

APPENDIX C

HALIBUT PROHIBITED SPECIES CATCH LIMITS

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This chapter presents information on halibut bycatch in the groundfish fisheries conducted in the Gulf of Alaska (GOA). It is intended for use by the Council to determine the halibut bycatch framework measures. In preparing this report, the GOA Plan Team discussed problems associated with bycatch in the Gulf of Alaska. Domestic groundfish fisheries for halibut, sablefish, pollock, flounder, rockfish, and Pacific cod are all currently managed by species or complex, and yet most species are caught together to some extent. This is true for all gear types. Under the current management scheme, fisheries directed at one species often discard other species, resulting in some discard mortality. Discard mortality of several species may be significant. The incidental catch and mortality of halibut in bottom trawl and longline groundfish fisheries are of principal concern in the Gulf.

Bycatch has in the past been controlled by reducing the total allowable catch (TAC) of other target species through the use of Prohibited Species Catch (PSC) limits, season delays, or some combination of these measures. Since 1995, an Individual Fishing Quota (IFQ) program has been in place in Gulf of Alaska, Bering Sea, and Aleutian Islands which allows the concurrent landing of both species with appropriate quota share holdings. Halibut discard mortality was reduced by 450 mt when the sablefish IFQ fishery was exempted from setting halibut PSC limits in 1995.

The Framework Process

Regulations require the Secretary of Commerce, after consultation with the Council, to propose the PSC limits as soon as practical after October 1 for the next fishing year. Thus, when the Council meets during October, it must decide what recommendations it will provide to the Secretary.

The Council can make recommendations for PSC mortality limits as follows:

1. Among trawl, hook-and-line, and pot gear.
2. Among fisheries complexes (i.e., shallow water trawl and deep water trawl complexes).
3. By season, which may be quarterly, semiannually, or any other reasonably configured period.
4. Gulf-wide or between the Western and Central Regulatory Areas and among the Districts of the Eastern Regulatory Area.

The Secretary will propose the PSC mortality limits in the *Federal Register* and request comment for 30 days from the date of filing with the Office of the Federal Register. The Council will review comments and will make final recommendations on PSC mortality limits at its December meeting. The Secretary will publish final

PSC mortality limits again in the *Federal Register* to be used to manage halibut bycatch mortality in the bottom trawl, hook-and-line, and/or pot fisheries in the Gulf of Alaska during that following fishing year.

The Council is not constrained to any particular PSC limit. The International Pacific Halibut Commission (IPHC) has recommended that halibut bycatch mortality not exceed 6,000 mt in the North Pacific, and has further recommended that halibut bycatch mortality in the Bering Sea/Aleutian Islands and GOA be limited to 4,000 mt and 2,000 mt, respectively. In 1996, the IPHC requested that the Council further decrease PSC caps by 10 percent in 1998, further reduce bycatch in 1999, and divide the savings between lower halibut bycatch limits and increased groundfish harvest.

During each year between 1986-89, the Council recommended a 2,000 mt bycatch mortality limit in the GOA, with only the bottom trawl fishery being affected if this limit had been reached. Between 1990-94, the Council has recommended an additional bycatch mortality limit of 750 mt for fixed gear fisheries. Pot gear was exempted from closures under the fixed gear cap, so all of the 750 mt was allocated to hook-and-line gear. Since 1995, the Council reduced the PSC cap for hook-and-line gear to 300 mt by exempting the IFQ sablefish fishery from halibut PSC restrictions as described above.

Establishing PSC limits for the Gulf of Alaska

Bycatch mortality of Pacific halibut in the Gulf of Alaska groundfish fisheries (trawl and hook & line) is shown below for the last sixteen years (in mt, based on IPHC and NMFS estimates). The amounts of halibut bycatch mortality shown for 1980-1986 reflect estimates of halibut bycatch and mortality from primarily foreign and joint-venture fisheries. The fishing practices currently in use by the fully domesticated fishery may produce very different bycatch estimates. Therefore, data gathered under the domestic observer program beginning in 1990 probably present a more realistic picture of the current groundfish fishery in the Gulf of Alaska. The Plan Team feels that this is the best information available upon which to base decisions regarding the setting of PSC limits for halibut in the Gulf of Alaska. A description of the relevant data from the domestic observer program in 1998 is provided in the subsequent section of this document.

<u>Year</u>	<u>Bycatch (mt)</u>
1980	4,596
1981	4,096
1982	3,785
1983	3,134
1984	2,382
1985	1,134
1986	935
1987	2,061
1988	2,243
1989	2,646
1990	3,936
1991	3,700
1992	3,383
1993	3,244
1994	2,973
1995	2,449
1996	2,118
1997	2,228
1998	2,319
1999*	2,458

*as of October 31, 1999

Halibut Bycatch Management in the Gulf of Alaska During 1998

Definition of terms:

- Bycatch rate - kg/mt of halibut caught in total groundfish catch.
- Mortality rate - that % of halibut bycatch that die after being caught.
- Bycatch mortality rate - kg/mt of halibut that are killed in total groundfish catch.

During 1997 the NMFS Alaska Region managed the groundfish fisheries using halibut bycatch rates from the NMFS Alaska Fishery Science Center's Observer Program Office. The Alaska Region also used assumed mortality rates, which were recommended by the IPHC

NOTE: kg/mt can be converted to % by moving the decimal place to the left one place; for example 21.3 kg/mt is equivalent to 2.13% bycatch per groundfish catch, such that:
 Bycatch rate X mortality rate = bycatch mortality rate (which can be expressed as either kg/mt or as a percent).

and reviewed by the Council. These mortality rates were based on a study of release condition factors. The 1999 fishery-specific discard mortality rates used were as follows:

GOA Trawl fisheries:

Atka mackerel	57%
Bottom trawl pollock	73
Pacific cod	66
Deepwater flatfish	66
Shallow water flatfish	71
Rockfish	64
Flathead Sole, catcher vessel	58
catcher/processor	74
Other species	66
Pelagic pollock	76
Sablefish	71
Arrowtooth flounder	57
Rex Sole	55

GOA Hook and Line fisheries:

(under mandatory Careful Release Measures)	
Pacific cod	16
Rockfish	9
Other Species	16

GOA Pot fisheries:

Pacific cod	6
Other Species	6

Seasonal Apportionments of the Halibut PSC Limit

Under Amendment 21, the halibut PSC limits can be seasonally apportioned. These limits were apportioned quarterly to trawl and hook-and-line gear beginning in 1991. Halibut are expected to be in shallow water during summer months (June through September), and fisheries for Pacific cod and shallow water flatfish require larger shares of the PSC mortality limit during this time to preclude a premature fishery closure. Fisheries for sablefish and deepwater flatfish require larger shares of the PSC mortality limit during January through May and during October through December for similar reasons.

Since 1995, total halibut PSC limits for all fisheries and gear types has totaled 2,300 mt. This cap was reduced from 2,750 mt after the sablefish IFQ fishery was exempted from the halibut PSC requirements in 1995. The following 1999 halibut PSC apportionments were instituted for the Gulf of Alaska groundfish fisheries:

1999 Trawl			1999 Hook and Line		
1st quarter	Jan 20-Mar 31	600 mt (30%)	1st trimester	Jan 1-May 17	250 mt (86%)
2nd quarter	Apr 1-Jul 3	400 mt (20%)	2nd trimester	May 18-Aug 31	15 mt (5%)
3rd quarter	Jul 4 -Sep 30	600 mt (30%)	3rd trimester	Sep 1-Dec 31	25 mt (9%)
4th quarter	Oct 1-Dec 31	400 mt (20%)	DSR		10 mt
TOTAL		2,000 mt			300 mt

One of the Council's objectives is to promote harvest of as much of the groundfish optimum yield (OY) as possible with a given amount of halibut PSC. If some gear types have excessively high bycatch rates during a given season, the Council may consider withholding halibut PSC in order to promote other gear types, which otherwise might be closed prematurely, thereby promoting harvest of the OY.

A regulatory amendment implemented in 1994 set up shallow water and deep water fishery complex categories. The shallow water complex includes pollock, Pacific cod, Atka mackerel, shallow water flatfish, flathead sole, and other species. The closures do not apply to fishing for pollock by vessels using pelagic trawl gear in those portions of the GOA open to directed fishing for pollock. The deep water complex includes deep water flatfish, rex sole, arrowtooth flounder, sablefish, and rockfish. The bycatch trawl limit for the first three quarters was

subdivided between shallow water and deep water complexes. The remaining 400 mt trawl limit is not apportioned.

Seasonal Halibut Bycatch Mortality Caps

Since 1993, halibut PSC mortality has applied only to the bottom trawl and hook-and-line fisheries. The midwater trawl fishery (targeting on pollock) has been exempt from bycatch-related closures. The pot fishery (primarily for Pacific cod), was exempted from fixed gear PSC limit since 1993 due to minimal bycatch mortality. Descriptions of halibut bycatch management in the 1999 trawl and hook-and-line fisheries follow.

Season	Trawl fishery categories		Total
	Shallow Water	Deep Water	
Jan 20-Mar 31	500 mt	100 mt	600 mt
Apr 1-Jul 3	100 mt	300 mt	400 mt
Jul 4 -Sep 30	200 mt	400 mt	600 mt
Oct 1-Dec 31	no apportionment		400 mt
TOTAL			2,000 mt

The 1999 Gulf of Alaska Trawl Fisheries

Trawl gear was used to harvest pollock, flatfish, rockfish, Pacific cod, sablefish, and arrowtooth flounder. The 2,000 mt PSC halibut bycatch mortality limit has been unchanged since 1993, and has been apportioned quarterly such that 30%, 20%, 30%, and 20% (or 600 mt, 400 mt, 600 mt, and 400 mt) are apportioned during the first, second, third, and fourth quarters, respectively.

Bottom trawling for flatfish in shallow water was prohibited on March 21, when the available data indicated that the first quarter allowance of halibut bycatch had been reached. The closure was extended through September 30 because the halibut bycatch through the third quarter was taken. Bottom trawling for deep water flatfish was closed on March 24. The second quarter opened on April 1 and closed on April 24. The third quarter opened on July 4 and closed on July 21. The fishery reopened on August 6 after catch data were reexamined and closed on August 16. The fourth quarter apportionment occurs for both shallow and deep water flatfish. It opened for both sectors on October 1 and closed for the year on October 16, 1999, when the 2000 mt halibut bycatch limit was exceeded.

Through October 31, 1999, total halibut bycatch mortality from trawl gear was 2,114 mt, an overage of 114 mt (Table 1). A summary of trawl halibut bycatch in the Gulf of Alaska for shallow water and deep water complexes by target fishery and week is shown in Table 2.

The 1999 Gulf of Alaska Hook-and-Line Fisheries

The hook-and-line fisheries are directed primarily at sablefish and Pacific cod, with minor effort on rockfish. The PSC halibut mortality limit of 300 mt for the hook-and-line fisheries was apportioned seasonally by trimester. The 300 mt allocation included 10 mt for the demersal shelf rockfish fishery in Southeast Alaska. For the first trimester, 250 mt was allocated. For the second trimester, 15 mt was allocated. The remaining 25 mt was allocated to the rest of the fishing year. The sablefish hook-and-line fishery is managed as an IFQ fishery. The season runs from March 15 to November 15, simultaneous with the halibut IFQ fishery.

Through October 31, 1999, total halibut bycatch mortality from hook-and-line gear was 344 mt, an overage of 44 mt. The breakdown of hook and line halibut bycatch rates by target fishery and week is provided in Table 3. GOA hook-and-line fisheries, except for sablefish and demersal shelf rockfish, were closed on April 24 and remained closed through December 31 due to halibut bycatch.

The Gulf of Alaska Pot Fishery

Pot gear was used to harvest mostly Pacific cod. Total mortality attributed to pot gear is approximately 44 mt, up significantly from 1998 (12 mt) (Table 4). Pot gear has been exempted from PSC mortality limits since 1993.

Expected Changes in Groundfish and Halibut Stocks for 2000

Given the preceding review of the bycatch situation in the Gulf for 1999, it may be useful to examine possible changes in the levels of biomass for target groundfish species and Pacific halibut. Some changes in the expected catch of groundfish for the upcoming fishing year will follow from the biomass estimates reported elsewhere in this SAFE report for GOA groundfish species as a result of the TACs established by the Council. Groundfish catch for most species will equal the TACs, tempered only by the PSC limits imposed by the Council. Lack of interest by industry in harvesting low value species, such as flatfish, may moderate this assumption to some degree. In general, it is apparent that changes in groundfish catch can have no effect on halibut bycatch once a PSC is established; rather, the PSC drives the formula and dictates the catch of groundfish. For 1999, the Council approved a decrease in the total GOA ABC to 532,590 mt from 548,650 mt in 1998. Because of PSC limitations and low interest in low values species, the catch in the GOA fisheries was only ?% of the total 1999 quota. The Team recommended an ABC of ? mt for 2000.

In 1997, the International Pacific Halibut Commission revised its stock assessment methodology for setting annual catch limits for Pacific halibut. As a result, catch limits for the GOA increased from 32.7 million pounds in 1995 to 44 million pounds in 1997, 58 million pounds in 1998, and 48.5 million pounds in 1999. The increased catch limits reflect healthier stock conditions. IPHC staff report no significant change to the Pacific halibut stock assessment or quotas for 2000. Catch limits for 2000 will be decided in late January 2000 by IPHC.

Potential methods for bycatch reduction

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 450 mt in Gulf of Alaska. The change in the nature of the Bering Sea pollock fisheries from open access to cooperatives under the American Fisheries Act has also resulted in a reduction of 2 mt of halibut for 1000 mt of groundfish taken (through September 25, 1999) in Bering Sea non-pelagic trawl fisheries.

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 the press of other Council business. In the interim, management options such as bycatch incentive programs, timing of groundfish seasons, and seasonal apportionments of the halibut PSC limits probably represent the most realistic methods of reducing halibut bycatch. 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.

Several possible methods exist which could contribute to a reduction in halibut bycatch by the groundfish fisheries. One method would be to set the TACs for groundfish at a level which would preclude excessive bycatch. Based on prevailing bycatch rates and mortality rates for each gear group, TACs can be back-calculated and set at levels to attain the desired level of bycatch. The economic tradeoffs associated with this method are discussed in the EA/RIR for Amendment 18. The current halibut bycatch limits amount to approximately 1% of halibut total biomass.

Gear modifications are a potential method of reducing the bycatch rates in the groundfish fisheries. The Council has examined the voluntary use of grid sorting to reduce halibut mortality and is currently reviewing the results of an experimental fishing permit for the use of a halibut excluder device in trawl gear. Any of these options would impose some kind of costs to the fishery which may or may not be offset by the potential benefits of the option chosen.

Gulf of Alaska Trawl Fisheries

Pacific cod Bycatch rates have been low during February through mid April and are high during late April through early August (and likely later).

Pollock Bycatch rates are low during the roe fishery when pelagic gear is used.

Flatfish Bycatch rates have been low during February and high during late March through mid May. However, differences in rate may be due to species composition. Dover sole, rex sole, and flathead sole are considered deep water flatfish species. Others are considered to be shallow water flatfish species.

Rockfish Bycatch rates have been high during March through mid May and lower during late May through mid August. If trawling for rockfish were directed at slope species, then the lower rates during summer may be the result of halibut moving into shallower water, thereby escaping the deep water rockfish fishery.

Sablefish Sablefish was intended to be a bycatch species for trawl gear. NMFS assumes that any catches occurred as a result of bycatches with other groundfish species.

Arrowtooth flounder This species is considered to be a shallow water flatfish species, although they may occur in deep water, also. Few data exist to indicate a trend. High bycatch rates have occurred during late June through mid August as a result of trawling for arrowtooth in shallow water.

Gulf of Alaska Hook-and-Line Fisheries

Pacific cod Bycatch rates have been low during January - through mid April and in the past, have been relatively high during late April through May, likely as a result of halibut moving into shallow water where Pacific cod are found.

Gulf of Alaska Pot Fishery

Pacific cod Bycatch rates have been low during January through mid-March but higher during mid-March through May, likely as a result of Pacific halibut moving into shallow water where Pacific cod are found.

Seasonal distribution of halibut and target groundfish

Halibut bycatch rates for trawl, hook-and-line, and pot gear vary seasonally. Much of the information on the seasonal distribution of halibut can be drawn from the commercial fishery and research surveys. These sources indicate that adult halibut undertake a seasonal migration related to a winter spawning period and a summer feeding period. Spawning generally takes place between 230 and 450 m in depth during November through March, but is greatest during December and January. During April and May, the fish can be found moving up through the gullies and onto the offshore banks, typically 135 to 270 m. During the summer months of June through August, halibut are found shallow, up to 45 m or less in some cases, but generally less than 135 m. Halibut are occasionally found in bays feeding on salmon and other fish. In September and October, halibut begin their movement back to deeper water for spawning. Thus, the spring months of April/May and fall months of September/October can be considered transition periods.

Trawl surveys have yielded information on the distribution of juvenile halibut (ages 2 through 4). Fish of this age are distributed throughout the entire Gulf during the year out to a depth of 180 m and occasionally deeper. However, abundance is greatest at depths of 100 meters or less. Little, if any, seasonal migration is observed in halibut of this size.

The seasonal distribution of the major groundfish species in the Gulf should be considered relevant to the distribution of halibut in efforts to minimize halibut bycatch. Walleye pollock, a pelagic species in all life stages, have probably the least interaction with halibut, in terms of physical location, of all the target groundfish species in the Gulf. Seasonal movements do occur with the fish moving to shallower water in the spring and summer. In the fall and winter months they return to deeper water. There may be vertical movement in the water column associated with feeding and diurnal patterns. Typically, they are found throughout the water column from shallow to deep water, frequently forming large schools at depths of 100-400 m along the outer continental shelf and slope.

Pacific cod are a widespread demersal species found along the continental shelf from inshore waters to the upper slope with adults commonly found at depths of 50-200 m. During the winter and spring cod appear to concentrate in the canyons that cut across the shelf and along the shelf edge and upper slope at depths of 100-200 m where they overwinter and spawn. Most spawning occurs in the spring at depths of 150-200 m along the outer continental shelf off Kodiak Island and in the Shelikof Strait area, as well as Prince William Sound. In the summer, they shift to shallower depths, usually less than 100 m.

The flatfish group, which are all demersal but have varying depth ranges, includes arrowtooth flounder, starry flounder, flathead sole, rock sole, Dover sole, yellowfin sole, and rex sole. Arrowtooth flounders are abundant over a depth range of 100-500 m and aggregate in the deeper portion of that range during the winter months. High densities have been indicated by resource surveys in the waters off southeastern Alaska at depths of 200-400 m. Most occurrences of starry flounder in the Gulf have been at depths less than 150 m while flathead sole are typically found at depths less than 250 m. Rock sole are more of a shallow water species and are most abundant in the Kodiak and Shumagin areas at depths of less than 100 m. Dover sole and rex sole are found throughout the northeastern Pacific and Bering Sea at depths usually less than 275 m. Yellowfin sole are a relatively abundant species in Cook Inlet and are also found in Prince William Sound.

The rockfish group includes four assemblages separated on the basis of habitat and behavioral characteristics - slope rockfish, pelagic shelf rockfish, demersal shelf rockfish, and thornyhead rockfish. Little information is available on life history and distribution patterns of demersal and pelagic shelf rockfish.

Little is known of the slope assemblage, except for Pacific ocean perch (POP). POP are found over a wide range of depths, usually between 100 and 450 m, with the adults performing seasonal bathymetric migrations

associated with reproduction and feeding. They apparently migrate into deep water during fall and winter to spawn and then move to shallower depths to feed in the spring and summer. Separate schools of males and females have been observed migrating from feeding grounds at depths of 150-185 m in the Unimak Pass region to spawning areas at depths of 350-400 m in the Yakutat Bay area. Thornyhead rockfish are benthic and seldom venture off the bottom where they occur at depths of 100-1,500 m.

Sablefish occur in the outer shelf, slope, and abyssal habitats over a depth range of 200-1,200 m with the centers of abundance occurring from 400-1,000 m along the continental slope, especially in or near submarine canyons. Sablefish spawn during late winter to early spring along the continental slope at depths exceeding 400 m. Sablefish spend their first year in estuarine areas, after which their depth distribution increases with age and some fish reach depths of 300 m by their third year. Some research evidence points to migratory movements by sablefish during different life stages, while other research indicates that sablefish remain in the same general bottom area where they settle as sub-adults.

Economic effects of groundfish seasons and seasonal halibut PSCs

An alteration of any species/gear type fishing season will impose some types of costs on certain segments of the fishing industry as well as result in benefits to the same or other segments of the industry. A delay in the season opening could impose costs in the form of foregone revenues. For instance, a delay in the season may shift effort, resulting in less of the PSC limit being available to a higher valued fishery.

Seasonal allocations of the PSC limits will likely have the same potential effects on the fishery as outlined above. The setting of the seasonal apportionments of the PSC limits will be directly related to any season changes adopted by the Council. The way in which these PSC limits are seasonally apportioned will affect the character of the fisheries for each major gear group throughout the year. A change in fishing seasons would require a corresponding shift in the PSC apportionments to accommodate the new season. The result is a tradeoff that must consider the relative values of the different groundfish species harvested and the relative values of halibut bycatch to those fisheries. Ideally, the seasonal apportionment of halibut PSC limits will provide the mechanism for each fishery to fully exploit the available resource without exceeding the PSC limits for each gear group. Fishermen and other industry representatives may be in the best position to provide the relevant information upon which to base the decisions regarding the seasonal apportionment of these halibut PSC limits.

Table 1.

1999 GULF OF ALASKA FISHERIES
 TRAWL HALIBUT BYCATCH MORTALITY (METRIC TONS)
 Week Ending: 10/23/99

WED	SHALLOW WATER COMPLEX		DEEP WATER COMPLEX		GRAND TOTAL
	WEEK TOTAL	CUMULATIVE TOTAL	WEEK TOTAL	CUMULATIVE TOTAL	
01/23/99	6	6	1	1	7
01/30/99	9	15	4	5	20
02/06/99	15	30	2	7	37
02/13/99	19	49	2	9	57
02/20/99	71	120	2	11	131
02/27/99	177	297	0	11	308
03/06/99	221	518	4	15	533
03/13/99	180	698	9	24	721
03/20/99	49	747	24	48	794
03/27/99	0	747	46	94	840
04/03/99	0	747	25	119	865
04/10/99	0	747	86	204	951
04/17/99	0	747	77	282	1,028
04/24/99	0	747	101	383	1,129
05/01/99	0	747	8	391	1,137
05/22/99	0	747	0	391	1,137
05/29/99	0	747	0	391	1,138
06/05/99	1	748	0	391	1,139
06/12/99	2	750	0	391	1,141
06/19/99	0	750	0	391	1,141
07/10/99	0	750	103	494	1,244
07/17/99	0	750	103	596	1,346
07/24/99	0	750	36	632	1,382
08/07/99	0	750	37	669	1,419
08/14/99	0	750	61	730	1,480
08/21/99	0	750	6	736	1,486
09/04/99	0	751	0	736	1,486
09/18/99	1	752	0	736	1,488
09/25/99	1	753	0	736	1,489
10/02/99	104	857	1	737	1,595
10/09/99	401	1258	40	778	2,036
10/16/99	43	1301	33	811	2,112
10/23/99	2	1303	0	811	2,114

CAP:	800	CAP:	800
% OF CAP:	163%	% OF CAP:	101%
REMAINING:	-503	REMAINING:	-11

SEASON	SEASONAL HALIBUT BYCATCH MORTALITY CAPS		TOTAL
	SHALLOW COMPLEX	DEEP COMPLEX	
Jan 01 - Mar 31	500 MT	100 MT	600 MT
Apr 01 - Jul 03	100 MT	300 MT	400 MT
Jul 04 - Sep 30	200 MT	400 MT	600 MT
Oct 01 - Dec 31	- No Apportionment	-	400 MT
TOTALS	800 MT	800 MT	2000 MT
Balance of 4th Quarter available for all trawl fisheries			

Shallow Water Complex = pollock, Pacific cod, shallow-water flatfish, flathead sole, Atka mackerel, and "other species."
 Deep Water Complex = sablefish, rockfish, rex sole, arrowtooth flounder, and deep-water flatfish.

Table 2.

1999 Halibut Bycatch by target fishery and week
in the Gulf of Alaska

Trawl Gear					
KEY	Groundfish Metric Tons	Halibut Bycatch Metric Tons	Bycatch Rate (kg/mt)	Halibut Mortality Metric Tons	Mortality %
B 01/23/99	496.67	1.53	3.07	1.11	0.2
B 01/30/99	293.28	1.21	4.13	0.88	0.3
B 02/06/99	31.89	0.21	6.65	0.15	0.5
B 02/20/99	72.82	0.48	6.65	0.35	0.5
B 05/29/99	94.14	0.25	2.67	0.18	0.2
B 10/02/99	339.08	0.90	2.67	0.66	0.2
B 10/09/99	988.56	0.12	0.12	0.08	0.0
B 10/16/99	1,205.57	0.14	0.12	0.10	0.0
B 10/23/99	30.42	0.00	0.12	0.00	0.0
C 01/23/99	159.04	3.92	24.64	2.59	1.6
C 01/30/99	325.74	8.49	26.05	5.61	1.7
C 02/06/99	789.51	19.45	24.64	12.86	1.6
C 02/13/99	1,561.19	27.57	17.66	18.19	1.2
C 02/20/99	5,002.19	107.56	21.50	70.99	1.4
C 02/27/99	8,161.04	268.68	32.92	177.34	2.2
C 03/06/99	9,380.73	333.47	35.55	220.09	2.3
C 03/13/99	7,467.79	272.08	36.43	179.56	2.4
C 03/20/99	1,654.09	64.41	38.94	42.51	2.6
C 04/17/99	27.57	0.19	6.91	0.13	0.5
C 10/02/99	895.11	156.77	175.14	103.47	11.6
C 10/09/99	5,632.53	607.04	107.77	400.65	7.1
D 03/20/99	375.92	26.10	69.43	17.23	4.6
D 03/27/99	1,030.19	52.64	51.10	34.74	3.4
D 04/03/99	37.07	2.30	61.98	1.52	4.1
D 04/10/99	848.27	42.88	50.55	28.30	3.3
D 04/17/99	599.74	27.93	46.58	18.44	3.1
D 04/24/99	812.67	53.26	65.54	35.14	4.3
D 05/01/99	33.89	1.40	41.40	0.93	2.7
D 07/10/99	132.34	5.48	41.40	3.62	2.7
D 08/21/99	1.46	0.06	41.40	0.04	2.7
H 03/06/99	10.46	0.73	69.44	0.52	5.0
H 03/20/99	36.76	0.71	19.44	0.51	1.4
H 09/04/99	4.24	0.50	117.07	0.35	8.3
H 10/16/99	1,317.00	60.27	45.76	42.79	3.2
H 10/23/99	67.80	3.16	46.59	2.24	3.3
K 02/13/99	12.50	0.52	41.28	0.33	2.6
K 07/10/99	5,154.70	152.08	29.50	97.32	1.9
K 07/17/99	6,583.35	137.67	20.91	88.11	1.3
K 07/24/99	3,209.68	42.54	13.25	27.23	0.8
K 08/07/99	1,511.56	51.49	34.06	32.94	2.2
K 08/14/99	5,083.35	82.52	16.23	52.81	1.0
K 08/21/99	388.24	5.85	15.08	3.75	1.0
K 10/23/99	25.41	0.22	8.59	0.14	0.6
O 03/20/99	804.88	9.19	11.42	6.07	0.8
O 03/27/99	9.77	0.11	11.42	0.07	0.7
O 04/24/99	2.53	0.03	11.42	0.02	0.8
O 10/16/99	4.65	0.05	11.42	0.04	0.9

P	01/23/99	5,104.20	3.09	0.61	2.33	0.0
P	01/30/99	11,948.62	3.68	0.31	2.81	0.0
P	02/06/99	5,166.85	2.21	0.43	1.68	0.0
P	02/13/99	3,809.63	0.47	0.12	0.36	0.0
P	02/20/99	4,643.33	0.10	0.02	0.08	0.0
P	02/27/99	484.49	0.01	0.03	0.01	0.0
P	03/06/99	1,100.22	0.00	0.00	0.00	0.0
P	03/13/99	767.08	0.00	0.00	0.00	0.0
P	03/20/99	42.59	0.00	0.00	0.00	0.0
P	05/22/99	34.53	0.01	0.18	0.00	0.0
P	06/05/99	8,125.37	1.95	0.24	1.47	0.0
P	06/12/99	11,002.87	2.10	0.19	1.59	0.0
P	06/19/99	227.01	0.02	0.09	0.01	0.0
P	09/04/99	7,694.74	0.15	0.02	0.11	0.0
P	09/18/99	8,167.92	1.36	0.17	1.04	0.0
P	09/25/99	12,159.55	1.87	0.15	1.43	0.0
P	10/02/99	6,459.68	0.31	0.05	0.24	0.0
P	10/09/99	2,125.62	0.06	0.03	0.04	0.0
P	10/16/99	3,719.77	0.01	0.00	0.00	0.0
P	10/23/99	137.58	0.00	0.00	0.00	0.0
S	07/17/99	141.87	0.30	2.10	0.21	0.1
S	08/21/99	16.12	0.30	18.60	0.21	1.3
W	03/27/99	67.34	3.32	49.28	2.19	3.3
W	04/03/99	143.32	4.95	34.57	3.27	2.3
W	04/10/99	131.27	6.70	51.08	4.43	3.4
W	04/17/99	468.50	23.09	49.28	15.24	3.3
W	04/24/99	204.68	9.51	46.46	6.28	3.1
W	05/01/99	164.54	8.56	52.01	5.64	3.4
W	07/17/99	272.67	12.99	47.63	8.57	3.1
W	07/24/99	262.63	11.81	44.95	7.79	3.0
W	08/07/99	99.58	2.90	29.13	1.91	1.9
W	10/02/99	9.22	0.27	29.13	0.18	2.0
W	10/09/99	1,089.61	61.29	56.25	40.45	3.7
W	10/16/99	1,040.45	47.33	45.49	31.24	3.0
X	01/23/99	25.48	1.44	56.42	0.79	3.1
X	01/30/99	126.32	6.98	55.28	3.84	3.0
X	02/06/99	73.96	4.14	55.99	2.28	3.1
X	02/13/99	53.09	3.00	56.42	1.65	3.1
X	02/20/99	58.16	3.28	56.42	1.80	3.1
X	03/06/99	188.08	7.83	41.63	4.31	2.3
X	03/13/99	363.89	15.69	43.11	8.63	2.4
X	03/20/99	508.42	12.44	24.48	6.85	1.3
X	03/27/99	518.50	16.63	32.07	9.14	1.8
X	04/03/99	590.72	36.40	61.61	20.02	3.4
X	04/10/99	1,712.25	96.08	56.11	52.84	3.1
X	04/17/99	1,449.98	79.60	54.90	43.78	3.0
X	04/24/99	1,492.41	108.30	72.57	59.57	4.0
X	05/01/99	32.91	2.60	79.07	1.43	4.3
X	07/10/99	63.79	3.98	62.41	2.19	3.4
X	07/17/99	159.54	10.34	64.81	5.69	3.6
X	07/24/99	17.22	1.05	61.09	0.58	3.4
X	08/07/99	96.07	4.27	44.43	2.34	2.4
X	08/14/99	633.55	14.82	23.40	8.16	1.3
X	08/21/99	57.32	3.37	58.83	1.85	3.2
X	10/02/99	43.56	2.35	54.04	1.29	3.0
X	10/16/99	45.19	2.55	56.42	1.41	3.1

Table 3. 1999 Halibut Bycatch by target fishery and week in the Gulf of Alaska

Hook & Line Gear					
KEY	Groundfish Metric Tons	Halibut Bycatch Metric Tons	Bycatch Rate (kg/mt)	Halibut Mortality Metric Tons	Mortality %
C 01/02/99	204.90	17.66	86.18	2.83	1.4
C 01/09/99	704.08	57.90	82.23	9.25	1.3
C 01/16/99	1,014.27	84.92	83.73	13.58	1.3
C 01/23/99	788.70	66.75	84.63	10.70	1.4
C 01/30/99	1,002.16	103.44	103.21	16.56	1.7
C 02/06/99	844.31	86.24	102.15	13.79	1.6
C 02/13/99	672.87	61.72	91.72	9.87	1.5
C 02/20/99	1,221.59	107.07	87.64	17.13	1.4
C 02/27/99	2,239.17	333.82	149.08	53.42	2.4
C 03/06/99	2,121.31	312.23	147.19	49.95	2.4
C 03/13/99	1,141.30	220.50	193.20	35.27	3.1
C 03/20/99	110.12	16.79	152.43	2.68	2.4
C 03/27/99	26.04	3.38	129.63	0.52	2.0
C 04/03/99	10.67	2.41	225.80	0.38	3.6
C 04/10/99	13.60	1.80	132.04	0.29	2.1
C 04/17/99	34.49	4.62	133.83	0.72	2.1
C 04/24/99	1,499.91	605.03	403.38	96.81	6.5
C 05/01/99	98.77	1.86	18.85	0.30	0.3
C 05/08/99	139.39	1.15	8.23	0.19	0.1
C 05/15/99	83.46	1.63	19.59	0.27	0.3
C 05/22/99	164.26	1.85	11.25	0.30	0.2
C 05/29/99	284.93	2.57	9.01	0.42	0.1
C 06/05/99	135.00	1.33	9.83	0.22	0.2
C 06/12/99	112.97	1.09	9.62	0.18	0.2
C 06/19/99	40.90	0.82	19.95	0.14	0.3
C 06/26/99	68.73	1.12	16.29	0.17	0.2
C 07/03/99	47.35	1.45	30.54	0.22	0.5
C 07/10/99	16.79	0.76	45.26	0.12	0.7
C 07/17/99	14.61	0.33	22.52	0.06	0.4
C 07/24/99	8.24	0.62	74.83	0.10	1.2
C 07/31/99	10.17	1.01	98.97	0.15	1.5
C 08/07/99	1.72	0.28	164.86	0.04	2.3
C 08/14/99	5.46	0.33	59.90	0.04	0.7
C 08/21/99	11.01	0.96	87.61	0.14	1.3
C 08/28/99	25.97	1.20	46.02	0.19	0.7
C 09/04/99	2.04	0.33	161.95	0.05	2.5
C 09/11/99	27.48	0.64	23.34	0.10	0.4
C 09/18/99	28.70	1.07	37.40	0.17	0.6
C 09/25/99	17.16	1.19	69.54	0.19	1.1
C 10/02/99	19.04	1.53	80.20	0.24	1.3
C 10/09/99	9.55	0.30	31.17	0.04	0.4
C 10/16/99	10.80	0.66	61.16	0.10	0.9
C 10/23/99	9.17	0.88	96.14	0.15	1.6
D 09/18/99	1.96	0.00	0.00	0.00	0.0
K 01/02/99	2.53	2.04	807.10	0.00	0.0
K 01/09/99	84.94	69.32	816.11	0.00	0.0
K 01/16/99	24.78	16.92	682.73	0.00	0.0
K 01/23/99	77.24	53.87	697.44	1.23	1.6
K 01/30/99	14.81	10.23	691.05	0.00	0.0
K 02/06/99	8.03	0.03	4.08	0.00	0.0
K 02/13/99	0.36	0.00	0.00	0.00	0.0

K 02/20/99	5.66	0.00	0.00	0.00	0.0
K 02/27/99	9.11	7.14	784.06	0.42	4.6
K 03/06/99	5.17	0.83	160.21	0.00	0.0
K 03/13/99	3.51	1.12	320.09	0.10	2.8
K 03/20/99	3.95	0.46	116.26	0.01	0.3
K 03/27/99	5.58	0.89	158.72	0.00	0.0
K 04/03/99	20.12	5.19	258.00	0.02	0.1
K 04/10/99	5.00	0.00	0.00	0.00	0.0
K 04/17/99	8.92	0.74	82.74	0.02	0.2
K 04/24/99	10.93	3.65	333.88	0.24	2.2
K 05/01/99	5.82	0.62	105.68	0.05	0.9
K 05/08/99	4.59	0.22	48.24	0.02	0.4
K 05/15/99	13.34	3.12	233.60	0.20	1.5
K 05/22/99	5.46	1.80	328.93	0.16	2.9
K 05/29/99	5.57	1.10	197.29	0.07	1.3
K 06/05/99	4.24	0.78	183.74	0.07	1.7
K 06/12/99	10.24	3.90	380.40	0.25	2.4
K 06/19/99	12.18	1.34	109.75	0.02	0.2
K 06/26/99	5.75	2.73	474.93	0.15	2.6
K 07/03/99	3.32	0.37	111.15	0.00	0.0
K 07/10/99	7.32	4.75	648.66	0.03	0.4
K 07/17/99	2.39	1.26	528.41	0.11	4.6
K 07/24/99	5.01	1.34	268.45	0.01	0.2
K 07/31/99	7.37	4.53	614.22	0.02	0.3
K 08/07/99	5.22	2.99	571.85	0.10	1.9
K 08/14/99	5.53	3.72	673.26	0.03	0.5
K 08/21/99	5.49	1.80	328.62	0.02	0.4
K 08/28/99	1.47	0.21	145.05	0.02	1.4
K 09/04/99	4.92	1.20	243.35	0.00	0.0
K 09/11/99	3.28	0.98	300.02	0.00	0.0
K 09/18/99	0.41	0.03	80.00	0.00	0.0
K 09/25/99	4.04	1.71	422.21	0.00	0.0
K 10/02/99	4.18	0.65	154.99	0.03	0.7
K 10/09/99	4.23	1.75	412.94	0.05	1.2
K 10/16/99	0.60	0.00	0.00	0.00	0.0
K 10/23/99	0.72	0.00	0.00	0.00	0.0
O 03/20/99	0.56	0.40	721.30	0.06	10.7
O 04/03/99	0.09	0.00	0.00	0.00	0.0
O 05/08/99	47.55	0.61	12.89	0.10	0.2
O 06/12/99	1.40	0.00	0.00	0.00	0.0
O 07/03/99	1.00	0.72	721.30	0.12	12.0
O 07/24/99	16.42	11.84	721.30	1.90	11.6
O 10/23/99	0.01	0.01	721.00	0.00	0.0
S 05/01/99	0.07	0.00	0.00	0.00	0.0

Table 4.

1999 Halibut Bycatch by target fishery and week
in the Gulf of Alaska

Pot Gear

KEY	Groundfish	Halibut Bycatch		Halibut Mortality	
	Metric Tons	Metric Tons	Rate (kg/mt)	Metric Tons	%
C 01/02/99	179.30	1.03	5.74	0.06	0.0
C 01/09/99	1,361.27	19.54	14.35	1.18	0.1
C 01/16/99	1,009.64	8.29	8.21	0.49	0.0
C 01/23/99	1,944.58	15.75	8.10	0.95	0.0
C 01/30/99	528.40	2.93	5.54	0.18	0.0
C 02/06/99	345.26	1.10	3.18	0.05	0.0
C 02/13/99	387.45	1.11	2.86	0.07	0.0
C 02/20/99	1,663.33	9.81	5.90	0.59	0.0
C 02/27/99	2,004.88	13.82	6.89	0.83	0.0
C 03/06/99	1,481.80	13.60	9.18	0.79	0.1
C 03/13/99	2,042.18	13.64	6.68	0.80	0.0
C 03/20/99	928.67	4.93	5.31	0.29	0.0
C 03/27/99	1,539.29	8.66	5.62	0.51	0.0
C 04/03/99	1,973.89	11.00	5.57	0.65	0.0
C 04/10/99	1,656.34	9.19	5.55	0.53	0.0
C 04/17/99	1,526.12	8.11	5.31	0.49	0.0
C 04/24/99	1,516.36	6.09	4.01	0.35	0.0
C 05/01/99	1,331.28	6.34	4.76	0.38	0.0
C 05/08/99	734.82	4.53	6.17	0.28	0.0
C 05/15/99	647.09	4.29	6.63	0.25	0.0
C 05/22/99	488.54	4.61	9.44	0.28	0.1
C 05/29/99	350.52	9.98	28.47	0.60	0.2
C 06/05/99	458.99	25.24	54.99	1.51	0.3
C 06/12/99	306.81	42.46	138.38	2.54	0.8
C 06/19/99	366.49	169.11	461.44	10.15	2.8
C 06/26/99	253.65	122.85	484.35	7.38	2.9
C 07/03/99	177.40	0.57	3.22	0.03	0.0
C 07/10/99	178.40	3.76	21.10	0.22	0.1
C 07/17/99	347.48	24.91	71.68	1.50	0.4
C 07/24/99	243.99	11.53	47.25	0.69	0.3
C 07/31/99	255.27	9.43	36.94	0.57	0.2
C 08/07/99	197.16	9.67	49.05	0.59	0.3
C 08/14/99	267.36	15.26	57.08	0.91	0.3
C 08/21/99	161.87	0.73	4.49	0.04	0.0
C 08/28/99	128.38	0.41	3.21	0.03	0.0
C 09/04/99	95.42	1.57	16.44	0.10	0.1
C 09/11/99	249.40	37.90	151.96	2.28	0.9
C 09/18/99	262.19	38.29	146.03	2.31	0.9
C 09/25/99	169.66	9.05	53.32	0.55	0.3
C 10/02/99	453.26	26.95	59.46	1.61	0.4
C 10/09/99	114.55	0.67	5.83	0.04	0.0
C 10/16/99	11.49	0.04	3.38	0.00	0.0
C 10/23/99	12.86	0.05	3.74	0.00	0.0
O 06/19/99	0.14	0.00	0.00	0.00	0.0
S 09/11/99	10.73	0.00	0.00	0.00	0.0
S 09/18/99	0.14	0.00	0.00	0.00	0.0
S 10/02/99	23.68	0.00	0.00	0.00	0.0
S 10/09/99	9.65	0.00	0.00	0.00	0.0
W 03/13/99	12.25	0.00	0.00	0.00	0.0
Z 05/29/99	30.62	2.31	75.52	0.14	0.5