M E M O R A N D U M

TO: Council, AP and SSC Members

FROM: Jim H. Branson
Executive Director

DATE: December 5, 1985

SUBJECT: Gulf of Alaska Fishery Management Plan

ACTION REQUIRED

Set 1986 Halibut PSC limits.

BACKGROUND

Included in Amendment 14 was a framework procedure for the annual setting of halibut bycatch limits. Under the Gulf Groundfish Plan halibut is defined as a prohibited species and when caught incidentally must be discarded. Currently, the FMP specifies that no more than 29 mt and 52 mt of halibut in the Western and Central Areas can be taken by domestic/joint venture trawlers during the period December 1 through May 31. For 1984 and 1985 the Council raised the bycatch limits to 270 mt and 768 mt in the Western and Central Areas, respectively, and exempted mid-water trawl gear by emergency rule to avoid a premature closure of the Shelikof Strait pollock fishery. The new framework will allow the Council to review and set halibut bycatch limits annually without requiring an emergency rule or plan amendment. In addition, bycatch limits specified using the framework will be effective for an entire year and when reached, all on-bottom trawling will be prohibited.

Since the September Council meeting, the plan team has continued its analysis of domestic bycatch data obtained from state and federal observer programs. Other information studied included material obtained from Natural Resource Consultants and written public comments. A summary of the public comments received during the review period are provided as item D-1(b)3.

As required under the framework, the plan team has prepared a report entitled "Halibut Bycatch Measures for the Gulf of Alaska Groundfish Fishery," included in your notebooks as item D-1(c)1. This report provides biological and some of the socioeconomic information that the Council will want to consider when setting halibut PSC limits for 1986. The report also discusses the halibut bycatch data available and the team's determination that a 0.38 percent bycatch rate be used in estimating potential halibut bycatches in Western and Central Gulf bottom trawl fisheries. The Council should compare these bycatch estimates to the historic PSC limits and those recommended through public comments listed in Table 1 [item D-1(c)2].

Once the Council sets a halibut PSC limit for 1986 they will need to apportion the halibut among DAP and JVP fishermen. In their report the Plan Team recommends operational procedures for monitoring DAP and JVP halibut bycatch. For joint ventures, fishery observers will be used to account for halibut bycatch. All joint venture halibut catch will be deducted from the JVP halibut PSC limit. Once the limit is reached, all bottom trawl joint-ventures will end unless the Regional Director authorizes continued use of the gear under certain conditions. These conditions may include time/area closures or depth restrictions.

Monitoring DAP halibut bycatch is impossible without a domestic observer program. In absence of such a program, the plan team recommends applying the assumed bycatch rate to the DAP estimates for those species where use of on-bottom trawl gear is expected (example: Pacific cod, flounder). When using this method the Regional Director will be able to estimate when the halibut PSC limit will be reached by monitoring groundfish landings. When this level of groundfish landings is reached, all further bottom trawling will be prohibited unless, as with joint ventures, certain conditions are met, or new information becomes available that would suggest lowering the assumed bycatch rate.

The Plan Team will be available to help the Council through these deliberations.

AGENDA D-1(c)1
DECEMBER 1985

Gulf of Alaska Groundfish Plan Team Report

Halibut Bycatch Measures for the Gulf of Alaska Groundfish Fishery

November 27, 1985

31D/AT-1

INTRODUCTION

In December 1983, the North Pacific Council was approached by the U.S. trawl industry and asked to prevent the closure of the developing mid-water Shelikof Strait pollock fishery by the already established halibut PSC limits for domestic trawlers. The PSC limits were considered low given the improving condition of the halibut resource, and were believed to be an unnecessary restriction on a pelagic fishery where halibut bycatches are minimal. The Council increased the PSC limits for 1984 and 1985 by emergency rule and exempted U.S. pelagic trawling from the regulation. The Gulf Plan Team was directed to develop a framework management measure that would achieve the same results as the emergency rules as well as provide the Council with the flexibility to adjust PSC limits when necessary without requiring a plan amendment.

The PSC framework developed and approved under Amendment 14 to the Gulf of Alaska Groundfish Fishery Management Plan allows the Council to set halibut PSC measures if necessary by a fast acting notice procedure. The management framework is intended to allow the full attainment of a groundfish OY as long as incidental catches of halibut are below a predetermined level. Once a PSC limit is reached, all further on-bottom trawling is prohibited. Amendment 14 establishes separate halibut PSC limits for domestic and joint venture fisheries by area. If it chooses to do so, the Council can approve separate PSC limits for subcomponents of the domestic or joint venture fisheries. The halibut PSC framework will be used for the first time in the management of the 1986 groundfish fishery.

The remainder of this report is in two parts. The first part summarizes the halibut PSC framework implemented by Amendment 14 and presents information required by the framework. The second part summarizes the Plan Team's recommendations on implementing the framework.

I. Summary of the Halibut PSC Framework and Required Information

A. Separate PSC limits will be established for the wholly domestic fishery and the joint venture fishery for each area.

B. The Regional Director in consultation with the Council will annually determine:

1. the areas for which PSC limits will be established;

2. the numbers of PSC limits per area and fishery;

3. the level of each PSC limit;

4. whether PSC limits will be allocated to individual operation;

5. the methods of allocation to be used; and

6. the types of gear or modes of operation to be prohibited once a PSC limit is taken. Note that the regulations that implement Amendment 14 define on-bottom trawls as the gear that will be prohibited.

C. The annual determination will be based upon the following types of information:

1. estimated halibut bycatch in years prior to that for which halibut PSC measures are being set;

2. expected changes in groundfish catch;

3. expected changes in groundfish biomass;

4. current estimates of halibut biomass and stock condition;

5. potential impacts of expected fishing for groundfish on halibut stocks and the United States halibut fisheries;

6. the methods available for and costs of reducing halibut bycatch in groundfish fisheries; and

7. other biological and socioeconomic information that affects the consistency of halibut PSC measures given the objectives of the Gulf of Alaska Groundfish FMP.

D. The Regional Director may, by rule-related notice, change halibut PSC measures during the year for which they were specified, based on new information of the types listed above.

Information of each of the aforementioned types is presented below.

1. Estimated Halibut Bycatch for Previous Years

The Foreign Vessel Observer Program is thought to provide accurate estimates of halibut bycatch in the foreign and joint venture fisheries. Observer Program estimates for 1977 through October of 1985 are presented in Table 1. Similar estimates are not available for the wholly domestic groundfish fisheries because there has not been an adequate observer program for the domestic fisheries. However, until quite recently, the level of effort in these fisheries has probably not been high enough to result in significant levels of halibut bycatch.

Table 1.--Estimated halibut bycatch in the foreign and joint venture groundfish fisheries in the Gulf of Alaska, 1977-1985.

(metric tons)

Year	Foreign Trawl	Foreign Longline	Foreign Total	Joint Ventures	Total
1977	2200	0	2200	0	2200
1978	1217	72	1288	0	1289
1979	2365	210	2575	21	2596
1980	2086	1119	3205	48	3253
1981	1192	1307	2499	5	2504
1982	1137	1514	2651	4	2655
1983	772	2463	3235	356	3591
1984	513	1077	1590	572	2162
1985*	15	344	359	269	628

* January-October

The historical allocation of halibut as bycatch to the groundfish trawl fishery can be measured in absolute or relative terms. That is, it can be measured either in terms of the metric tons of halibut that were taken in the groundfish trawl fisheries, or in relative terms terms of this bycatch as a percentage of the sum of directed halibut catch and this bycatch. The mean annual bycatch in the foreign and joint venture groundfish trawl fisheries in the Gulf of Alaska for 1977-84 was approximately 1,561 t. The mean annual directed halibut catch in IPHC Area 3 for the same period was 9,613 t round weight; therefore, bycatch in trawl fisheries accounted for approximately 14 per cent of the total halibut taken in the directed halibut fishery in Area 3. If the total halibut available to these fisheries in 1986 is the same as was taken in 1985 and if 14 per cent of that total is taken as bycatch in the groundfish trawl fisheries, that bycatch will equal approximately 2,700 t.

It should be noted that although the observer program is thought to provide good estimates of bycatch, the estimates of bycatch mortality are potentially less accurate because the handling or discard mortality rates are not known with certainty. These mortality rates are thought to range from 10 to 50 per cent for longline gear and from 50 to 100 per cent for trawl gear. The upper part of the latter range is probably more appropriate for joint ventures and the lower part is more appropriate for small shorebased trawlers.

2. Expected Changes in Groundfish Catch

Based on the Status of Stocks Report for the Gulf of Alaska, a decrease in total groundfish catch in 1986 is expected with a dramatic change in catch composition. These changes will be caused by a very large decrease in pollock catch and potentially large increases in sablefish, Pacific cod, and flounder catch. Such changes are likely to increase halibut bycatch because halibut bycatch rates tend to be much lower for the pollock fishery than for the cod and flounder fisheries. The differences in halibut bycatch rates can in part be explained by the gear used in these fisheries. Flounder and cod are typically taken with bottom trawls while pollock has typically been caught by domestic fishermen with midwater trawls. Use of the latter gear tends to result in dramatically lower halibut bycatch rates.

3. Expected Changes in Groundfish Biomasses

The pollock biomass is expected to be at a very low level in early 1986. The biomass of sablefish is expected to increase, and the biomasses of the other target species are expected to be relatively stable. The sablefish, flounder, and Pacific cod stocks are thought to be in very good condition. The Status of Stocks Report provides additional information on stock conditions for 1986.

4. Current Estimate of Halibut Biomass and Stock Condition

The halibut biomass is increasing and stocks are in good condition. The catch limit for the directed setline fishery was set at 45 million pounds dressed weight or about 27,200 t round weight for the Gulf of Alaska (areas 2C, 3A, and 3B).

5. Potential Impacts of Expected Fishing for Groundfish on Halibut Stocks and the Domestic Halibut Fisheries

The International Pacific Halibut Commission attempts to adjust the harvest of the directed halibut setline fishery to account for halibut bycatch in other fisheries. If the IPHC is successful in properly adjusting the directed halibut harvest and if bycatch does not exceed the halibut ABCs, bycatch will not adversely affect the condition of the resource. The 1985 quotas for the directed halibut fishery were set by the IPHC at approximately 3,800 t and 14,400 t (round weight) respectively for the Western and Central Gulf. These quotas were set after reducing estimated halibut ABCs for expected bycatch losses. The IPHC is expected to set the 1986 halibut quotas at, or above, 1985 levels.

The estimated reduction in directed halibut catch per metric ton of halibut bycatch is from approximately 1 t to over 3.3 t (round weight), depending on the average bycatch size, if the discard mortality rate is 100 per cent and if the future loss to the halibut fishery is not discounted. With a discount rate of 5 per cent, the discounted loss is between 1 and 2.3t of halibut per metric ton of halibut bycatch. Assuming: 1) a round weight to dressed weight conversion factor of 0.75; 2) exvessel and retail prices of $1.33 and $3.00 per pound dressed weight, respectively; and 3) no price response to the decrease in supply caused by the bycatch, the estimated impact per metric ton of halibut bycatch is from $2,000 to $5,200 at the exvessel level and from $4,900 to $11,600 at the retail level. Based on an average weight of 3.15 kg per halibut in joint venture fisheries targeting on Pacific cod and flounder, the estimated impacts per metric ton of halibut bycatch are $3,000 and $6,800 at the exvessel and retail levels, respectively. Both of these measures of impacts are in terms of changes in gross, not net, value. They, therefore, overstate the net impacts. The assumptions of no price response and a handling mortality of 100 per cent also tend to make these upper bound estimates of the impacts. Estimates of the impact per metric ton of halibut bycatch based on alternative assumptions concerning the handling mortality rate and the average size of bycatch halibut are presented in Table 2.

6. Methods Available For, and Costs of, Reducing Halibut Bycatch in Groundfish Fisheries

Bycatch can be reduced by changing fishing strategies including regulations on gear used and the distribution of effort. The experience with PSC limits in the Bering Sea and discussions with fishermen suggest that bycatch rates can be reduced sharply if proper incentives are used. Because bycatch can be reduced by reducing target groundfish catch and because other methods of bycatch reduction are probably less costly, the cost of reducing bycatch by reducing target catch provides an upper-bound estimate. Estimates of this cost that are comparable to the impacts estimated in Table 2 are provided by: 1) the product of the exvessel price and the inverse of the bycatch rate and 2) the product of the retail price, the inverse of the bycatch rate, and the round weight to product weight conversion factor. The former would be appropriate for a joint venture fishery and, perhaps, a domestic fishery. The latter may be appropriate for a domestic fishery.

The following examples are useful in understanding this method of estimating the cost of reducing halibut bycatch. If the bycatch rate is 4 per cent (i.e. if on average 0.04 t of halibut are taken per 1 t of groundfish or if equivalently 1 t of halibut is taken for each 25 t of groundfish) and if the

Table 2.-- Estimated impact per metric ton of halibut bycatch for alternative combinations of handling mortality rates and average sizes of bycatch halibut.

Impact on Discounted Exvessel Value
(dollars)

Handling Mortality (%)	Average Size at Age (kg/halibut) 4 YR 1.38	5 YR 2.73	6 YR 4.69	7 YR 7.25	8 YR 10.35	9 YR 13.87	10 YR 17.71	11 YR 21.71
10	516	342	262	223	205	201	205	220
20	1032	683	525	445	410	401	410	441
30	1548	1025	787	668	615	602	615	661
40	2064	1367	1049	891	820	802	820	882
50	2579	1709	1312	1113	1025	1003	1025	1102
60	3095	2050	1574	1336	1230	1204	1230	1323
70	3611	2392	1836	1559	1435	1404	1435	1543
80	4127	2734	2099	1781	1640	1605	1640	1764
90	4643	3075	2361	2004	1845	1806	1845	1984
100	5159	3417	2623	2227	2050	2006	2050	2205

Impact on Discounted Retail Value
(dollars)

Handling Mortality (%)	Average Size at Age (kg/halibut) 4 YR 1.38	5 YR 2.73	6 YR 4.69	7 YR 7.25	8 YR 10.35	9 YR 13.87	10 YR 17.71	11 YR 21.71
10	1161	769	590	501	461	451	461	496
20	2321	1538	1181	1002	923	903	923	992
30	3482	2307	1771	1503	1384	1354	1384	1488
40	4643	3075	2361	2004	1845	1806	1845	1984
50	5804	3844	2951	2505	2307	2257	2307	2480
60	6964	4613	3542	3006	2768	2708	2768	2976
70	8125	5382	4132	3507	3229	3160	3229	3472
80	9286	6151	4722	4008	3691	3611	3691	3968
90	10446	6920	5313	4509	4152	4063	4152	4464
100	11607	7689	5903	5010	4613	4514	4613	4960

Note: The impact estimates are in terms of reduced discounted value. Exvessel and retail prices of $1.33 and $3.00 per pound dressed weight and a discount rate of 5% are used. No price adjustment is made for the the change in supply that results from halibut bycatch.

exvessel price of groundfish is $220 per t, then at the exvessel level the cost of reducing halibut bycatch by reducing target catch is $5,500 per metric ton of halibut. With the additional assumption of a retail price of $2.50 per pound and a product weight conversion factor of 0.33, the comparable estimated cost at the retail level is approximately $46,000. Estimates of the cost of reducing bycatch by decreasing the target groundfish catch based on alternative assumptions concerning bycatch rates and groundfish prices are presented in Table 3.

7. Other Biological and Socioeconomic Information

a. Bycatch Rates

Halibut bycatch rates vary by area, season, year, target species, and fishing gear. The dependence of bycatch rates on such a large number of factors makes it difficult to determine what the bycatch rate will be or should be in a given fishery.

The 1981 through 1984 annual bycatch rates for foreign trawlers ranged up to 6.1 per cent and were typically close to 2 per cent for the vessel classes that took relatively large amounts of flounder, POP, and Atka mackerel. In the western Gulf, the annual bycatch rates of joint ventures defined by nation ranged up to 6.4 per cent for a joint venture that had a catch composition dominated by flounder and sablefish. In the central Gulf, the annual joint venture bycatch rates ranged up to 5.7 per cent for a joint venture in which cod and flounder accounted for about 80 per cent of the groundfish catch. Bycatch rates from the Japanese Pacific cod longline fishery ranged from 0.7 to 9.2 per cent and have typically been greater than 5 per cent.

Other sources of bycatch rate estimates are the Status of Stocks Report and the ADF&G observer program. Based on the 1984 trawl survey, the former suggests a bycatch rate of approximately 10.5 per cent in a flounder fishery. The latter reports annual bycatch rates for the ADF&G observer program in its entirety from 1.40 to 5.7 per cent. This range was for trawlers targeting on pollock, Pacific cod, or bait. The data have not been disaggregated to estimate bycatch rates in separate fisheries, such as Pacific cod and flounder. The small sample sizes prevent such a disaggregation from providing useful estimates.

After considering both the sources of halibut bycatch rate estimates and the uses that are to be made of bycatch rate estimates, the Plan Team believes that the best estimate is that based on the joint ventures of Taiwan and Spain in the central Gulf during 1984. The weighted average bycatch rate for these joint ventures was 0.038 t of halibut per metric ton of groundfish. Table 4 includes bycatch rate estimates from the Foreign Vessel Observer Program.

b. Changes in Fishing Opportunities

With the sharp decline in the amount of pollock available to fishermen in the Gulf of Alaska, fishermen will be looking for alternative fisheries to enter. Pacific cod, flounder, and sablefish are all in a healthy condition and it is anticipated that these fisheries will see increased effort in 1986. However, if halibut PSC limits are set at levels of recent years, the PSC limit may constrain growth into these fisheries since recent groundfish harvests have emphasized pollock taken with mid-water gear. Incidental catches of halibut will be higher in a Pacific cod and founder fishery since the harvest of these species will likely occur with on-bottom trawl gear.

Table 3.-- Estimated cost of reducing halibut bycatch by one metric ton by reducing target groundfish catch for alternative combinations of bycatch rates and groundfish prices.

Cost at the Exvessel Level
(dollars)

Bycatch Rate (%)	Exvessel Groundfish Price ($ per pound round weight)							
	0.05	0.10	0.15	0.20	0.25	0.35	0.50	0.75
1	11023	22046	33069	44092	55115	77161	110230	165345
2	5512	11023	16535	22046	27558	38581	55115	82673
3	3674	7349	11023	14697	18372	25720	36743	55115
4	2756	5512	8267	11023	13779	19290	27558	41336
5	2205	4409	6614	8818	11023	15432	22046	33069
6	1837	3674	5512	7349	9186	12860	18372	27558
7	1575	3149	4724	6299	7874	11023	15747	23621
8	1378	2756	4134	5512	6889	9645	13779	20668
9	1225	2450	3674	4899	6124	8573	12248	18372
10	1102	2205	3307	4409	5512	7716	11023	16535

Cost at the Retail Level
(dollars)

Bycatch Rate (%)	Retail Groundfish Price ($ per pound product weight)							
	1.25	1.50	1.75	2.00	2.25	2.50	2.75	3.00
1	91858	110230	128602	146973	165345	183716	202088	220460
2	45929	55115	64301	73487	82672	91858	101044	110230
3	30619	36743	42867	48991	55115	61239	67363	73487
4	22965	27557	32150	36743	41336	45929	50522	55115
5	18372	22046	25720	29395	33069	36743	40418	44092
6	15310	18372	21434	24496	27557	30619	33681	36743
7	13123	15747	18372	20996	23621	26245	28870	31494
8	11482	13779	16075	18372	20668	22965	25261	27557
9	10206	12248	14289	16330	18372	20413	22454	24496
10	9186	11023	12860	14697	16534	18372	20209	22046

Note: The cost estimates are in terms of reduced value.

Table 4. -- Catch and bycatch as a percentage of groundfish catch by nation and vessel class, western and central Gulf of Alaska, 1984-1985.

WESTERN GULF

NATION	VESSEL	YR	MO	AREA	POLLOK	PACCOD	ATKAMK	FLOUND	RKFISH	THNYHD	POPC	BLKCOD	SALMON	HALBUT	K CRAB	T CRAB
JAPAN	SML TR	84	13	W GULF	84.77	1.49	5.65	4.87	0.26	0.32	1.97	0.68	0.04	0.61	0.00	0.00
JAPAN	SUR TR	84	13	W GULF	98.29	0.39	0.47	0.57	0.06	0.03	0.09	0.10	0.04	0.19	0.00	0.00
JAPAN	FRZ TR	84	13	W GULF	32.39	21.40	26.54	6.47	0.39	2.47	8.24	2.10	0.01	1.28	0.00	0.00
JAPAN	SAB LL	84	13	W GULF	0.01	2.24	0.00	1.42	0.64	2.59	0.76	92.34	0.00	1.20	0.05	0.55
JAPAN	COD LL	84	13	W GULF	0.46	95.70	0.01	0.81	0.07	0.04	0.11	2.80	0.00	5.34	0.00	0.00
KOREA	SML TR	84	13	W GULF	96.08	2.28	0.05	0.76	0.07	0.01	0.37	0.38	0.02	0.13	0.00	0.00
KOREA	FRZ TR	84	13	W GULF	97.60	1.09	0.01	0.77	0.06	0.01	0.21	0.25	0.00	0.10	0.00	0.00
US-SOVI	J V	84	13	W GULF	9.65	9.43	0.13	64.93	0.01	0.14	1.48	14.22	0.02	6.43	0.03	0.03
US-KORE	J V	84	13	W GULF	70.65	2.59	5.16	4.48	1.78	0.15	12.84	2.35	0.01	1.21	0.00	0.00
US-POLA	J V	84	13	W GULF	97.42	0.29	0.00	1.33	0.00	0.29	0.66	0.02	0.20	0.24	0.00	0.00
US-SPAI	J V	84	13	W GULF	29.83	18.75	1.48	24.49	1.88	0.00	3.20	20.38	0.04	3.44	0.07	0.00
FOREIGN	ALL	84	13	W GULF	76.58	19.55	0.86	1.09	0.08	0.09	0.39	1.36	0.02	1.20	0.00	0.00
ALL	ALL	84	13	W GULF	75.50	16.67	1.58	1.75	0.37	0.10	2.48	1.55	0.02	1.21	0.00	0.00

NATION	VESSEL	YR	MO	AREA	POLLOK	PACCOD	ATKAMK	FLOUND	RKFISH	THNYHD	POPC	BLKCOD	SALMON	HALBUT	K CRAB	T CRAB
JAPAN	SML TR	85	13	W GULF	2.94	0.00	0.00	97.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
JAPAN	SUR TR	85	13	W GULF	99.69	0.17	0.00	0.12	0.00	0.01	0.00	0.01	0.00	0.03	0.00	0.00
JAPAN	COD LL	85	13	W GULF	0.16	99.44	0.00	0.26	0.01	0.00	0.00	0.12	0.00	3.17	0.00	0.00
KOREA	SML TR	85	13	W GULF	98.29	0.26	0.00	0.94	0.03	0.03	0.37	0.09	0.00	0.18	0.00	0.00
KOREA	FRZ TR	85	13	W GULF	98.68	0.24	0.06	0.88	0.01	0.00	0.04	0.09	0.00	0.19	0.00	0.00
US-KORE	J V	85	13	W GULF	78.22	2.38	14.24	2.61	0.25	0.03	1.56	0.71	0.00	0.88	0.00	0.00
US-POLA	J V	85	13	W GULF	99.94	0.00	0.00	0.00	0.05	0.01	0.00	0.00	0.00	0.35	0.00	0.00
US-TAIW	J V	85	13	W GULF	98.85	0.00	0.00	0.00	1.15	0.00	0.00	0.00	0.00	3.21	0.00	0.99
FOREIGN	ALL	85	13	W GULF	68.28	31.15	0.02	0.45	0.01	0.00	0.02	0.07	0.00	1.07	0.00	0.00
ALL	ALL	85	13	W GULF	72.54	20.38	4.95	1.19	0.09	0.01	0.56	0.29	0.00	0.98	0.00	0.00

Table 4. -- Continued

CENTRAL GULF

NATION	VESSEL	YR	MO	AREA	POLLOK	PACCOD	ATKAMK	FLOUND	RKFISH	THNYHD	POPC	BLKCOD	SALMON	HALBUT	K CRAB	T CRAB
JAPAN	SML TR	84	13	C GULF	83.54	1.06	0.22	5.42	0.60	0.80	8.16	0.21	0.01	0.66	0.01	0.00
JAPAN	SUR TR	84	13	C GULF	98.68	0.48	0.00	0.73	0.02	0.00	0.04	0.05	0.02	0.39	0.01	0.01
JAPAN	FRZ TR	84	13	C GULF	21.69	4.34	0.90	24.64	7.30	0.85	39.88	0.39	0.01	1.58	0.01	0.00
JAPAN	COD LL	84	13	C GULF	0.28	95.65	0.00	1.77	0.04	0.00	0.03	2.22	0.00	9.19	0.00	0.02
POLAND	FRZ TR	84	13	C GULF	98.04	0.35	0.00	0.80	0.03	0.04	0.48	0.26	0.61	0.13	0.00	0.00
KOREA	SML TR	84	13	C GULF	95.05	1.74	0.00	2.55	0.03	0.00	0.03	0.60	0.00	0.96	0.00	0.00
KOREA	FRZ TR	84	13	C GULF	92.40	2.15	0.01	3.87	0.13	0.01	0.24	1.18	0.02	1.13	0.00	0.00
US-SOVI	J V	84	13	C GULF	80.39	10.75	0.02	7.48	0.03	0.00	0.38	0.94	0.03	0.96	0.03	0.13
US-KORE	J V	84	13	C GULF	99.17	0.24	0.01	0.06	0.10	0.00	0.42	0.00	0.00	0.04	0.00	0.00
US-POLA	J V	84	13	C GULF	97.44	0.57	0.00	1.73	0.01	0.00	0.07	0.18	0.72	0.35	0.00	0.02
US-JAPA	J V	84	13	C GULF	99.62	0.30	0.00	0.05	0.00	0.00	0.03	0.01	0.02	0.00	0.00	0.00
US-W. GYJ	V	84	13	C GULF	99.68	0.29	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
US-TAIW	J V	84	13	C GULF	33.58	39.13	0.02	24.99	0.33	0.00	0.22	1.73	0.07	3.71	0.22	0.23
US-SPAI	J V	84	13	C GULF	14.29	43.11	0.00	36.59	0.25	0.00	0.12	5.63	0.04	5.74	0.17	0.21
FOREIGN	ALL	84	13	C GULF	84.07	7.48	0.09	3.60	0.54	0.17	3.53	0.52	0.04	1.25	0.01	0.00
ALL	ALL	84	13	C GULF	93.22	3.42	0.02	1.93	0.16	0.04	0.98	0.22	0.07	0.47	0.01	0.01

NATION	VESSEL	YR	MO	AREA	POLLOK	PACCOD	ATKAMK	FLOUND	RKFISH	THNYHD	POPC	BLKCOD	SALMON	HALBUT	K CRAB	T CRAB
JAPAN	SML TR	85	13	C GULF	80.00	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	0.00
JAPAN	SUR TR	85	13	C GULF	99.71	0.01	0.00	0.01	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00
JAPAN	COD LL	85	13	C GULF	0.14	99.70	0.00	0.13	0.01	0.00	0.00	0.01	0.00	6.13	0.00	0.00
KOREA	FRZ TR	85	13	C GULF	92.75	0.02	0.00	6.90	0.00	0.00	0.00	0.33	0.00	0.94	0.00	0.00
US-KORE	J V	85	13	C GULF	99.48	0.33	0.00	0.11	0.00	0.01	0.02	0.05	0.00	0.01	0.00	0.00
US-POLA	J V	85	13	C GULF	97.73	0.49	0.00	1.67	0.00	0.00	0.02	0.08	0.00	0.12	0.00	0.01
US-JAPA	J V	85	13	C GULF	99.30	0.53	0.00	0.15	0.00	0.00	0.01	0.01	0.00	0.02	0.00	0.00
US-TAIW	J V	85	13	C GULF	33.00	27.62	0.00	37.12	0.48	0.00	0.16	1.61	0.00	4.05	0.18	0.63
FOREIGN	ALL	85	13	C GULF	79.65	19.72	0.00	0.38	0.00	0.00	0.02	0.23	0.00	1.26	0.00	0.00
ALL	ALL	85	13	C GULF	97.56	1.57	0.00	0.78	0.01	0.00	0.02	0.06	0.00	0.13	0.00	0.01

Source: NMFS Foreign Vessel Observer Program.

Other alternatives include fisheries in the Bering Sea and Aleutian Islands.

c. Ability to Enforce PSC Limits

The Foreign Vessel Observer Program is thought to provide sufficiently good estimates of halibut bycatch such that PSC limits can probably be enforced in the joint venture fisheries at no additional cost. The Plan Team recognizes that, in the absence of an adequate observer program for the domestic fisheries, the full power of the halibut PSC framework cannot be utilized. The Plan Team discussed three ways to control halibut bycatch in domestic trawl fisheries in the absence of such a program. They are: 1) reduce OYs to assure that an acceptable level of bycatch is not exceeded, 2) use time/area closures, and 3) set a domestic PSC limit and prohibit further domestic on-bottom trawling once it appears the PSC limit has been taken, based on target catch and the expected bycatch rate. Each method is outlined below.

Method 1: Reduce OYs to Limit Bycatch

Historically the Council has set the OYs of Pacific cod and flounders substantially below their ABCs to provide some control on halibut bycatch. The OYs can be set such that, given expected bycatch rates, the domestic PSC limit will not be exceeded. For example, if the domestic PSC limit is 1,000 t of halibut and if the expected bycatch rate is 4 per cent (i.e., 0.04 t of halibut per t of groundfish or equivalently 25 t of groundfish per t of halibut), by limiting domestic groundfish catch in this fishery to 25,000 t of groundfish we would expect halibut bycatch to be limited to the PSC limit of 1,000 t. The disadvantages of this approach are that: 1) it is difficult to limit domestic groundfish catch in our example to 25,000 t without setting OY equal to 25,000 and eliminating the possibility of joint venture and foreign fisheries; and 2) if during the fishing year the domestic fishery adequately demonstrates that its actual bycatch rate is lower than the expected rate, it would be difficult to increase the limit on domestic groundfish catch for that year. The former disadvantage is only relevant if there would otherwise be either a joint venture or foreign fishery that would take part of the affected OY.

Method 2: Time/Area Closures

Time/area closures have been used by the Council to control bycatch and in the absence of an adequate observer program they may be necessary to prevent excessive amounts of bycatch in areas of unusually high concentrations of halibut. For example, if it is known that the bycatch rate in a particular time/area tends to be so high that the value of the groundfish taken in that time/area is expected to be at most equal to the damage that would be done with respect to bycatch, it would be appropriate to close that time/area. However, for controlling bycatch in a larger area, the disadvantage of time/area closures is that it is very difficult to define the closure that will limit bycatch to a given PSC limit.

Method 3: Prohibit Further On-Bottom Trawling in a Fishery Once it Appears that the PSC Limit Has Been Taken

With this method the bycatch of a fishery is estimated based on its landed groundfish catch and the estimated or expected bycatch rate, and once it appears that the PSC limit has been taken further on-bottom trawling would be

PSC limit would appear to have been taken once the groundfish catch reached 25,000 t and further on-bottom trawling would be prohibited in that fishery. If during the year it is adequately well demonstrated that the actual bycatch rate is lower than the expected rate, the use of on-bottom trawls would continue until it appears that based on the revised bycatch rate the PSC limit has been taken. The Plan Team believes that a fishery can adequately demonstrate that its bycatch rate is lower than the expected rate only with onboard observers.

The Plan Team believes that this method is preferable to altering OYs to control bycatch by domestic on-bottom trawl gear if the approach is operational. The Plan Team also believes that the use of limited time/area closures in conjunction with this method may be desirable and suggests that closures could be implemented under the inseason adjustments to PSC measures provided for by the PSC framework.

d. Allocating PSC Limits Between Domestic and Joint Venture Fisheries

Assuming that a market oriented mechanism such as the auctioning of PSC limits or the allocation of transferable PSC limits to individual operations will not be used, there are two basic ways that PSC limits can be established for domestic and joint venture fisheries: 1) an overall PSC limit can be determined and then split between the two types of fisheries; or 2) the PSC limit for each type of fishery can be determined independently. If the former approach is used and if the PSC limits are expected to constrain target fisheries with high bycatch rates, the following question is relevant. Should all of the overall PSC limit be allocated to the domestic fisheries to minimize the constraint placed on that fishery by its PSC limit, or should the allocation be based on some other criteria that may result in a partial allocation to joint ventures at some cost to the domestic groundfish fisheries? This issue can be avoided if the PSC limits for the two types of fisheries are set independently of each other. For example, this could be done based on the benefits of the PSC limit for each fishery compared to the costs of each limit.

e. Allocations by Operation

Whether or not target species quotas are allocated by nation or operation, it may be desirable to allocate PSC limits to as narrowly defined operational units as is practicable. The advantages of doing this are: 1) it provides each operational unit a stronger incentive to reduce bycatch; and 2) the actual bycatch of one unit will not affect the ability of other units to proceed with their planned fishing activities. The latter will result in a more orderly and less costly fishery and what some would consider a more equitable fishery. The disadvantage of such allocations include the difficulty of determining what these allocations should be.

f. Gear to Prohibit Once a PSC Limit is Taken

Because halibut bycatch rates are very low with off-bottom trawls, it is probably appropriate to prohibit on-bottom trawling once a PSC limit is taken.

II. Plan Team Recommendations

1. The Appropriate Level for the Sum of the Domestic and Joint Venture PSC Limits

The determination of the overall level of the PSC limits is an allocation decision. The Plan Team has provided information that will aid the Council in determining the overall level, but since this determination will depend on how the Council decides to weight the value of halibut that is taken in the halibut and groundfish fisheries, the Plan Team did not recommend a specific allocation. The information provided by the Plan Team includes estimates of the value of halibut to the halibut and groundfish fisheries and estimates of the historical allocations. Table 5 presents both the implied halibut PSC limits for previous years and potential overall PSC levels for 1986 based on historical bycatch and public comments.

2. Allocating the Overall PSC Level Among Domestic and Joint Venture Fisheries

The Plan Team discussed the issue of having a joint venture PSC limit greater than zero when the resulting domestic PSC limit would tend to limit the groundfish catch of the domestic fishery. It was noted that the Council's decision to have separate PSC limits for domestic and joint venture fisheries suggests that such a circumstance might well be acceptable. This is similar to the situation in which the domestic halibut fishery catch has been limited by bycatch in both joint venture and foreign fisheries. Pat Travers is aware of this issue and is expected to have a legal opinion prepared for the Council. Information provided in this report on the relative value of halibut to alternative groundfish fisheries will assist the Council in determining the appropriate PSC limits for joint ventures.

3. Operational Characteristics of Halibut PSC Measures

The Plan Team had a lengthy discussion of the potential operational characteristics of halibut PSC measures and recommends the following.

Joint Ventures

- Establish an overall joint venture PSC limit.
- Allocate it to individual joint ventures on the basis of expected target catch.
- Use Foreign Vessel Observer Program data to monitor bycatch.
- Count all halibut bycatch of a joint venture against its PSC limit.
- Prohibit further on-bottom trawling by a joint venture that has taken its PSC limit.

Domestic Fisheries

- Establish a domestic on-bottom trawl PSC limit and an expected bycatch rate.

- Monitor bycatch on the basis of the expected bycatch rate for cod and flounder and the reported trawl catch of cod and flounder.

- Adjust the expected bycatch rate inseason if new bycatch rate information becomes available.

- Set PSC limits at zero for small time/areas for which bycatch rates are expected to be unacceptably high.

- Prohibit further on-bottom trawling once it appears that the PSC limit has been taken.

Foreign Fisheries

- The regulations that implement Amendment 14 do not refer to foreign fisheries; therefore, without changing these regulations, the PSC framework cannot be used to control bycatch in foreign fisheries.

- The permit process can be used to control foreign bycatch of halibut just as it was used to control the bycatch of fully utilized species in 1985.

Table 5.--Halibut PSC limits for previous years and possible overall PSC levels for 1986 based on historical trawl bycatch and public comment.

FMP Prior to Amendment 14--

December 1 - May 31. Foreign on-bottom trawling is prohibited and domestic trawling is only permitted until 29 t and 52 t of halibut are taken in the western and central Gulf, respectively.

June 1 - November 30. Only time/area restrictions and OYs limit bycatch.

Emergency Rules for 1984 and 1985--

Similar to the above except the December 1-May 31 domestic PSC limits were increased to 270 t and 768 t of halibut in the western and central Gulf, respectively. Once a PSC limit is reached, only on-bottom trawling is prohibited.

Overall halibut PSC levels for 1986 based on--

mean annual groundfish trawl halibut bycatch, 1977-1984:	1,561 t
mean annual split between the halibut and groundfish trawl fisheries 1977-1984 (mean annual catch of halibut x 14% overall bycatch rate):	2,700 t

Overall halibut PSC levels for 1986 recommended by:

IPHC and ALFA:	2,000 t
Bob Jacobson:	Set PSC to allow directed halibut catch to remain at the 1985 level.
Deep Sea Fisherman's Union:	Not to exceed 2,500 t
Fishing Vessel Owner's Association:	2,833 t

Note: The recommended overall halibut PSC levels may have in some cases been intended to apply to all groundfish fisheries, not just the domestic and joint venture trawl fisheries.

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Overall halibut PSC levels for 1986 recommended by:

IPHC and ALFA: (mortality rate, not catch) 2,000 t

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