on vessel ***v***

p_v = proportion of total number of halibut caught on vessel ***v*** in a fishery

Then $\overline{DMR} = \sum_{v=1}^{n} (p_v \times DMR_v)$

Standard errors of the weighted mean DMR were estimated as:

$$V\left(\overline{DMR}\right) = \sum_{v=1}^{n} \left(p_v^2 \times V\left(DMR_v\right)\right)$$

and $$SE\left(\overline{DMR}\right) = \sqrt{V\left(\overline{DMR}\right)}$$

where $V\left(DMR_v\right)$ is the sample variance of all the $DMRs_v$, and $V\left(\overline{DMR}\right)$ and $SE\left(\overline{DMR}\right)$ are the variance and standard error of $\overline{DMR}$, respectively.

Results for 2004 fisheries

CDQ fisheries

A summary of observer coverage, sampling, and halibut viability data is shown in Table 2. In 2004, pot, trawl, and longline gear was used in CDQ fishing. Targeted species included pollock, Atka mackerel, and yellowfin sole by trawls, Pacific cod by longline, and sablefish by pots.

Almost all halibut caught in the trawl operations were dead when examined. The resulting DMRs ranged from 0.84 to 0.90, which are generally higher than what is seen in open access fishing for the same target species.

Longline CDQ fishing consisted of 21 vessels targeting cod. Distribution of release injuries to halibut in the CDQ longline cod fishery was similar to that observed in the open access cod fishery, with a very similar DMR (0.09). The DMR remained unchanged from 2002.

Pot effort in 2004 was focused on sablefish, with five vessels observed. DMRs were significantly higher (0.18 vs. 0.06) than what is normally seen in the BSAI open access fishery for cod. This difference is probably due to the different target species. Sablefish is fished at greater depths, ranging from 200 to 575 fathoms, and pot soaking times average 4-5 days.

Open access fisheries

A summary of the observer sampling is shown in Table 4, with the subsequent analytical results presented in Table 5. The full time series is shown in Tables 6 (Bering Sea/Aleutians) and 7 (Gulf of Alaska).

Recommendations for 2006 CDQ fishery DMRs

A mean annual DMR for all targets was calculated using data from all available years, as a basis for the recommendations for 2006. In most cases, there are at least five years of data, and up to seven years for pelagic pollock and longline cod. These mean annual DMRs are shown in Table 3, and summarized as our recommendations in Table 8. For those targets with no recent information, including trawl flathead sole and rockfish, longline turbot, and pot cod, we recommend using DMRs derived from open access fisheries.

All recommendations for CDQ monitoring are summarized in Table 8.

Status of open access fishery DMRs

In 2000, IPHC proposed, and the Council adopted, a plan to use a long-term average DMR for all open access fisheries for 2001-2003. At the end of that period, new long-term DMRs would be recalculated using the data collected in subsequent years and revisions recommended. In 2000, DMRs for 2001-2003 were recommended, using an average of 1990-1999, which were the most current data available at that time. Williams and Chen (2003) updated this process, with recommendations for 2004-2006, based on data from 1993-2002. Thus, no changes are proposed for the open access fisheries at this time. We anticipate providing recommendations to the Council in 2006 for the 2007-2009 seasons.

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Table 1. 2004 groundfish target definitions and target determination method used to classify observer sampled hauls in the halibut discard mortality rate analysis.

BSAI		GOA	
Target	**Definition**	**Target**	**Definition**
A	Atka mackerel	A	Atka mackerel
B	Bottom pollock	B	Bottom pollock
C	Pacific cod	C	Pacific cod
F	Other flatfish	D	Deep water flatfish
K	Rockfish	H	Shallow water flatfish
L	Flathead sole	K	Rockfish
O	Other spp.	L	Flathead sole
P	Pelagic pollock	O	Other spp.
R	Rock sole	P	Pelagic pollock
S	Sablefish	S	Sablefish
T	Greenland turbot	W	Arrowtooth flounder
Y	Yellowfin sole	X	Rex sole

OPEN ACCESS and CDQ TARGET DETERMINATION

Bering Sea/Aleutians

P if Pollock ≥ 95% of total catch, or

Y/R/L/F if (rock sole + other flatfish + yellowfin sole + flathead) is the largest component of the retained catch using this rule:

Y if yellowfin sole is ≥ 70% of (rock sole + other flatfish + yellowfin sole + flathead sole), or

R if rock sole > other flatfish and rock sole > flathead sole, or

L if flathead sole > other flatfish and flathead sole > rock sole, or

F if none of the three conditions above are met.

If target is not P, Y, R, L or F, then target is whichever species or species group (A, B, C, K, O, S, T) forms the largest part of the Total Catch.

Gulf of Alaska

P if Pollock ≥ 95% of total catch, or

W if Arrowtooth flounder ≥ 65% of total catch.

If target is not P or W, then target is whichever species or species group (A, B, C, D, H, K, L, O, S, X) forms the largest part of the Total Catch.

Table 2. Observer coverage and halibut viability/injury data collected from the 2004 Bering Sea/Aleutian CDQ fisheries.

			Raw Data					Extrapolated data					
Target	No. of Vsls	# of Hauls	Exc./ Minor	Poor/ Mod.	Dead/ Sev.	Dead	DMR	Exc./ Minor	Poor/ Mod.	Dead/ Sev.	Dead	DMR	SE
CDQ Longline													
P cod	21	715	2129	155	20	48	0.082	38,127	3117	813	749	**0.088**	0.017
CDQ Pot													
Sable	5	192	285	18	45	-	0.181	706	47	104	-	**0.176**	0.021
CDQ Trawl													
Atka m.	2	128	2	0	60	-	0.877	63	0	1329	-	**0.869**	0.019
Btm pol	5	71	1	22	210	-	0.864	22	573	2760	-	**0.836**	0.049
Pel pol	12	740	1	4	780	-	0.897	2	9	2200	-	**0.898**	0.002
YF sole	3	247	6	15	292	-	0.870	138	451	14541	-	**0.883**	0.011

Table 3. Summary of halibut discard mortality rates (DMRs) in the CDQ Bering Sea/Aleutian Islands (BSAI) groundfish fisheries during 1998-2004.

Gear/Target	1998	1999	2000	2001	2002	2003	2004	1998-2004 Mean DMR
CDQ Trawl								
Atka mackerel	-	82	89	80	90	86	87	86
Bottom pollock	90	88	90	90	66	-	84	85
Flathead sole	-	-	83	90	-	-	-	87
Pelagic pollock	90	90	88	89	89	90	90	89
Rockfish	-	88	-	90	-	-	-	89
Yellowfin sole	-	83	-	-	81	89	88	85
CDQ Longline								
Pacific cod	10	10	13	11	9	9	9	10
Turbot	-	-	4	-	-	-	-	4
CDQ Pot								
Pacific cod	-	-	7	2	-	-	-	5
Sablefish	-	-	38	46	25	22	18	30

Table 4. Information on observer coverage, sampling, and size composition of the halibut bycatch in 2004.

Area/Gear /Target	No. of Vsls Observed	No. of Sampled hauls	No. of fish measured	Mean Length (cm)	Percent <65 cm	Percent < 82 cm
BSAI Longline						
Pacific cod	38	914	11,502	67.6	46.4	85.7
Other sp.	6	27	19	73.7	26.3	73.7
Turbot	6	92	19	98.5	5.3	5.3
BSAI Pot						
Pacific cod	50	103	643	62.9	57.4	97.8
Sablefish	5	63	14	80.1	0.0	64.3
BSAI Trawl						
Atka mackerel	22	662	962	59.5	72.9	94.9
Bottom pollock	104	808	4,857	57.3	71.9	92.0
Pacific cod	75	659	5,537	55.9	77.7	94.2
Other flatfish	16	150	525	51.1	89.0	96.6
Rockfish	12	121	79	91.3	12.7	35.4
Flathead sole	17	546	1,677	64.1	58.9	86.3
Pelagic pollock	96	1,304	8,735	56.8	72.5	91.0
Rock sole	24	502	4,540	49.1	87.0	95.8
Turbot	6	34	61	78.4	21.3	55.7
Yellowfin sole	25	573	1,080	62.8	63.1	84.1
GOA Longline						
Pacific cod	10	214	547	72.3	34.7	74.2
GOA Pot						
Pacific cod	25	83	509	73.7	23.2	73.5
GOA Trawl						
Bottom pollock	32	63	182	67.5	51.1	79.7
Pacific cod	43	189	2,399	60.6	66.2	92.5
Dp wtr flatfish	5	23	139	67.8	51.1	79.9
Shall wtr flatfish	16	69	860	50.3	86.7	96.4
Rockfish	45	366	607	79.8	26.5	55.2
Flathead sole	7	115	144	64.1	64.6	83.3
Pelagic pollock	41	87	33	71.7	27.3	81.8
Sablefish	2	7	6	105.8	0.0	16.7
Arrowtooth flndr	9	39	90	66.6	48.9	83.3
Rex sole	3	48	236	64.4	55.1	88.6

Table 5. Distribution of halibut viability data by condition factor and open access target fishery during 2004.

	Raw Data				Extrapolated Data				
Target	**Exc**	**Poor**	**Dead**	**DMR**	**Exc**	**Poor**	**Dead**	**DMR**	**SE**
BSAI Trawl									
Atka mackerel	122	312	268	0.623	4,914	17,257	12,509	**0.627**	0.1776
Bottom pollock	210	439	4,025	0.836	7,230	16,309	50,610	**0.755**	0.0527
Pacific cod	644	1,535	2,503	0.689	13,972	44,173	71,905	**0.706**	0.0400
Other flatfish	3	30	128	0.822	-	2,766	13,135	**0.839**	0.0364
Rockfish	13	10	10	0.518	216	117	803	**0.731**	0.1443
Flathead sole	232	341	476	0.631	5,537	8,053	11,620	**0.634**	0.0913
Pelagic pollock	59	31	9,959	0.895	403	204	19,261	**0.882**	0.0228
Rock sole	179	327	3,506	0.840	5,558	16,075	208,108	**0.859**	0.0239
Turbot	7	13	1	0.450	196	74	-	**0.296**	.
Yellowfin sole	45	87	813	0.834	1,451	3,062	33,731	**0.845**	0.0168
BSAI Pot									
Pacific cod	725	29	26	0.071	2,155	84	79	**0.070**	0.0747
Sablefish	186	7	21	0.131	449	14	44	**0.114**	0.2010
GOA Trawl									
Bottom pollock	28	27	142	0.753	800	778	3,218	**0.726**	0.1609
Pacific cod	666	661	828	0.576	16,688	20,720	29,330	**0.616**	0.0399
Deepwater flatfish	46	40	46	0.550	1,663	2,414	1,268	**0.524**	0.1359
Shallow water flatfish	59	187	502	0.757	1,722	7,673	16,325	**0.749**	0.0392
Rockfish	96	101	210	0.648	2,053	2,553	8,346	**0.720**	0.0780
Flathead sole	12	16	15	0.574	241	627	931	**0.684**	0.4088
Other sp.	5	15	47	0.769	50	15	46	**0.537**	0.3100
Pelagic pollock	1	-	32	0.879	1	-	32	**0.879**	0.0188
Arrowtooth flounder	25	32	29	0.566	580	1,567	2,030	**0.671**	0.1664
Rex sole	4	15	72	0.812	255	782	1,754	**0.738**	0.1353
GOA Pot									
Pacific cod	438	45	56	0.187	1,451	159	242	**0.217**	0.0652

	Raw Data					Extrapolated Data					
Target	**Minor**	**Mod**	**Severe**	**Dead**	**DMR**	**Minor**	**Mod**	**Severe**	**Dead**	**DMR**	**SE**
BSAI Longline											
Pacific cod	10,011	1,107	261	252	0.101	217,009	21,280	5,346	4,309	**0.093**	0.0172
Rockfish	-	-	-	-	0.000	-	-	-	-	**0.000**	.
Other sp.	85	4	3	4	0.108	1,665	341	83	29	**0.126**	0.1193
Turbot	57	8	-	-	0.075	727	51	-	-	**0.056**	0.0238
GOA Longline											
Pacific cod	438	45	56	.	0.187	1,451	159	242	.	**0.217**	0.0652
Other sp.	40	6	-	6	0.261	360	74	-	64	**0.224**	0.2724

Table 6. Summary of halibut discard mortality rates (DMRs) in the Open Access (non-CDQ) Bering Sea/Aleutian Islands (BSAI) groundfish fisheries during 1990-2003. Mean DMR for 1993-2002 used for managing bycatch during 2004-2006.

Gear/Target	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	DMR Used in 2004-2006[1]
BSAI Trawl																
Atka mackerel	66	77	71	69	73	73	83	85	77	81	77	73	85	67	63	78
Bottom pollock	68	74	78	78	80	73	79	72	80	74	67	74	78	65	76	76
Pacific cod	68	64	69	67	64	71	70	67	66	69	69	69	69	67	71	68
Other Flatfish	80	75	76	69	61	68	67	71	78	63	76	81	77	79	84	71
Rockfish	65	67	69	69	75	68	72	71	56	81	89	85	73	84	73	74
Flathead sole	-	-	-	-	67	62	66	57	70	79	74	69	60	69	63	67
Pelagic pollock	85	82	85	85	80	79	83	87	86	87	88	89	90	89	88	85
Rock sole	64	79	78	76	76	73	74	77	79	81	75	77	83	82	86	77
Sablefish	46	66	-	26	20	-	-	-	-	90	60	-	-	-	-	49
Turbot	69	55	-	-	58	75	70	75	86	70	74	68	75	67	30	72
Yellowfin sole	83	88	83	80	81	77	76	80	82	78	77	74	77	81	85	78
BSAI Pot																
Pacific cod	12	4	12	4	10	10	7	4	13	9	13	6	5	6	7	8
Sablefish	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-
BSAI Longline																
Pacific cod	19	23	21	17	15	14	12	11	11	12	12	12	10	8	9	11
Rockfish	17	55	-	6	23	-	20	4	52	-	12	10	4	-	-	16
Sablefish	14	32	14	13	38	-	-	-	-	-	-	-	-	-	-	-
Turbot	15	30	11	10	14	9	15	22	18	17	14	6	23	7	6	15

[1] Mean DMR for 1993-2002 and adopted by NPFMC at Dec. 2003 meeting.

Table 7. Summary of halibut discard mortality rates (DMRs) in the Gulf of Alaska (GOA) groundfish fisheries during 1990-2003. Mean DMR for 1993-2002 used for managing bycatch during 2004-2006.

Gear/Target	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	DMR Used in 2004-2006[1]
GOA Trawl																
Atka mackerel	67	89	81	67	53	-	60	-	-	-	-	-	-	-	-	60
Bottom pollock	51	62	66	57	48	66	79	66	55	55	52	58	55	47	73	59
Pacific cod	60	62	66	59	53	64	70	62	64	54	57	67	59	69	62	61
Deep wtr flats	61	58	70	59	60	56	71	61	51	51	62	49	48	31	52	57
Shallow wtr flats	66	71	69	65	62	70	71	71	67	81	67	62	66	80	75	68
Rockfish	65	75	79	75	58	71	65	63	68	74	71	61	64	65	72	67
Flathead sole	-	-	-	-	54	64	67	74	39	51	69	68	74	49	68	62
Pelagic pollock	71	82	72	63	61	51	81	70	80	86	80	89	90	34	88	75
Sablefish	70	60	68	59	67	58	80	61	-	68	38	66	62	-	79	62
Arrowtooth fldr	-	-	-	-	-	-	66	48	62	73	75	86	76	70	67	69
Rex sole	-	-	-	-	56	76	63	47	58	70	71	62	57	69	74	62
GOA Pot																
Pacific cod	12	7	16	24	17	21	7	11	16	13	8	33	19	21	22	17
GOA Longline																
Pacific cod	15	18	13	7	11	13	11	22	11	17	16	11	11	13	12	13
Rockfish	6	-	-	7	-	4	13	-	9	-	9	-	-	-	-	8
Sablefish	17	27	28	30	22	-	-	-	-	-	-	-	-	-	-	--

[1] Mean DMR for 1993-2002 and adopted by NPFMC at Dec. 2003 meeting.

Table 8. Summary of recommended Pacific halibut discard mortality rates (DMRs) for calculating bycatch mortality in the 2006 CDQ groundfish fisheries off Alaska.

Gear/Target	Used in 2005	2006 Recommendation
CDQ Trawl		
Atka mackerel	85	86
Bottom pollock	85	85
Flathead sole	67[a]	67[a]
Pelagic pollock	90	89
Rockfish	74[a]	74[a]
Yellowfin sole	84	85
CDQ Longline		
Pacific cod	10	10
Turbot	15[a]	15[a]
CDQ Pot		
Pacific cod	8[a]	8[a]
Sablefish	33	30

[a] Open access fishery DMRs.

The Bering Sea trawl fishery Prohibited Species Donation Program: Results from 1998-2005

Gregg H. Williams

Abstract

Since 1998, SeaShare of Bainbridge Island, Washington has operated a program which acquires unintentionally-landed halibut bycatch in Alaska for donation to hunger relief programs. The program is conducted under a Prohibited Species Donation (PSD) program adopted by National Marine Fisheries Service (NMFS) and the North Pacific Fishery Management Council (Council) following several years of development and, ultimately, approval by the International Pacific Halibut Commission (IPHC). In 2005, halibut collected for this program were landed at two participating processors in Dutch Harbor by shore-based trawlers that are unable to sort their catch at sea, and totaled 29,556 pounds. Donations in the program have totaled 185,346 pounds (net weight) since inception. NMFS Enforcement Division has monitored the halibut donated to this PSD program and has reported no incidents.

Final 2004 results

The amount of halibut collected by SeaShare in 2004 was 15,890 pounds, with only two processors participating (Table 1). As in past years, Unisea was the leading contributor, followed by Alyeska. Processing and inspection was conducted by SeaFreeze personnel, as in previous years. Recipients of the processed halibut included Food Lifeline in Seattle.

Preliminary 2005 results

Only two Dutch Harbor processors (UniSea and Alyeska) participated in 2005. As of December 1, 2005, 29,556 pounds (net weight) of frozen, headed & gutted halibut has been received (Table 1), 93 percent (27,430 pounds) from Unisea and 7 percent (2,126 pounds) from Alyeska. The fish were delivered to SeaFreeze in Seattle through donated shipping by Coastal Transportation and Horizon Lines. SeaFreeze weighed the halibut in the totes, and the net weight was estimated. The fish were processed into steaks, sleeved, and repackaged for delivery to regional food banks by Smoki Foods. This represents over 50,000 meals provided to regional area food banks in 2005.

The quality of the halibut was evaluated by J. McGraw, the Quality Assurance manager at SeaFreeze. McGraw reported that the fish donated in 2005 were generally of excellent quality. Any substandard fish was discarded at the time of processing; however discards were minimal.

Program history

The initial program adopted by the Council in 1998 expired on December 31, 2000. NMFS and IPHC staff conducted a review of the program during 2000 for the purpose of examining the appropriateness of extending the program. The review was discussed with the Council at its June, 2000 meeting and formed the basis of an extension of the program. The extension contains no sunset provision but does require a review every three years. The next review was scheduled for

2003, but was overlooked by staff. Accordingly, IPHC staff will be examining the program in the coming year to fulfill this requirement.

Although limited to shore-based trawl catcher vessels that land in Dutch Harbor, there is neither a limitation on the amount that can be donated nor a requirement that the halibut bycatch originates from specific fisheries.

Table 1. Amount of halibut (pounds, net weight) received and distributed by SeaShare during 1998-2005. Halibut is comprised of dead fish, landed by shore-based catcher vessel trawlers.

Year	UniSea	Alyeska	Westward	Total
1998	10,498	10,698	--	21,196
1999	3,762	714	--	4,476
2000	6,534	5,051	6,684	18,269
2001	32,318	10,281	980	43,579
2002	33,256	718	--	33,974
2003	15,737	2,669	--	18,406
2004	14,274	1,616	--	15,890
2005	27,430	2,126	--	29,556
Total	**143,809**	**33,873**	**7,664**	**185,346**