MEMORANDUM

TO: Council and Commission Members

FROM: Clarence G. Pautzke
Executive Director

DATE: October 7, 1999

SUBJECT: Halibut Bycatch

1. Status report on 1999 bycatch.
2. Bottom trawl ban for the pollock fishery.
3. Undersize mortality accounting in Area 4E halibut CDQ fisheries.
4. Research on trawl modifications.
5. Progress and evaluation of bycatch reduction, including VBAs, HMAP, and effect of AFA, relative to 1991 goals.

BACKGROUND

Status report on 1999 bycatch

For the Alaskan groundfish fishery, NMFS data indicate that bycatch mortality totaled 9.0 million pounds (5,431 mt) through September 11, or 78 % of the annual bycatch limits. Bering Sea fisheries have taken 75% of their limits and are slightly behind last year's pace. However, significant fishing remains for yellowfin sole, Pacific cod, and pollock, which will likely result in a total bycatch similar to 1998. Gulf of Alaska fisheries have taken 83% of their annual bycatch limit in fishing through September 11. Small amounts of fishing remain in the Gulf, including several short pollock openings, some "cleanup" fishing for Pacific cod by pot boats and trawlers, and additional trawling for flatfish.

Halibut bycatch limits for the 1999 Alaskan groundfish are unchanged from 1998. Additional details on bycatch in the groundfish fishery are shown in Item 1. Bycatch in Area 2B has not yet been reported. In Area 2A, current efforts are aimed at examining bycatch rates in the Oregon Enhanced Data Collection Program and in projecting trawl effort in the 2000 fishery. All fisheries off the West Coast are expected to be significantly reduced in 2000 due to lower groundfish ABCs. Other fisheries will be analyzed and estimated in late October.

Bycatch estimates for 1998 have been finalized by: (1) incorporating revised Discard Mortality Rates (DMRs) for the Alaskan groundfish fishery based on 1998 observer sampling, and (2) inclusion of a final estimate of bycatch mortality in the Canadian trawl fishery. The revised estimate for 1998 is 12.8 million pounds, compared to an earlier estimate of 13.1 million pounds (shown for 1998 in Table 2 of Item 3). The main reduction occurred in the estimate for trawl bycatch in the Gulf of Alaska.

Bottom trawl ban for the pollock fishery

In June 1998, the Council adopted an amendment to prohibit the use of non-pelagic trawl gear for vessels targeting pollock in the BSAI. Only pelagic trawl gear as defined in regulations (together with the performance-based bycatch standard of 20 crabs) will be allowed in the directed pollock fishery. Total bycatch limits of prohibited species will be reduced to reflect this gear prohibition. Prohibited species bycatch will be reduced by 220,000 lb (100 mt) of halibut mortality, 3,000 red king crab, 50,000 *C. bairdi* crab, and 150,000 *C. opilio* crab. The proposed rule is being developed by the NMFS Regional Office.

Undersize mortality accounting in Area 4E Halibut CDQ fisheries

At its January 1999 Annual Meeting, the IPHC adopted the following reporting requirement concerning the retention of sublegal halibut in the Area 4E CDQ halibut fishery:

> "The manager of a CDQ organization that authorizes persons to harvest halibut in the Area 4E CDQ fishery must report to the Commission the total number and weight of undersized halibut taken and retained by such persons pursuant to paragraph 7(1). This report, that shall include data and methodology used to collect the data, must be received by the Commission prior to December 1 of the year in which such halibut were harvested."

NMFS/AKR wrote to each CDQ group on March 18, 1999, advising them of the need to comply with the IPHC regulation. A memo from IPHC was distributed to the CDQ groups on March 24, 1999, outlining the requirement, the data to be reported, the methodology used, and the reporting deadline.

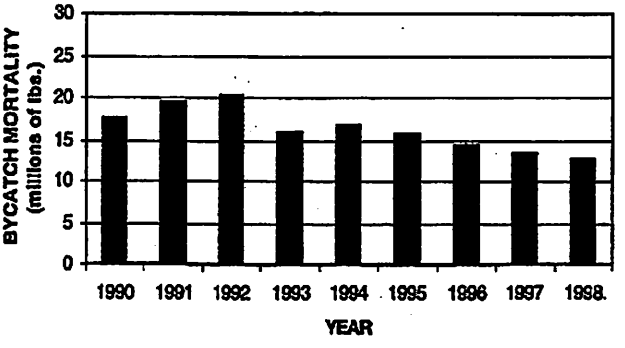
The current provision for sublegal retention in Area 4E expires at the end of the 1999 season. An extension has been discussed, but the Commission needs to know how much halibut is involved in this program before it will
consider a program for 2000. An extension of this regulation will be on the agenda for the January 2000 IPHC Annual Meeting.

Research on trawl modifications

Craig Rose, NMFS AFSC, will provide preliminary results of field work of several halibut excluder devices tested this past summer. A written report is attached as Item 2.

Progress and evaluation of bycatch reduction

In 1996, the IPHC passed a resolution to reduce bycatch based on the findings of the Halibut Bycatch Work Group in July 1991. As shown in Item 3, halibut bycatch mortality was estimated at 17.7 million pounds (10,665 mt RWT) in 1990, the year the North Pacific Observer Program was implemented for the domestic groundfish fleet. It has since declined to a revised estimate for 1998 of 12.8 million pounds (7,721 mt RWT) in 1998, a reduction of nearly 5 M lb. The figure at right depicts the trend since 1990. The 1998 halibut bycatch level is nearly a 28% reduction from 1990, and a 37% reduction from the decadal peak of 20.3 M lb in 1992.



Bycatch limits for 1998 Bering Sea and Aleutian Island and GOA groundfish fisheries were set as indicated at right. These halibut bycatch limits equate to slightly more than 1% of halibut total biomass in both the Bering Sea/Aleutian Islands and Gulf of Alaska areas.

	trawl	non-trawl
BSAI	8.3 M lb (3,775 mt)	2.0 M lb (900 mt)
GOA	5.1 M lb (2,300 mt)	0.7 M lb (300 mt)
TOTAL	13.4 M lb (6,075 mt)	2.7 M lb (1,200 mt)

The box at right depicts the halibut bycatch mortality caps, catches and percent of the caps taken each year (in mt) for the BSAI and GOA groundfish fisheries for 1992-98. Overall, since 1992, the caps, catches, and percentage of the cap taken have declined. Using final 1998 landings, less than 94% of allowable halibut bycatch was taken in the BSAI and GOA groundfish fisheries.

	BSAI			GOA			Total		
	Cap	Catch	% Cap	Cap	Catch	% Cap	Cap	Catch	% Cap
1992	4,675	6,271	134.1	2,750	4,067	147.9	7,425	10,338	139.2
1993	4,675	4,502	96.3	2,750	3,286	119.5	7,425	7,788	104.9
1994	4,675	5,515	118.0	2,750	3,095	112.6	7,425	8,610	116.0
1995	4,675	5,067	108.4	2,300	2,648	115.1	6,975	7,715	110.6
1996	4,675	4,932	105.5	2,300	2,646	115.0	6,975	7,578	108.7
1997	4,675	4,567	97.7	2,300	2,501	108.7	6,975	7,068	101.3
1998	4,675	4,436	94.9	2,300	2,116	92.0	6,975	6,552	93.9

Since 1991, NMFS has implemented numerous management measures that reduce halibut bycatch in the groundfish fleet. The Council is developing a vessel bycatch allowance program, but further development has been stalled by recent legislation. In addition to bycatch limits, gear restrictions and other regulatory changes have also been implemented to reduce bycatch and waste. Biodegradable panels are required for pot gear to minimize waste associated with so-called ghost fishing of lost gear. Tunnel openings for pot gear are limited in size to reduce incidental catch of halibut and crabs. Gillnets for groundfish have been prohibited to prevent ghost fishing and reduce bycatch of non-target species. With the implementation of an individual fishing quota system for halibut and sablefish longline fisheries in 1995, bycatch and waste were reduced because the race for fish was eliminated, allowing for more selective fishing practices and significant reductions in actual gear deployment/loss. As a result of the IFQ halibut and sablefish program, the halibut bycatch limit for non-trawl fisheries was reduced by 1.0 M lb (450 mt) in Gulf of Alaska. In June 1998, the Council approved a prohibition on the use of non-pelagic trawl gear for vessels targeting pollock in the Bering Sea, and reduced the halibut bycatch limit by 220,000 lb (100 mt) in 1999, even though the amendment has not yet been implemented. The change in the nature of the Bering Sea pollock fisheries from open access to cooperatives under the American Fisheries Act has resulted in a reduction of 2 mt of halibut for 1000 mt of groundfish taken (through September 25, 1999).

	1998			1999 (thru 9/25/99)		
Target	Groundfish	Halibut	%	Groundfish	Halibut	%
pollock, bottom	16,562	57	0.34	5,147	8	0.16
P. cod	8,675	46	0.53	12,999	43	0.33
pollock, pelagic	407,637	47	0.01	273,393	42	0.02
rock sole	1,362	13	0.95			
yellowfin sole	29,980	184	0.61	14,039	48	0.34
TOTAL	464,216	347	0.07	305,578	141	0.05

Table 1. Summary of 1998 and 1999 halibut bycatch estimates for the groundfish fishery off Alaska.

I. THOUSANDS OF POUNDS, NET WEIGHT

Region	1999 Bycatch Limit	Est. Byc. Mortality Through Sept. 11 wt.	%	1998 Total
Bering Sea/Aleutians				
Trawl	5,789	5,103	88	5,795
Hook-&-Line, Jig	1,379	603	44	1,409
Pot	exempt	3	--	11
Groundfish CDQ	582	124	21	151
Total	7,751	5,834	75	7,366
Gulf of Alaska				
Trawl	3,316	2,460	74	3,042
Hook-&-Line, Jig	481	564	117	466
Pot	exempt	146	--	19
Total	3,797	3,170	83	3,528
GRAND TOTAL	11,547	9,004	78	10,894

II. METRIC TONS, ROUND WEIGHT

Region	1999 Bycatch Limit	Est. Byc. Mortality Through Sept. 11 wt.	%	1998 Total
Bering Sea/Aleutians				
Trawl	3,492	3,078	88	3,495
Hook-&-Line, Jig	832	364	44	850
Pot	exempt	2	--	7
Groundfish CDQ	351	75	21	91
Total	4,675	3,519	75	4,443
Gulf of Alaska				
Trawl	2,000	1,484	74	1,835
Hook-&-Line, Jig	290	340	117	281
Pot	exempt	88	--	12
Total	2,290	1,912	83	2,128
GRAND TOTAL	6,965	5,431	78	6,571

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Alaska Fisheries Science Center
Resource Assessment and Conservation Engineering Division
7600 Sand Point Way Northeast
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Seattle, Washington 98115-0070

September 10, 1999 F/AKC2:CR

Clarence Pautzke
North Pacific Fishery Management Council
605 W. 4th Avenue, Suite 306
Anchorage, Alaska 99501-2252

Dear Mr. Pautzke:

On August 31, field work was completed on tests of several halibut excluders designed to wrap over net reels. This letter provides some preliminary results of that work. The excluders followed the same separation concept as the rigid grid tested last year during an Groundfish Forum EFP. A panel of large square holes allowed target species to pass through to the codend, while large halibut were routed to an escape path. The tests and devices used this August differed from the 1998 work in several respects:

1. All devices were constructed of flexible material that could be wrapped over a net reel,
2. The diverter grid used in the 1998 work was replaced with a mesh panel that both diverted fish to the leading edge of the selection panels and forced them against those panels for most of the panel lengths. This mesh panel is called the forcing panel in the remainder of this letter.
3. The selection grids were installed at shallower angles and were much longer than the 1998 grid.
4. All escaping fish were recaptured in a auxiliary net, allowing the proportion retained to be calculated for each tow.

Three selection panels were used.

1. A mesh panel hung in a square configuration with each side of the squares (bars) measuring six inches,
2. A mesh panel hung in a square configuration with each side of the squares (bars) measuring seven inches, and
3. A flexible grid constructed of fiberglass and hose with each side of its squares measuring seven inches.

All three panels were identically attached into the study trawl's intermediate (see attached description and diagram).

I have just completed the initial estimates for this study (see attached graph). These estimates should be considered preliminary, and they may need some revision after further analysis. The 7-inch flexible grid and the 6-inch mesh grid had very similar selection characteristics. Both excluded nearly all of the halibut, while retaining approximately 80% of the target species. The 7-inch mesh panel retained more and larger halibut, resulting in exclusion of only about half of the weight of halibut. However, essentially all of the target species were retained with the six-inch mesh grid. Each of the grids also seemed to retain the primary target species (rex, Dover and flathead soles, Pacific Ocean perch [POP], and shortspine thornyheads [SSTH]) better than the less valuable or bycatch species (arrowtooth flounder [ATF], pollock, cod, and blackcod).

These results indicate to me that these devices could be very useful in reducing halibut bycatch, particularly in the Gulf of Alaska, where large halibut make up most of the bycatch weight. In addition to finalizing these estimates, I still have to work up the size data to see if there is any size selection occurring for the target species. As you may remember, this was one of the key questions left after last year's study.

I hope that this information is of use to you. I have tried to make it available as soon as possible, recognizing that it would mean some sacrifice in detail. I will be at sea until the last week of September. Please contact me then with any comments or if I can help with any clarification on the work or on this data. (phone 206-526-4128, fax 206-526-6723, craig.rose@noaa.gov).

Sincerely,

Craig S. Rose
Research Fisheries Biologist

cc. Gary Stauffer

Grids and Installation

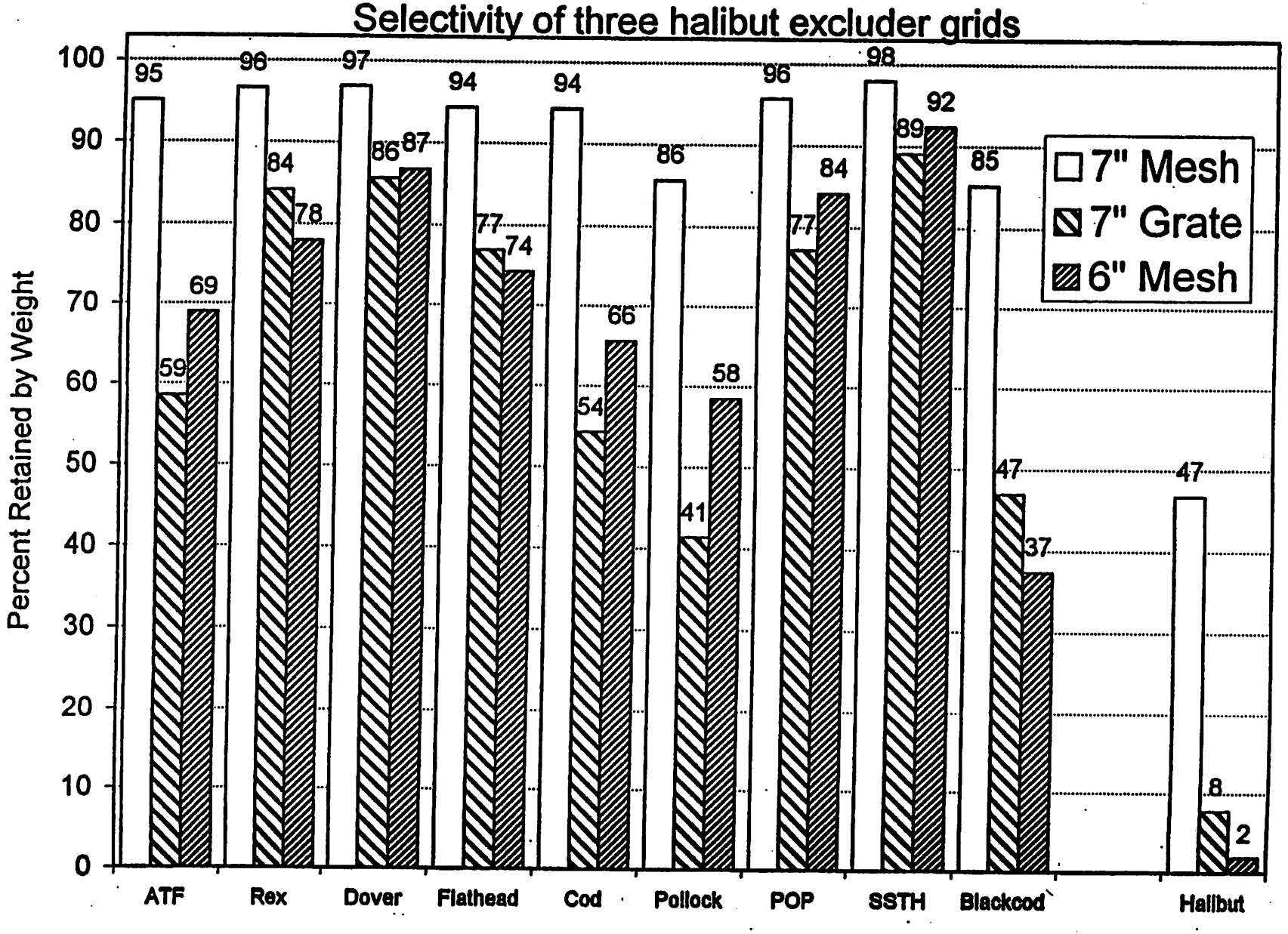
The intermediate of the study trawl was 100 meshes long and had four panels, each 36 open meshes across, of 5.5 inch stretch mesh length of 5.5 mm double polyethylene twine. The seven-inch grids were 8 squares across and 32 squares long, while the six inch grid was 9 by 37. The seven-inch mesh grid was constructed of 0.25 inch woven nylon line, while the six-inch grid was 6 mm knotted polyethylene. The leading edge of the grids were secured to the bottom panel of the intermediate. The first eight squares of the 7-inch grids (9 of the 6-inch) were attached to the side panels with a taper of 2 bars, 1 mesh. The end of this section was 16 intermediate meshes above and 8 meshes behind the point of attachment to the bottom panel. The next 10 squares of seven-inch grid (12 of the 6 inch) were attached along a continuous bar of the intermediate mesh. The last 14 squares of the seven-inch grids (16 of the 6-inch) were attached to 21 meshes of the intermediate extending directly aft. At that point, a panel of 5.5 inch mesh (same composition as the intermediate) was attached to the aft edge of the grid and the side panels of the intermediate for another 18 meshes aft where it was secured to the top panel of the intermediate.

The forward edge of the forcing panel was attached to the top panel of the intermediate, and then along a descending bar of the side panel for 20 meshes. Then its attachment extended 8 meshes directly aft (all points). These 8 meshes were directly above the first section of the selection grid. From that point aft, the forcing panel was attached along the same line as the selection grid, until the horizontal section where they were separated by 2 meshes. The panel continued horizontally aft to where the continuation of the selection panel had been attached to the top of the intermediate. A hole was cut across the top of the intermediate just ahead of that point, and the forcing panel was pulled out through it. The aft corners of the forcing panel were attached to the end of the intermediate with stretch cords (bungee), to prevent it from flapping upward.

To keep the grids from folding inwards, fiberglass rods were put under the grids at three places. These were 60 inches of 5/8-inch diameter fiberglass, covered with 3/4-inch rubber hose, with bolts threaded onto the ends for attachment. The forward rod was only used with the six-inch grid. These rods did break a few times during the study, so their design and attachment can be improved. I do feel that their spreading function is critical to the effectiveness of non-rigid excluders. The short sections of chain indicated in the diagram were tied on top of the forcing panel at four locations to keep it in close contact with the separator grids. These were also considered important to the function of the excluders.

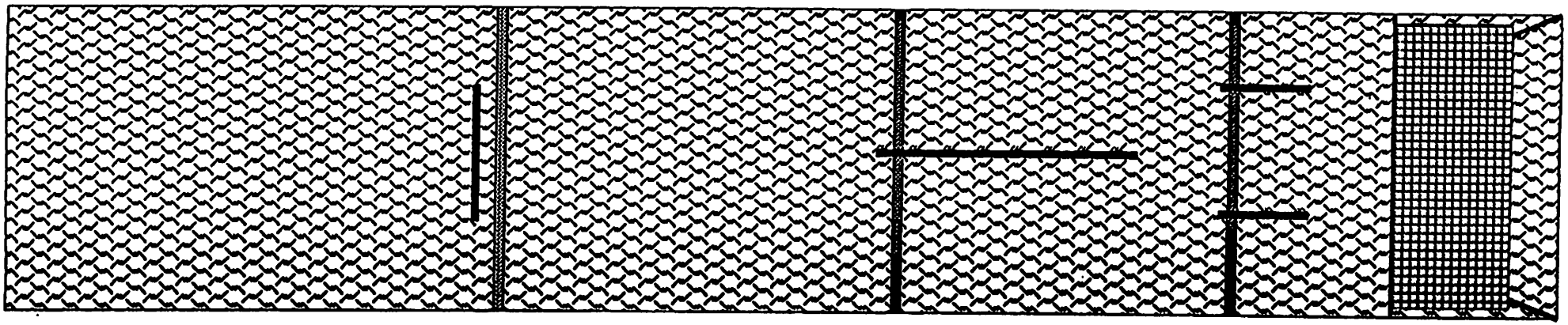
One problem that did occur was that there were usually several halibut and a few skates in the horizontal section of the excluder as the net was being brought aboard. While these were counted as excluded, some effort should be made to help them complete their escape as the net is retrieved.

The main difference between these tests and usual commercial fishing practice was the presence of a recapture net. Because the escape hole was so restricted, it is doubtful that fish were impeded from 'escaping' by that net. Since the net was towed from the top riblines of the intermediate, the additional drag that it produced could have slightly changed the shape of that section. It is not expected that this auxiliary net affected the function of the excluders.

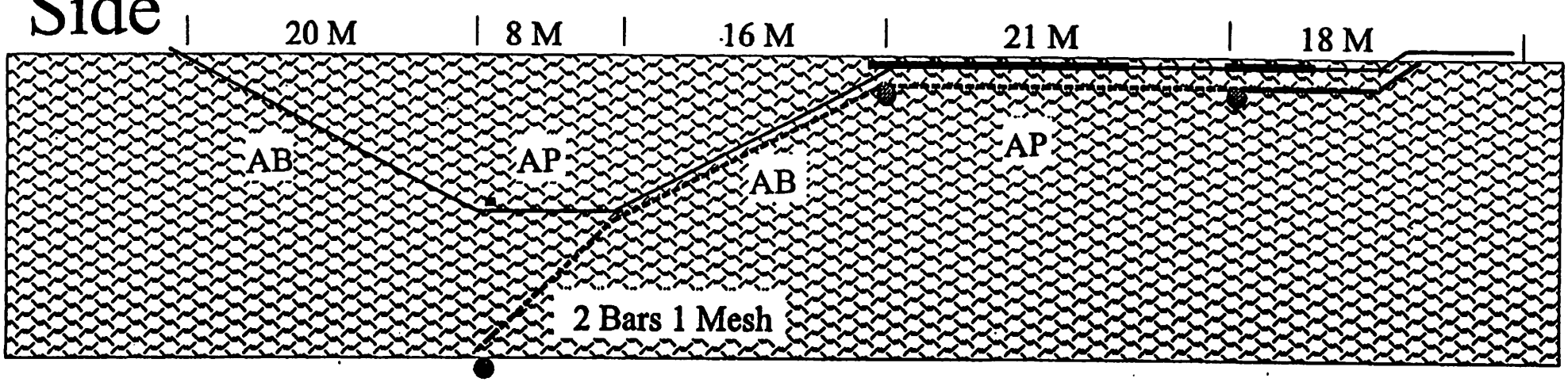

Selectivity of three halibut excluder grids
Percent Retained by Weight
100
90
80
70
60
50
40
30
20
10
0
7" Mesh
7" Grate
6" Mesh
95
59
69
96
84
78
97
86
87
94
77
74
94
54
66
86
41
58
96
77
84
98
89
92
85
47
37
47
8
2
ATF
Rex
Dover
Flathead
Cod
Pollock
POP
SSTH
Blackcod
Halibut

Top

One mesh on drawing = Two meshes on net



Side



Selection Panel (7" bar flexible grid, 7" bar mesh or 6" bar mesh)

Forcing Panel (4" knotless square mesh - 30 X 208 open 2" bars)

Weight Chains (5/8" long link, 1X4', 1X6', 2X3')

Spreading rods (60 inches of 5/8" fiberglass)

Incidental Catch and Mortality of Pacific Halibut: 1962-1998

by

Gregg H. Williams

INTRODUCTION

Pacific halibut (*Hippoglossus stenolepis*) are inadvertently caught by fisheries targeting on other fish and shellfish. 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 1998 is 13.1 million pounds, a 3% reduction from 1997. This document provides an overview of areas and fisheries which contributed to halibut bycatch mortality in 1998.

SOURCE OF BYCATCH ESTIMATES

For most fisheries, 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 an observer program covering the groundfish fishery off Alaska and provides bycatch estimates. Estimates for 1998 were based on estimated bycatch reported from fishing through November 1 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 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 quotas program instituted in 1996 by the Department of Fisheries and Oceans (DFO). Fishery observers sample the catch on each trawler, collecting data to estimate bycatch. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish longline fisheries, is largely unknown. However, DFO is currently examining the shrimp trawl fishery for halibut bycatch potential. Results are expected by the spring of 1999.

Observer information for the Area 2A domestic trawl and hook-&-line fisheries is lacking. IPHC staff, state, and federal agencies have recently established methodology for estimating bycatch using commercial fishery logbook information and results from gear experiments, using 1987 as a baseline year. Estimates are now being calculated every three years, coinciding with NMFS trawl surveys of the area. The CPUE from the survey is used to index the bycatch rates against changes in halibut abundance. More detailed information can be found in Williams et al. (1998).

DISCARD MORTALITY RATES

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 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 in other reports (Clark et al. 1992; Williams 1997).

Observer data are used to estimate DMRs in the groundfish fishery off Alaska. NMFS manages these fisheries according to a schedule of DMRs; those used in 1998 are summarized in Table 1. DMRs for previous years can be found in Williams (this volume).

IPHC assumes DMRs for most other fisheries. For Area 2A, the domestic groundfish trawl and shrimp trawls are assumed to have a 50% mortality rate, whereas the unobserved hook-and-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. In Area 2B, observers monitoring the Canadian trawl fishery examine each bycaught halibut to determine survival. Data collected by observers in the state-managed scallop fisheries indicate a 50% discard mortality rate is appropriate.

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 (Figure 1). Bycatch mortality declined during the 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. 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 1998 total 13.1 million pounds, a decrease of 3% from 1997 and 35% from 1992. Most of the decrease is attributed to the introduction of Individual Fisherman's Quotas (IFQs) in the Alaskan sablefish fishery and Individual Vessel Bycatch Quotas (IVBQs) in the Canadian trawl fishery.

Estimates of bycatch mortality by fishery and major IPHC regulatory area for 1990 through 1998 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 Alaskan groundfish fisheries. More detailed information on bycatch in the groundfish fisheries off Alaska can be found in the document by Williams (this volume).

Area 2

Bycatch mortality in Area 2 was estimated at 1.22 million pounds in 1998, representing little change from 1997. The IVBQ program for the trawl fishery in Canada, in its third year, contin-

ues to keep halibut bycatch at very low levels in Area 2B. The estimate for 1998 is only slightly higher than 1997.

Bycatch for the trawl fisheries in Area 2A has been estimated for 1987, 1992, and 1995, with estimates for the intervening years filled in by carrying forward the previous estimate. Thus, the 1995 estimate is used for 1996 and 1997. The 1995 (and hence the 1996-1998) estimate increased as a result of an increase in bycatch rates reflecting increases in halibut abundance. An estimate for 1998 is waiting for trawl fishery effort data from state logbooks and should be available in late 1999. Until then, the 1995 estimate is being rolled over.

Much of the bycatch mortality in Area 2C has been eliminated with the introduction of IFQs in 1995. Most halibut and sablefish are caught in mixed target trips, thereby allowing much of what used to be bycatch to be retained by those vessels that hold halibut IFQ. A minor amount of trawling occurs in Area 2C, mostly in the inside waters in state-managed fisheries for flatfish. Trawling in the outside waters has been curtailed in recent years by federal fishery management plans.

Area 3

Bycatch mortality in 1998 in Area 3 was estimated at 4.3 million pounds, down from 4.4 million pounds in 1997. Trawl fishery bycatch mortality increased slightly from 1997, whereas non-IFQ hook & line fishery (e.g., cod) bycatch mortality decreased, especially in Area 3A. The amount of bycatch mortality occurring in Area 3A was calculated at 66% of the total Area 3 bycatch.

Area 4

Area 4 bycatch mortality was estimated at 7.56 million pounds, a decline of 4% from 1997. Trawl fishery bycatch mortality was down from 1997, primarily because the cod and pollock fisheries didn't take their bycatch allotment. Non-IFQ hook & line bycatch mortality declined 15%. Bycatch mortality declined in the pot fishery for cod, helped by extremely low DMRs typical for this gear.

REFERENCES

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

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

Williams, Gregg, Gary Stauffer, Hal Weeks, Mark Saelens, Joe Scordino, Don Bodenmiller, and Tom Northup. 1998. Pacific halibut bycatch in Area 2A: Bycatch rates and current estimates of bycatch mortality. Int'l. Pac. Halibut Comm. Report of Assessment and Research Activities 1998: 269-282.

Table 1. **Preseason assumed discard mortality rates used by NMFS for monitoring halibut bycatch mortality in 1998 in the Alaskan groundfish fisheries. From Williams (this volume).**

Bering Sea/Aleutians Fishery	1998 Preseason Assumed DMR	Gulf of Alaska Fishery	1998 Preseason Assumed DMR
Trawls		***Trawls***	
Atka mackerel	83	Atka mackerel	57
Bottom trawl pollock	76	Bottom trawl pollock	73
Pacific cod	71	Pacific cod	67
Other flatfish	68	Deep water flatfish	64
Rockfish	70	Shallow water flatfish	71
Flathead sole	64	Rockfish	68
Other species	71	Flathead sole	67
Midwater pollock	81	Other species	67
Rock sole	74	Midwater pollock	66
Sablefish	23	Sablefish	67
Turbot	73	Arrowtooth flounder	66
Yellowfin sole	77	Rex sole	69
Pots		***Pots***	
Pacific cod	9	Pacific cod	14
Other species	9	Other species	14
Hook & Line		***Hook & Line***	
Pacific cod	11	Pacific cod	12
Rockfish	22	Rockfish	9
Other species	12	Other species	12
Turbot	12		

Table 2. **Estimates (thousands of pounds, *net weight*) of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) for 1990-1998. Estimates for 1998 are preliminary and subject to change.**

Region and Area	1990	1991	1992	1993	1994	1995	1996	1997	1998
AREA 2A									
Joint Venture	2	2	0	0	0	0	0	0	0
Groundfish Trawl	308	308	385	385	385	548	548	548	548
Shrimp Trawl	82	82	43	43	43	50	50	50	50
Hook & Line	16	16	16	16	16	16	16	16	16
Total	408	408	444	444	444	614	614	614	614
AREA 2B									
Joint Venture	tr	tr	tr	tr	tr	tr	tr	tr	tr
Domestic Trawl	1,679	1,992	1,745	1,661	1,219	1,522	299	215	243
Total	1,679	1,992	1,745	1,661	1,219	1,522	299	215	243
AREA 2C									
Crab Pot/Shrimp Trawl	303	303	303	303	303	303	303	303	303
Groundfish Trawl	27	46	32	1	13	1	2	46	4
Hook & Line (non-IFQ)	509	366	388	413	174	8	4	12	18
Hook & Line (IFQ)	-	-	-	-	-	3	3	3	3
Scallop Trawl	0	0	0	0	5	0	0	0	0
Chatham Str. Sablefish	12	7	3	10	8	8	8	8	8
Clarence Str. Sablefish	5	11	10	15	25	25	25	25	25
Total	856	733	736	742	528	348	345	397	361
AREA 2 Subtotal	**2,943**	**3,133**	**2,925**	**2,847**	**2,191**	**2,484**	**1,258**	**1,226**	**1,218**
AREA 3A									
Crab Pot/Shrimp Trawl	250	250	250	250	250	250	250	250	250
Groundfish Trawl	2,578	3,185	2,821	2,827	2,700	2,299	2,198	2,044	2,082
Hook & Line (non-IFQ)	1,238	1,404	1,580	1,200	913	267	159	534	374
Hook & Line (IFQ)	-	-	-	-	-	119	119	119	119
Groundfish Pot	48	4	17	14	17	18	7	8	17
Scallop Trawl	-	-	-	-	17	0	0	0	0
Pr Wm Sd Sablefish	-	-	-	-	10	10	10	10	10
Total	4,114	4,843	4,668	4,291	3,907	2,963	2,743	2,965	2,852
AREA 3B									
Crab Pot/Shrimp Trawl	50	50	50	50	50	50	50	50	50
Groundfish Trawl	1,726	1,307	1,207	720	906	1,445	1,690	1,201	1,212
Hook & Line (non-IFQ)	265	311	716	287	425	132	97	71	91
Hook & Line (IFQ)	-	-	-	-	-	116	116	116	116
Groundfish Pot	4	3	9	5	6	17	4	5	5
Total	2,045	1,671	1,982	1,062	1,387	1,760	1,957	1,443	1,474
AREA 3 Subtotal	**6,159**	**6,514**	**6,650**	**5,353**	**5,294**	**4,723**	**4,700**	**4,408**	**4,326**
AREA 4									
Crab Pot/Shrimp Trawl	300	300	300	300	300	300	300	300	300
Joint Venture	1,340	-	-	-	-	-	-	-	-
Groundfish Trawl	6,309	8,254	7,622	6,603	7,199	6,610	6,582	5,947	5,858
Hook & Line (non-IFQ)	627	1,464	2,775	861	1,944	1,731	1,535	1,564	1,336
Hook & Line (IFQ)	-	-	-	-	-	60	60	60	60
Groundfish Pot	4	4	21	tr	9	25	30	9	6
Scallop Trawl	-	0	0	0	14	0	0	0	0
AREA 4 Subtotal	**8,580**	**10,022**	**10,718**	**7,764**	**9,466**	**8,726**	**8,507**	**7,880**	**7,560**
GRAND TOTAL	**17,682**	**19,669**	**20,293**	**15,964**	**16,951**	**15,933**	**14,465**	**13,514**	**13,104**

Table 3. **Estimates of bycatch mortality of Pacific halibut (*Hippoglossus stenolepis*) from all sources, in thousands of pounds (net weight), by IPHC regulatory area for 1962 to 1998. Estimates for 1998 are preliminary and subject to change.**

	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	1,218	4,326	7,560	13,104	735	2,609	4,560	7,904

Table 4. **Pacific halibut (*Hippoglossus stenolepis*) bycatch mortality from all sources by IPHC regulatory subarea for 1962 through 1998. Estimates for 1998 are preliminary and subject to change.**

	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	1,158	702	2,499	5,193
1963	-	1,077	206	3,314	2,788	2,038	9,423	-	649	124	1,999	1,682	1,229	5,684
1964	-	1,105	205	9,370	2,269	2,965	15,914	-	667	124	5,653	1,369	1,789	9,601
1965	-	1,435	205	6,097	10,442	3,182	21,361	-	866	124	3,678	6,299	1,920	12,887
1966	-	1,666	213	4,513	7,982	3,400	17,774	-	1,005	128	2,723	4,815	2,051	10,723
1967	-	1,652	439	4,633	4,895	4,718	16,337	-	996	265	2,795	2,953	2,846	9,856
1968	-	1,963	515	5,476	1,577	5,685	15,216	-	1,184	311	3,304	951	3,430	9,180
1969	-	2,183	468	3,806	1,174	7,599	15,230	-	1,317	282	2,296	708	4,584	9,188
1970	-	1,470	562	3,389	2,841	8,028	16,290	-	887	339	2,045	1,714	4,843	9,827
1971	-	1,745	539	2,974	1,367	13,095	19,720	-	1,052	325	1,794	825	7,900	11,896
1972	-	1,750	756	5,406	1,693	9,675	19,280	-	1,056	456	3,261	1,021	5,837	11,631
1973	-	1,509	848	4,452	2,695	8,029	17,533	-	910	512	2,686	1,626	4,844	10,577
1974	477	1,729	532	5,247	3,420	7,620	18,548	288	1,043	321	3,165	2,063	4,597	11,477
1975	477	1,909	639	3,158	2,073	3,650	11,429	288	1,152	385	1,905	1,251	2,202	7,183
1976	477	2,064	708	3,495	2,443	4,564	13,274	288	1,245	427	2,108	1,474	2,753	8,296
1977	477	1,817	580	4,094	1,894	2,914	11,776	288	1,096	350	2,470	1,143	1,758	7,104
1978	477	1,471	377	3,055	1,840	5,023	12,242	288	887	227	1,843	1,110	3,030	7,385
1979	476	1,852	821	5,780	935	5,419	15,282	287	1,117	495	3,487	564	3,269	9,220
1980	476	1,372	520	5,852	1,246	9,235	18,702	287	828	314	3,531	752	5,571	11,282
1981	475	1,188	507	4,720	1,563	6,408	14,859	287	716	306	2,847	943	3,866	8,964
1982	475	867	302	3,797	2,175	4,756	12,373	287	523	182	2,291	1,312	2,869	7,464
1983	476	943	304	2,957	1,935	4,269	10,883	287	569	183	1,784	1,167	2,575	6,565
1984	475	1,074	302	2,140	1,507	4,692	10,189	287	648	182	1,291	909	2,830	6,147
1985	475	1,139	301	1,001	577	4,207	7,700	287	687	182	604	348	2,538	4,645
1986	476	1,161	303	836	410	5,576	8,762	287	700	183	504	247	3,364	5,286
1987	476	1,649	303	2,240	873	5,738	11,279	287	995	183	1,351	527	3,462	6,804
1988	477	1,609	303	3,365	50	8,858	14,662	288	971	183	2,030	30	5,344	8,845
1989	477	1,498	303	3,267	818	7,282	13,646	288	904	183	1,971	494	4,393	8,232
1990	408	1,679	856	4,114	2,045	8,580	17,682	246	1,013	516	2,482	1,234	5,176	10,667
1991	408	1,992	733	4,843	1,671	10,022	19,669	246	1,202	442	2,922	1,008	6,046	11,866
1992	444	1,745	736	4,668	1,982	10,718	20,293	268	1,053	444	2,816	1,196	6,466	12,242
1993	444	1,661	742	4,291	1,062	7,764	15,964	268	1,002	448	2,589	641	4,684	9,631
1994	444	1,219	528	3,907	1,387	9,466	16,951	268	735	319	2,357	837	5,711	10,226
1995	614	1,522	348	2,963	1,760	8,726	15,933	370	918	210	1,788	1,062	5,264	9,612
1996	614	299	345	2,743	1,957	8,507	14,465	370	180	208	1,655	1,181	5,132	8,727
1997	614	215	397	2,965	1,443	7,880	13,514	370	130	240	1,789	871	4,754	8,153
1998	614	243	361	2,852	1,474	7,560	13,104	370	147	218	1,721	889	4,561	7,905

Table 5. **Pacific halibut (*Hippoglossus stenolepis*) bycatch mortality from all sources by geographic region of the coast for 1962 through 1998. Estimates for 1998 are preliminary and subject to change.**

	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	614	243	4,687	7,560	13,104	370	147	2,827	4,560	7,904

Table 6. **Pacific halibut (*Hippoglossus stenolepis*) bycatch mortality in the Alaskan groundfish fishery for 1990 through 1998. Estimates for 1998 are preliminary and subject to change. All federally managed fisheries are represented, including the IFQ sablefish fishery. However, fisheries occurring entirely in state waters (e.g., Chatham Strait sablefish fishery) are not included.**

	Thousands of Pounds, net weight				*Metric Tons, round weight*			
Year/Area	**Trawls**	**H&L**	**Pot**	**Total**	**Trawls**	**H&L**	**Pot**	**Total**
Bering Sea/Aleutians								
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	1,791	25	8,426	3,987	1,080	15	5,082
1996	6,582	1,595	30	8,207	3,970	962	18	4,950
1997	5,947	1,624	9	7,580	3,587	980	5	4,572
1998	5,858	1,396	6	7,260	3,533	842	4	4,379
Gulf of Alaska								
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	3,298	721	22	4,041	1,989	435	13	2,437
Alaska Total								
1990	10,640	2,639	56	13,335	6,418	1,592	34	8,043
1991	12,792	3,545	11	16,348	7,716	2,138	7	9,861
1992	11,682	5,459	47	17,188	7,046	3,293	28	10,367
1993	10,151	2,761	19	12,931	6,123	1,665	19	7,807
1994	10,818	3,456	32	14,306	6,525	2,085	19	8,629
1995	10,355	2,436	60	12,851	6,246	1,469	36	7,751
1996	10,472	2,093	41	12,606	6,316	1,262	25	7,604
1997	9,238	2,479	22	11,739	5,572	1,495	13	7,081
1998	9,156	2,117	28	11,301	5,523	1,277	17	6,816

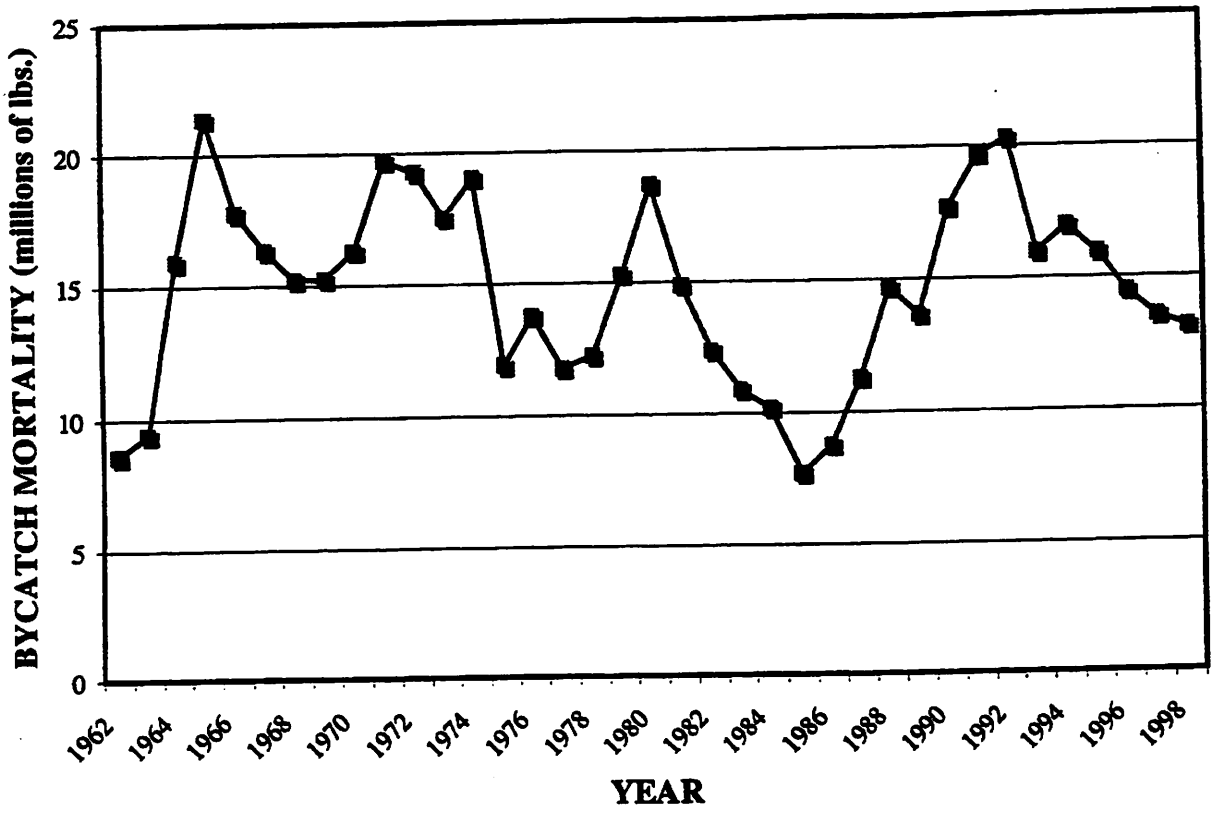


Figure 1. **Pacific halibut bycatch mortality (millions of pounds, net weight) from 1962 through 1998.**