MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: January 7, 1994

SUBJECT: Opilio Bycatch

ESTIMATED TIME
1 HOUR

ACTION REQUIRED

(a) Report on Opilio bycatch in all fisheries.
(b) Determine whether to proceed with further analysis.

BACKGROUND

Information on the bycatch of C. opilio crab in groundfish and crab fisheries will be provided by NMFS and ADF&G. Bycatch numbers for the 1992 Bering sea C. opilio and C. bairdi Tanner crab fisheries are listed in the attached tables. NMFS will provide a report on C. opilio bycatch in the groundfish fisheries at the meeting.

Based on this information, the Council may consider initiating an analysis for a plan amendment to establish PSC caps for C. opilio Tanner crab in the BSAI, or some other program. Existing PSC crab caps for the BSAI trawl fisheries total 200,000 king crab and 4,000,000 C. bairdi Tanner crab. Another program that could be established to address bycatch is the vessel incentive program (VIP) for the BSAI and GOA trawl fisheries. Seasonal starting dates or area closures may also have some potential to reduce bycatch.

Catch per unit effort (CPUE) of selected commercially important species during the 1992 Bering Sea C. opilio fishery including total sample catches and estimated total catch in the fishery.

Species	Total pot sample catch[a]	Catch per unit effort	Estimated total fishery catch[b]
C. opilio			
legal male	253,995	208.9	267,767,184
sub-legal male	1,857	1.5	1,922,694
female	3,855	3.2	4,101,747
C. bairdi			
legal male	3,194	2.6	3,332,670[c]
sub-legal male	9,886	8.1	10,382,548
female	958	.8	1,025,437

[a]Total pot contents derived from 1,216 random samples taken on catcher processors during the fishery.

[b]Estimated catch derived from pot sample CPUE x 1,281,796 total reported pot pulls during the fishery.

[c]Unknown portion legally retained.

Catch per unit effort (CPUE) of selected commercially important species during the 1992 Bering Sea C. bairdi crab fishery from November 15th to December 31st, 1992, including total sample catches and estimated total catch in the fishery.

Species	Total pot sample catch[a]	Catch per unit effort	Estimated total fishery catch[b]
C. bairdi			
legal male	15,365	29.7	14,629,181
sub-legal male	21,917	42.3	20,835,500
female	5,354	10.4	5,122,676
C. opilio			
legal male	2,754	5.3	2,610,595[c]
sub-legal male	86	.2	98,513
female	66	.1	49,257

[a]Total pot contents derived from 517 random samples taken on catcher processors between November 15th and December 31st, 1992.

[b]Estimated catch derived from pot sample CPUE x 492,565 total reported pot pulls between November 15th and December 31st, 1992.

cUnknown portion legally retained.

HILLSTRAND

NEW ERA OF ALASKA, INC.
F/V Time Bandit
Johnathan Hillstrand
P. O. Box 3186, Homer, Alaska 99603
(907) 235-2976
Fax (907) 235-6557

Mr. Rick Lauber, Chairman
North Pacific Fishery Management Council
P. O. Box 103136
Anchorage, Alaska 99833

Dear Chairman and Members of the Council:

REGARDING OPILIO BY-CATCH

Regulations and gear restrictions are a very powerful and effective management tool. As you know, millions of opilio crab were destroyed in 1993 by the trawling industry. The mutilation of this many crab, especially female crab, in any numbers, can be devastating to the crab fleets future resource.

Boundaries or a line must be drawn to protect these crab. Drawing a line from Unimak Island to St. Matthew Island in 70 fathoms for the trawling fleet would eliminate crab by-catch to almost nothing. Crab being deeper in the winter months, out to 70 fathoms, and shallower in summer months.

Allowing only boats with proven clean methods of fishing bottom fish on the inside of that line. Harvesting those fish without disturbing crab habitat and the precious crab resource.

Sole could be fished with a pot with an opening the size of a sole. Thin and wide, only allowing sole to enter. No crab and no cod, no other by-catch entering without dragging up the bottom, killing plant life and ruining habitat.

Regulation of escape rings on the tunnels of opilio and bairdi crab pots, allowing female and recruit crab to escape would also cut by-catch of crab considerably in these two fisheries.

Again, regulations of gear types and restrictive boundaries is a very powerful and effective tool needed to manage this fishery and stop unnecessary by-catch and destruction.

Thank you for your concern.

Sincerely,

Johnathan Hillstrand

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

AGENDA D-2(c)
JANUARY 1994
Supplemental

January 6, 1994

JAN 10 1994

Richard B. Lauber, Chairman
North Pacific Fishery Management Council
P.O. Box 103136
605 West 4th Avenue
Anchorage, Alaska 99501

Dear Rick,

Under Agenda Item D-2(d), the North Pacific Fishery Management Council will review bycatch information for Opilio Tanner crab (Chionoecetes opilio) in all fisheries, including directed groundfish fisheries. We have summarized certain Opilio bycatch information from the 1993 groundfish trawl fisheries in the Gulf of Alaska (GOA) and in the Bering Sea and Aleutian Islands area (BSAI).

Attached are tables that show Opilio bycatches. A total of 5,694 and 14,476,797 Opilio crabs (Table 1) were caught as bycatch in the GOA and BSAI trawl fisheries, respectively. Because most of the bycatch occurs in the BSAI, we focused our review in that management area.

Sixty-four percent of the total BSAI Opilio bycatch occurred in the yellowfin sole fishery, followed by 29 percent occurring in the rock sole/"other flatfish" fishery (Table 1). For each of the target fishery categories, most of the bycatch occurred in reporting areas 513 and 514 (Table 2). Figures also are attached, which summarize this information.

We will be available to discuss this information further during the Council meeting.

Sincerely,

for Steven Pennoyer
Director, Alaska Region

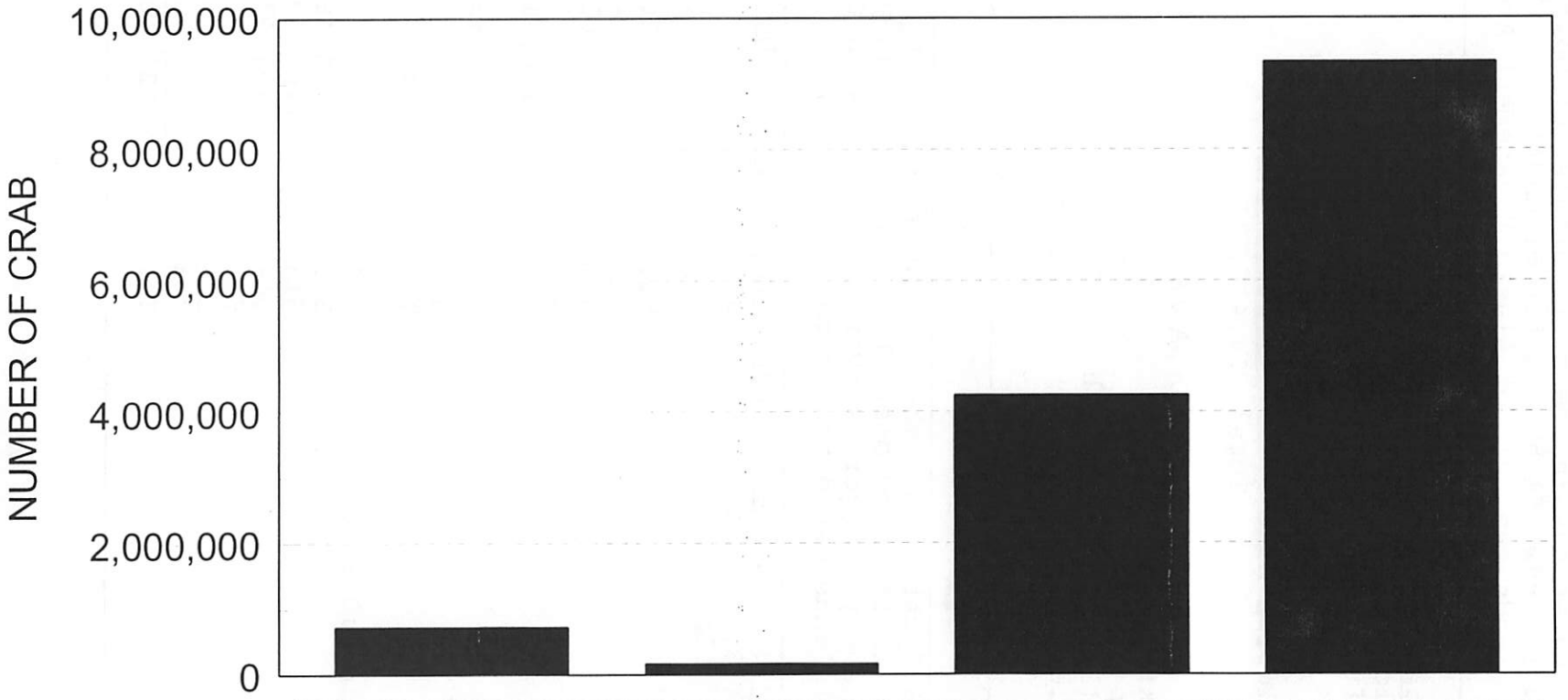
Table 1. 1993 Bycatches (numbers of animals) of Opilio Tanner Crab occurring in trawl fisheries for groundfish in the Bering Sea/Aleutian Islands and Gulf of Alaska Management Areas.

BERING SEA/ALEUTIAN ISLANDS	
Target Fisheries	Number
Pollock	727,177
Pacific cod	165,638
Rock Sole/Other flatfish	4,257,881
Yellowfin sole	9,326,101
Total	14,476,797
GULF OF ALASKA	
Rockfish	2,591
Deep water flatfish	454
Shallow water flatfish	2,571
Sablefish	78
Total	5,694

Table 2. 1993 Bycatches (numbers of animals) of Opilio Tanner Crab occurring in the rocksole/"other flatfish" and yellowfin sole target fishery categories by reporting area in the Bering Sea/Aleutian Islands management area.

Target Fisheries	Reporting Area	Number
Rock Sole/Other flatfish	508	0
	509	2731
	513	2,752,190
	514	1,116,592
	516	1,449
	517	16,038
	519	0
	521	110,515
	523	0
	524	258,367
	540	0
	Total	4,257,882
Yellowfin Sole	508	0
	509	8,468
	513	5,167,494
	514	3,797,439
	516	0
	521	0
	524	352,700
	Total	9,326,101

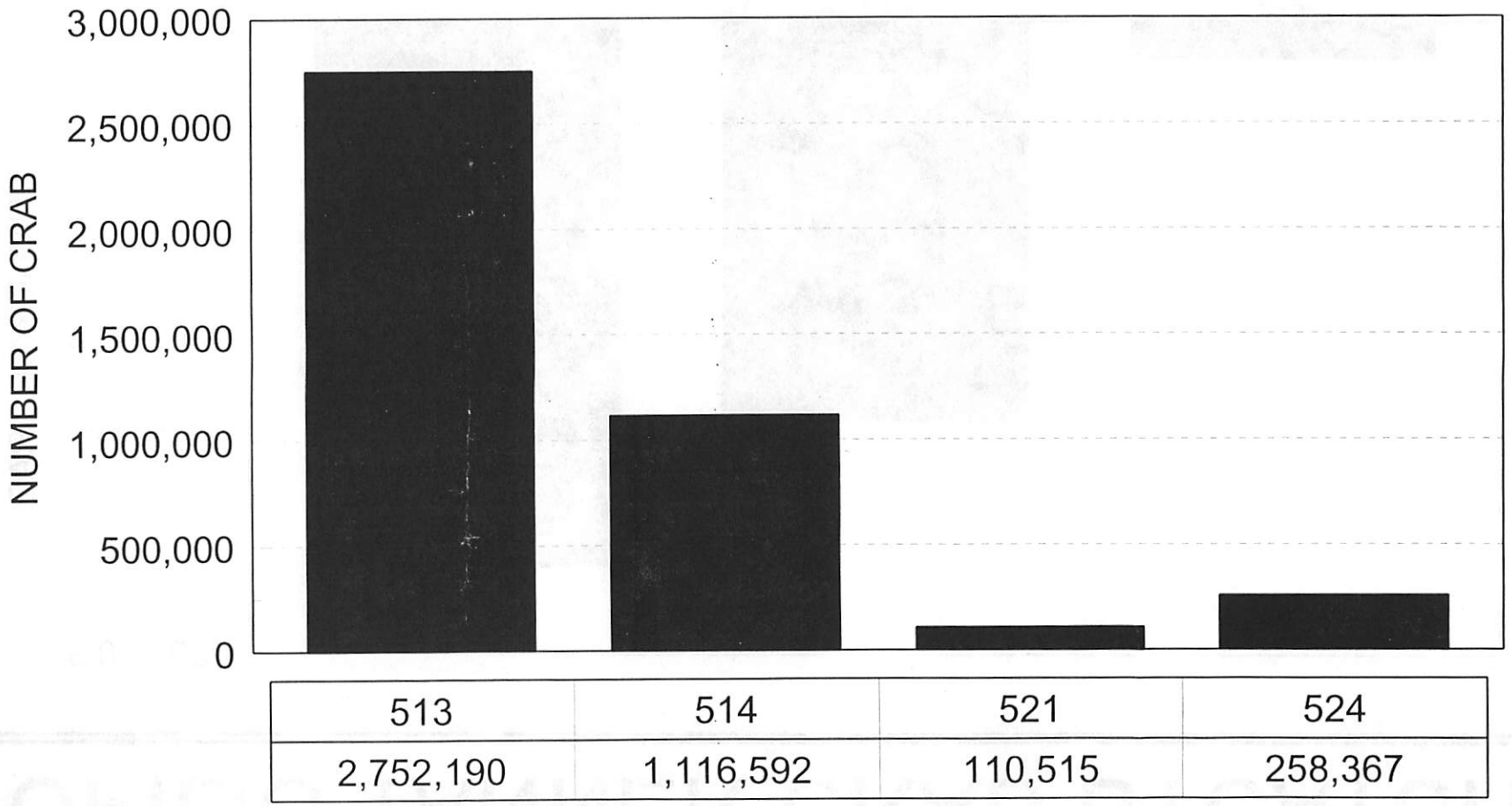
1993 BSAI TRAWL OPILIO TANNER CRAB BYCATCH



PLCK	PCOD	RSOL/OFLT	YSOL
727,177	165,638	4,257,881	9,326,101

(through 12/31/93)

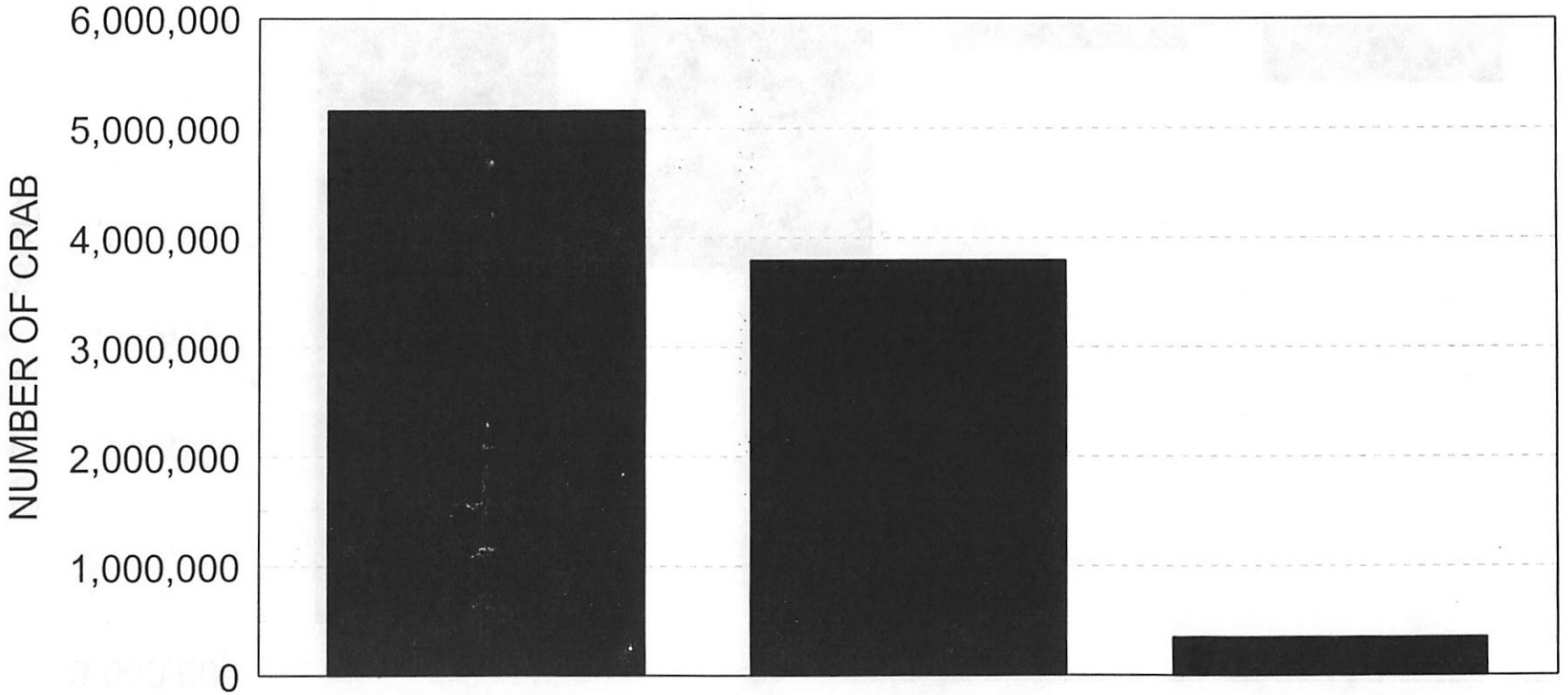
1993 BERING SEA RSOL/OFLT TRW OPTANNER CRAB BYCATCH



513	514	521	524
2,752,190	1,116,592	110,515	258,367

(through 12/31/93)

1993 BERING SEA YSOL TRAWL OPILIO TANNER CRAB BYCATCH



513	514	524
5,167,494	3,797,439	352,700

(through 12/31/93)

COMMISSIONERS:

RICHARD J. BEAMISH
NANAIMO, B.C.
RICHARD ELIASON
SITKA, AK
RALPH G. HOARD
SEATTLE, WA
STEVEN PENNOYER
JUNEAU, AK
ALLAN T. SHEPPARD
PRINCE RUPERT, B.C.
BRIAN VAN DORP
RICHMOND, BC

INTERNATIONAL PACIFIC HALIBUT COMMISSION

DIRECTOR
DONALD A. MC CAUGHRAN

P.O. BOX 95009
SEATTLE, WA 98145-2009

TELEPHONE
(206) 634-1838

FAX:
(206) 632-2983

ESTABLISHED BY A CONVENTION BETWEEN CANADA
AND THE UNITED STATES OF AMERICA

RECEIVED
DEC 29 1993

CRUISE REPORT

HALIBUT BYCATCH SURVIVAL/SORTING EXPERIMENT

F/T Northern Glacier
October 7-28, 1993

Conducted By
International Pacific Halibut Commission
National Marine Fisheries Service
Highliner's Association

December 15, 1993

HALIBUT BYCATCH SURVIVAL/SORTING EXPERIMENT

F/T *Northern Glacier*

INTRODUCTION

The International Pacific Halibut Commission, the Highliners Association (with Natural Resource Consultants), and the NMFS Alaska Fishery Science Center (AFSC) conducted an experiment to evaluate methods of increasing halibut bycatch survival in bottom trawls. The experiment involved sorting and discarding halibut from the groundfish catch more rapidly than is now current practice, and estimating the savings in halibut discard mortality rates. The experiment took place aboard the F/T *Northern Glacier* from October 6 through 29.

Halibut are caught as bycatch by most gear types used in North Pacific groundfish fisheries, but the majority are taken by trawls, especially those targeting on Pacific cod. Bycatch mortality could be reduced by improving survival and several methods have been suggested to accomplish this goal. One way would be to sort the halibut from the catch on deck, before groundfish and halibut are dumped into the below-deck holding tanks. A screen or grid has been suggested as a means of filtering halibut, particularly large halibut, from the catch. Another possibility is to improve the sorting methods used in the factory, in a manner that returns halibut to the sea more quickly than is currently practiced. Termed enhanced sorting, this practice could improve survival for the smaller fish that previously passed through the grid. This experiment was designed to address these issues.

OBJECTIVES

The experiment involved sorting and discarding halibut from the groundfish catch more rapidly than is now current practice, and estimating the savings in halibut discard mortality rates.

The experiment addressed the following questions:

1) What percent of the total halibut bycatch can be screened by the grid?

2) What percent of the total halibut bycatch can be sorted during the period of enhanced sorting?

3) What is the survival rate of halibut discarded from the grid screening and the enhanced sorting, compared to normal discards?

4) How much additional operating time accrues from the sorting procedures?

5) Will grid screening or enhanced sorting increase overall survival of halibut bycatch from trawls?

Specific objectives were:

1) Determine the sorting capability of a grid or screen placed over the deck opening to the factory holding tanks.

2) Determine if overall halibut mortality is reduced by sorting large halibut out on deck and immediately returning them to the sea.

3) Determine if halibut mortality is reduced by "speed sorting" of bycatch from the groundfish in the factory.

EXPERIMENTAL DESIGN

The vessel targeted Pacific cod in a normal commercial manner over the full 24-hour period. The experiment focused on the bottom trawl Pacific cod fishery because it is allotted the greatest portion of bycatch in the Bering Sea. The vessel operated in the Bering Sea (NMFS areas 517 and 521) and on Sanak Bank in the Gulf of Alaska. Two NMFS observers, one supplied by the vessel and one by the AFSC, determined halibut viability from each haul and sampled the groundfish catch on most hauls.

Two specific experiments were conducted. The first experiment (the Grid Sorting Experiment) evaluated two improved methods of sorting halibut from groundfish against a control method. For many factory layouts, halibut and other prohibited species and discards transit a series of conveyor belts to reach the exit chute. Forty-five minutes or more may elapse for the discard to move from the hold to the exit chute. We considered this procedure for handling discards to be the control method. The second experiment (Live Tank Holding) examined the relative survival of halibut within the established condition categories of excellent, poor, and dead.

For the Grid Sorting Experiment, three treatments were performed: (1) deck sorting with a grid; (2) enhanced sorting of the catch in the factory; and (3) normal sorting in the factory (the control). On the *Northern Glacier*, a single, short conveyor led from the hold to the exit chute. Retained fish were selected from the conveyor, and all else was quickly discarded. The regular procedure on the *Northern Glacier* was designated the enhanced treatment, while the control treatment was simulated by delaying processing for 45 minutes. Thirty hauls for each treatment were conducted, for a total of 90 hauls. We randomized the order of treatments. Other factors monitored were tow duration, haul size, time on deck, and fish size. A factorial analysis will be conducted on the results to determine significance among these factors. In some cases, the data may be post-stratified for the analysis.

The Live Tank Holding Experiment was conducted to reaffirm relative differences in survival of the three condition categories. Halibut sorted from the catch on deck and in the factory were placed in holding tanks with running seawater for 3 days (72 hours) until the end of the trip, when holding time was reduced to about 12 hours. Differences in viability going in and coming out of the tanks will be compared among the 3 conditions (excellent, poor, and dead). Approximately 20 halibut at a time were selected for placement into a tank. Post-stratification will also be done on important factors, notably sorting method, tow duration, time

on deck, and fish size. An ANOVA analysis is planned for the results.

The first four hauls on the first fishing day were used to set up specific sampling procedures, and the first haul tested appropriate grid dimensions. The two grid dimensions examined were 9 inches by 11 inches and 11 inches by 14 inches. These are based on an even division of the deck opening, the first yielding a grid 3 openings deep and 6 wide. The second provided 2 openings deep by 6 wide. The vessel had on-board welding equipment to modify the grid dimensions, which proved to be unnecessary.

Tow duration was not predetermined, but two duration strata of $\geq$ 3 hr and < 3 hr were established. The distribution of tow times was adjusted so that equal numbers of short and long hauls occurred for each treatment.

While no limit was set on the catch of groundfish or halibut, we anticipated catching the following quantities of fish:

Groundfish (other than Pacific cod)	700 mt
Pacific cod	1,500 mt
Prohibited species	
Pacific halibut	less than 50 mt

The vessel was allowed to retain, process, and sell the groundfish caught. Only the traditional prohibited species (crabs, salmon, halibut, herring) were required to be discarded.

DATA COLLECTION

Grid Sorting Experiment

During this experiment, data on length (cm), condition factor (excellent, poor, or dead) observations, and time of observation from the net coming on board were collected from each halibut encountered. Such data will allow enumeration and frequency distributions for the treatments (total halibut, total halibut from grid screening or enhanced sorting, and total halibut missed by the experimental treatment). NMFS observers conducted basket sampling to define the groundfish catch and determined halibut condition, so that these data are consistent with data collected in commercial fishery situations.

A schedule of the treatment for each haul alerted the bridge and the factory so that hauls could be made with factory processing capacity available. As each codend came on board, a biologist started a stopwatch; time of each halibut was recorded to the nearest minute. The observer and the skipper each estimated the groundfish catch. For grid sort treatments, the grid was placed over the hold, the deck crew grabbed halibut prior to the hatch and on the grid, and passed them to biologists for measurement and viability determination by the observer. When deck sampling was completed, the biological team moved to the factory where length, viability and time data were collected for all remaining halibut. For enhanced and control treatments, the sampling process started in the factory. Enhanced treatments started processing groundfish and sorting halibut quickly after dumping to the hold, while control treatments started processing 45 minutes after dumping to simulate the time needed for halibut to transit the factory to the exit chute typical of most layouts.

Live Tank Holding

Three specially-constructed deck-mounted holding tanks, each about 80 square feet by 36 inches high, with seawater circulation, an inside lip, dump door, and water overflow sump were used for holding halibut. Originally, only halibut sorted on deck were scheduled for these tanks, but halibut sorted out from the factory were also placed in these tanks when the factory tanks proved impractical. Initially, halibut collected from the factory were held in one or two 4'x4'x15' holding bins fed with circulating water. Water flow rates exchanged bin volumes about once per hour. Unfortunately, water jets in the holding bins, designed to lubricate large volumes of dead fish flowing to an exit, churned the water significantly, greatly diminishing survival. Halibut from the factory were carried as quickly as possible to the holding tanks on deck.

When a fish was selected for holding, a round, uniquely-numbered ID tag was placed on the tail using a nylon electrical tie. Selected fish were measured, condition factor assessed, and ID number noted on a form. Halibut were released after three days, and date and time of release, ID number, and viability noted on a separate form.

PRELIMINARY RESULTS

Ninety five hauls made during the experiment included four test hauls, one invalid haul caused by a ripped net, and the ninety hauls specified in the experimental design (Table 1). Catch weight ranged from about 5 mt to 35 mt per haul, but most were in the 10 to 15 mt range. The experimental hauls were divided into 30 hauls for each treatment, and the hauls of each treatment partitioned equally among < 3 hr and ≥ 3 hr tows. The number of halibut caught reached 13,861, at an estimated weight of 38,000 kg (2.75 kg/halibut). Groundfish harvest totalled 1,189 mt, of which the retained portion was 243 mt of Pacific cod and 496 mt of pollock. The remaining 450 mt, mostly arrowtooth flounder, other flatfish, and Atka mackerel, were discarded. The halibut bycatch rate was 32 kg/mt. Total Pacific cod and halibut were significantly below the anticipated catch of 1,500 mt of Pacific cod and the maximum 50 mt of halibut. Pollack and discarded groundfish somewhat exceeded the 700 mt anticipated for other groundfish. Bycatch rates were higher than expected, and had the anticipated 2,200 mt of groundfish been harvested, halibut catch would have reached approximately 70 mt.

Approximately equal numbers of halibut were caught in each of the three treatments, with 4,714 in the grid sorting, 4,244 in the control sorting, and 4,903 in the enhanced sorting. In the grid sorting, 1,927 halibut (41%) were collected on deck. While weights have not yet been calculated, larger sizes of halibut sorted on deck probably put the proportion of deck-sorted halibut at least at 50% by weight.

The grid selected for use, although the smaller of the two available, did not directly filter out many of the halibut. The high proportion of deck-sorted halibut was due to the slower rate of dumping catch from the cod end to the hold, and the opportunity for the deck crew to sort out halibut pouring from the cod end to the hatch. Time required to dump a cod end after the net came on board normally ranged from about 90 seconds to 2 1/2 minutes, while a grid sort took about 10 to 15 minutes to dump.

While condition factor data and survival estimates are not yet available, several obvious

conclusions result from observing halibut in the treatments. Halibut collected on deck during the grid sort experienced a high proportion of excellent condition factors. Only a few poor condition halibut were encountered, and halibut in dead condition were rarely seen. For enhanced sorting or grid sorting in the factory, nearly all halibut were in poor condition for about the first 40-50 minutes after the net came on board. A few excellent and dead halibut were noted. For control sorting and for enhanced or grid sorting after about 40-50 minutes, nearly all halibut were in dead condition, with occasional poor and the rare excellent halibut.

Holding tank experiments did not provide as much useable data as anticipated, because of situations with high mortality of halibut in the tanks. Bleeding tanks in the factory did not work because the water flow system agitated the halibut. A sloped floor in the bleeding tanks that prevented halibut from resting without piling up may have also contributed to the mortality. Of three tanks on deck, only one provided consistent data. The best tank was nearly square, while the other two were long and narrow. Vessel movement caused traveling waves in the narrow tanks that disrupted the halibut. In cases of prolonged rough weather, nearly all halibut died, regardless of initial condition factor. A total of 320 halibut from 17 hauls were placed in the live tanks for the standard three day period. Eighty-one more from four hauls were held for 12 hours. Nine hauls of the long holding period were from grid sort hauls, three from control sort hauls, and five from enhanced sort hauls. Three hauls from the short holding period were grid sort, and the last was enhanced sort.

SUMMARY

Ninety hauls equally divided among three sorting treatments provided 13,861 halibut for which condition factor, length, and time on deck were collected. On-deck sorting provided the highest survival, and control sorting caused the most mortality. Pollock and Pacific cod made up the retained catch. About 62% of the total was retained, and the remaining 38% was discarded. At 32 kg/mt, the halibut bycatch rate was higher than expected.

Holding tank experiments were less successful than anticipated. Tanks in the factory could not be used because of excessive mortality, and periods of rough weather caused mortality not related to condition factor in two of the three deck tanks. Periods of good weather during several holding periods permitted useable data from several hauls.

PERSONNEL

Trip 1:
October 7 -- October 19

Gregg Williams, IPHC
Janet Wall, NMFS/AFSC Observer Pgm
Steve Hughes, NRC
Brent Paine, NPFMC
Tracy Schall, NMFS/D. Hbr Observer Pgm
Mike Sloan, NMFS/AKR
Robert Morrow, vessel observer
Shari Gross, HANA

Trip 2:
October 19 -- October 28

Gregg Williams, IPHC
Janet Wall, NMFS/AFSC Observer Pgm
Steve Hughes, NRC
Chris Oliver, NPFMC
Tracy Schall, NMFS/D. Hbr Observer Pgm
Bob Trumble, IPHC
Robert Morrow, vessel observer

Abbreviations:

IPHC	International Pacific Halibut Commission, Seattle
NMFS/AFSC	National Marine Fisheries Service, Alaska Fisheries Science Center, Seattle
NMFS/AKR	National Marine Fisheries Service, Alaska Region Office, Juneau
NMFS/D Hbr	National Marine Fisheries Service, Observer Program, Dutch Harbor
NRC	Natural Resources Consultants, Seattle
NPFMC	North Pacific Fishery Management Council, Anchorage
HANA	Halibut Association of North America, Seattle

For further information, please call Bob Trumble or Gregg Williams at the International Pacific Halibut Commission, Seattle, Washington, (206)634-1838.

Table 1. **Preliminary catch totals during 1993 Halibut Bycatch Survival/Sorting Study. Codes for treatment are CL=Control, ES=Enhanced Sort, and GS=Grid Sort. Haul 590 was considered invalid.**

Date	Haul No.	Treatment	Number of Halibut			Cumul. Total	Live Tank	Cumul. Total
			Deck	Factory	Total			
07-Oct	567	Test	20	n/a	20	20	-	-
	568	Test	88	173	261	281	-	-
	569	Test	105	n/a	105	386	-	-
	570	Test	66	n/a	66	452	-	-
08-Oct	571	GS	182	178	360	360	0	0
	572	CL	0	37	37	397	0	0
	573	ES	0	9	9	406	0	0
09-Oct	574	CL	0	13	13	419	0	0
	575	ES	0	57	57	476	0	0
	576	GS	94	38	132	608	14	14
	577	GS	41	23	64	672	8	22
	578	CL	0	68	68	740	12	34
10-Oct	579	ES	0	58	58	798	0	34
	580	CL	0	53	53	851	0	34
	581	GS	24	4	28	879	7	41
	582	ES	0	64	64	943	0	41
11-Oct	583	GS	60	14	74	1,017	0	41
	584	ES	0	8	8	1,025	0	41
	585	CL	0	29	29	1,054	0	41
12-Oct	586	ES	0	65	65	1,119	0	41
	587	CL	0	6	6	1,125	0	41
	588	GS	12	4	16	1,141	3	44
	589	CL	0	55	55	1,196	0	44
13-Oct	590							
	591	GS	53	9	62	1,258	18	62
	592	ES	0	69	69	1,327	13	75
	593	GS	2	37	39	1,366	0	75
14-Oct	594	ES	0	96	96	1,462	0	75
	595	CL	0	79	79	1,541	0	75
	596	ES	0	50	50	1,591	0	75
15-Oct	597	CL	0	2	2	1,593	0	75
	598	GS	4	6	10	1,603	0	75
	599	CL	0	54	54	1,657	0	75
	600	GS	3	25	28	1,685	0	75
	601	ES	0	52	52	1,737	0	75
16-Oct	602	GS	45	55	100	1,837	18	93
	603	ES	0	85	85	1,922	20	113

Table 1. (continued)

Date	Haul No.	Treatment	Number of Halibut			Cumul. Total	Live Tank	Cumul. Total
			Deck	Factory	Total			
17-Oct	604	CL	0	145	145	2,067	22	135
	605	ES	0	143	143	2,210	0	135
	606	CL	0	123	123	2,333	0	135
18-Oct	607	GS	32	109	141	2,474	0	135
	608	CL	0	27	27	2,501	0	135
	609	GS	111	116	227	2,728	0	135
	610	ES	0	479	479	3,207	0	135
	611	CL	0	172	172	3,379	0	135
	612	ES	0	196	196	3,575	0	135
19-Oct	613	GS	107	242	349	3,924	0	135
	614	ES	0	160	160	4,084	0	135
	615	GS	72	82	154	4,238	63	198
20-Oct	616	CL	0	108	108	4,346	0	198
	617	CL	0	169	169	4,515	19	217
	618	GS	52	113	165	4,680	0	217
21-Oct	619	ES	0	87	87	4,767	21	238
	620	GS	55	93	148	4,915	0	238
	621	CL	0	519	519	5,434	0	238
22-Oct	622	ES	0	107	107	5,541	0	238
	623	ES	0	119	119	5,660	0	238
	624	CL	0	272	272	5,932	0	238
	625	GS	68	125	193	6,125	22	260
	626	CL	0	191	191	6,316	0	260
	627	GS	19	13	32	6,348	0	260
23-Oct	628	ES	0	252	252	6,600	0	260
	629	GS	74	109	183	6,783	0	260
	630	ES	0	139	139	6,922	0	260
	631	CL	0	134	134	7,056	0	260
	632	ES	0	136	136	7,192	20	280
24-Oct	633	CL	0	214	214	7,406	0	280
	634	GS	140	227	367	7,773	0	280
	635	CL	0	201	201	7,974	0	280
	636	GS	80	144	224	8,198	0	280
	637	ES	0	221	221	8,419	20	300
	638	GS	82	186	268	8,687	0	300
25-Oct	639	ES	0	313	313	9,000	0	300
	640	CL	0	255	255	9,255	0	300
	641	ES	0	232	232	9,487	0	300
	642	CL	0	108	108	9,595	0	300
	643	GS	43	68	111	9,706	20	320
	644	CL	0	263	263	9,969	0	320

Table 1. (concluded)

Date	Haul No.	Treatment	Number of Halibut			Cumul. Total	Live Tank	Cumul. Total
			Deck	Factory	Total			
26-Oct	645	GS	97	174	271	10,240	0	320
	646	ES	0	273	273	10,513	0	320
	647	GS	37	107	144	10,657	0	320
	648	CL	0	187	187	10,844	0	320
	649	ES	0	163	163	11,007	0	320
27-Oct	650	ES	0	260	260	11,267	0	320
	651	CL	0	158	158	11,425	0	320
	652	GS	146	167	313	11,738	19	339
	653	CL	0	44	44	11,782	0	339
	654	GS	42	75	117	11,899	0	339
	655	ES	0	99	99	11,998	0	339
	656	GS	51	61	112	12,110	20	359
28-Oct	657	ES	0	281	281	12,391	0	359
	658	CL	0	351	351	12,742	0	359
	659	CL	0	207	207	12,949	0	359
	660	ES	0	630	630	13,579	22	381
	661	GS	99	183	282	13,861	20	401