MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director

DATE: September 9, 1996

ESTIMATED TIME
10 HOURS
(for all D-1 items)

SUBJECT: Initial Groundfish Specifications for 1997

ACTION REQUIRED

(a) Review Preliminary 1997 BSAI Final Stock Assessment and Fishery Evaluation (SAFE) document.

(b) Approve preliminary BSAI groundfish specifications for 1997:

1. Acceptable Biological Catch (ABC), and Annual Total Allowable Catch (TAC)
2. Division of the pollock ITAC into the January 1-April 15 ('A' Season) and September 1-December 31 ('B' Season) allowances;
3. Seasonal apportionment of the fixed gear Pacific cod TAC; and
4. Bycatch allowances, and seasonal apportionments of Pacific halibut, red king crab, Tanner crab, and herring to target fishery (PSC) categories.

(c) Recommend bycatch rate standards for the Vessel Incentive Program.

BACKGROUND

At this meeting, the Council sets initial recommendations of groundfish and bycatch specifications as listed above. The preliminary SAFE report, groundfish ABCs and TACs, and bycatch apportionments need to be approved and made available for public review and comment. These initial specifications will be used for management of the 1997 groundfish fisheries until superseded by publication of the Council's final specifications. On the basis of comments and new information, the Council will adopt final recommendations for the 1997 fishing year at its December 1996 meeting.

(a) BSAI SAFE Document

The groundfish Plan Teams met in Seattle during the week of August 26-30, to prepare the preliminary SAFE documents provided at this meeting. This SAFE forms the basis for preliminary groundfish specifications for the 1997 fishing year.

The preliminary BSAI SAFE contains the Plan Team's estimates of biomass and ABCs for all groundfish species covered under the FMP and information concerning PSC bycatch to provide guidance to the Council in establishing PSC apportionments. The attached tables from the SAFE lists the Plan Team's recommended 1997

ABCs and corresponding overfishing levels for each of the species or species complexes. Draft minutes of the BSAI plan team are also attached (Item D-1(a)(1)).

(b) Preliminary ABCs, TACs, and Apportionments

During the week of this Council meeting the SSC and AP recommendations will be provided to the Council. Attached as Item D-1(b)(1) are Tables 6 - 8 from the SAFE summary chapter indicating ABCs and biomass levels. The Plan Team's sum of recommended ABCs for 1997 is 2.67 million mt. Overall, the status of the stocks continues to appear relatively favorable. The Council will establish preliminary catch specifications for 1997 based on this information.

Adopt Seasonal Allowances for the Pollock Seasons

The FMP requires the Council to apportion pollock in the BSAI between the roe (January 1 - April 15) and non-roe (September 1 - December 31) seasons. For the 1991 and 1992 fisheries, the Council recommended a 40/60 percent split between the roe and non-roe seasons, and a 45/55 percent split for the 1993-1996 pollock fishery. In recommending seasonal allowances of the BSAI pollock TAC, the Council will need to consider the following factors as outlined in the FMP:

1. Estimated monthly catch and effort.
2. Expected changes in harvesting and processing capacity.
3. Current estimates of and expected changes in pollock biomass, and conditions of other fish and marine mammal stocks.
4. Potential impacts of seasonal fishing on pollock stocks, marine mammals, and other fish stocks.
5. The need to obtain fishery related data throughout the year.
6. Effects on operating costs and gross revenue.
7. The need to spread fishing effort over the year.
8. Potential allocative effects among users and indirect effects on coastal communities.
9. Other biological and socioeconomic information.

The Council can also set a limit on the amount of pollock that can be taken in the bottom trawl pollock fishery to control the bycatch of crab and halibut (Amendment 16a). However, for the past 6 years, the Council did not recommend a specific apportionment between pelagic and bottom gears, noting that additional pollock harvests with non-pelagic trawl gear likely would be constrained by halibut bycatch. In recommending apportionment of pollock between gears, the Council would need to consider PSC limits, projected bycatch, costs, and other factors consistent with goals of the FMP (675.24).

Adopt Seasonal Apportionments of the Pacific Cod TAC Allocated to Fixed Gear

Amendment 24 regulations allow seasonal apportionment of the Pacific cod TAC allocated to vessels using hook-and-line or pot gear. Seasonal apportionments will be divided among trimesters and established through the annual specifications process. In recommending seasonal apportionments, regulations require the Council to base its decision on the following information:

1. Seasonal distribution of Pacific cod relative to PSC distribution;

2. Expected variations in PSC bycatch rates in the Pacific cod fishery throughout the fishing year; and

3. Economic effects of any seasonal apportionment of Pacific cod on the hook-and-line and pot gear fisheries.

Under Amendment 46, two percent of the TAC is reserved for jig gear, 51 percent for fixed gear, and 47 percent for trawl gear. The trawl apportionment will be split between catcher vessels and catcher processors 50/50. Any unused TAC from the jig gear quota will become available to fixed gear on September 15.

For the 1996 fisheries, the Council recommended that 79% of the fixed gear's allocation be released during the first trimester (January 1 - April 30), 18% be released for the second trimester (May 1 - August 31), and 3% for the third trimester.

Adopt bycatch allowances of Pacific halibut, red king crab, Tanner crab (*C. bairdi*), and herring, and seasonal allowances

Halibut PSCs

For the Trawl Fisheries: Amendment 21 established a 3,775 mt limit on halibut mortality for trawl gear. This limit can be apportioned to the following trawl fishery categories:

1. Greenland turbot, arrowtooth flounder and sablefish;
2. rock sole and "other flatfish;"
3. yellowfin sole;
4. rockfish;
5. Pacific cod; and,
6. pollock, Atka mackerel and "other species."

Note that under Amendment 46, the trawl halibut PSC mortality cap for Pacific cod will be no greater than 1,600 mt.

For Fixed Gear Fisheries: A 900 mt non-trawl gear halibut mortality can be apportioned to the following fishery categories:

1. Pacific cod;
2. Other non-trawl (includes hook-and-line sablefish, rockfish and jig gear); and
3. Groundfish pot (recommended exempt for 1996).

Note that under Amendment 46, the hook-and-line halibut PSC mortality cap for Pacific cod will be no greater than 900 mt. Item D-1(b)(2) is a table indicating 1996 PSC allocations and seasonal apportionments for the trawl and non-trawl fisheries. Item D-1(b)(3) is a current summary of PSC bycatch accounting for the 1997 BSAI fisheries.

Crab PSCs

In June 1996, the Council approved a stairstep procedure for determining PSC limits for red king crab taken in Zone 1 trawl fisheries. Amendment 37 specified PSC limits based on abundance of Bristol Bay red king crab as shown in the adjacent table. Given NMFS and ADF&G's 1996 abundance estimate for Bristol Bay red king crab, a Zone 1 PSC limit will be established at 100,000 red king crabs for 1997 (pending approval by the Secretary of Commerce).

Amendment 37 PSC limits for Zone 1 red king crab.

Abundance	PSC Limit
Below threshold or 14.5 million lbs of effective spawning biomass (ESB)	35,000 crabs
Above threshold, but below 55 million lbs of ESB	100,000 crabs
Above 55 million lbs of ESB	200,000 crabs

Tanner crab PSC limits for the BS trawl fisheries under Amendment 16 are:

C. bairdi: 1,000,000 crabs in Zone 1 for a Zone 1 closure
3,000,000 crabs in Zone 2 for a Zone 2 closure

These limits for Tanner crab would be in effect until mid-1997, even if revised limits are recommended under proposed Amendment 41. The Council is scheduled to take final action on Amendment 41 at this meeting. Any recommendations regarding PSC limits for Tanner and snow crabs would be implemented during the 1997 fishing year.

Herring PSCs

Amendment 16a established an overall herring PSC bycatch cap of 1 percent of the EBS biomass of herring. This cap is to be apportioned to the same six PSC fishery categories listed above, plus a seventh group, mid-water pollock. The Alaska Department of Fish and Game has not completed its forecast for 1997 herring biomass, so interim specifications will be based on the 1996 estimate (1,697,000 mt). The PSC limit is set at 1 percent of the biomass in metric tons. A revised herring assessment should be available for the December Council meeting.

Seasonal Apportionment of PSC

The Council may also seasonally apportion the bycatch allowances. Regulations require that seasonal apportionments of bycatch allowances be based on the following types of information:

1. Seasonal distribution of prohibited species;
2. Seasonal distribution of target groundfish species relative to prohibited species distribution;
3. Expected prohibited species bycatch needs on a seasonal basis relevant to change in prohibited species biomass and expected catches of target groundfish species;
4. Expected variations in bycatch rates throughout the fishing year;
5. Expected changes in directed groundfish fishing seasons;
6. Expected start of fishing efforts; and

7. Economic effects of establishing seasonal prohibited species apportionments on segments of the target groundfish industry.

NOTE: Additional information on PSC limits and apportionments is presented in BSAI SAFE Appendix D.

Staff will present a worksheet with SSC and AP recommendations for ABCs, TACs, PSC and seasonal apportionments when the Council addresses this Action Item.

(c) Bycatch rate standards for the Vessel Incentive Program

The Vessel Incentive Program (VIP) rate for halibut and crab Prohibited Species Catch (PSC) includes all trawl fisheries in both the BSAI and GOA. The grouping for VIP fishing categories is:

	Fishery	PSC Species
BSAI	midwater pollock	halibut*
BSAI	bottom pollock	halibut
BSAI	yellowfin sole	halibut; red king crab**
BSAI	other trawl	halibut; red king crab
GOA	midwater pollock	halibut
GOA	other trawl	halibut

* % of groundfish
**number of crabs per ton of groundfish

Note that regulations specify that the vessel incentive program for the midwater pollock fishery becomes effective after the directed fishery for pollock by trawl vessels using non-pelagic gear is closed.

Item D-1(c)(1) is a letter from the Regional Director containing the VIP rate standards used in 1996 and catch rates observed during past years for these fishery categories. The Council will need to recommend to the Regional Director the bycatch rate standards for these categories for the first two quarters of the 1997 fishery.

Draft Minutes of the Bering Sea/Aleutian Islands Groundfish Plan Team Meeting, August 26-30, 1996

Members Present:

Loh-lee Low (NMFS-AFSC, Chairman)
Dave Colpo (NMFS -AFSC)
Richard Ferrero (NMML)
Vivian Mendenhall (USFWS)
Mike Sigler (AFSC-ABL)
Andrew Smoker (NMFS-AKRO)
Grant Thompson (NMFS-AFSC)
Ivan Vining (ADF&G)
Farron Wallace (WDF)
Dave Witherell (NPFMC)

The Bering Sea/Aleutian Islands (BSAI) Groundfish Plan Team met August 26-30 at the Alaska Fisheries Science Center in Seattle. The meeting was open to the public, and several industry representatives attended. A packet of materials was distributed to team members prior to the meeting, and several additional documents were distributed at the meeting. The focus of the meeting was to review updated stock assessments and discuss ecosystems considerations. Loh-lee Low was re-elected chair of the Plan Team for another two year term.

The Plan Team reviewed preliminary assessments of groundfish for the 1997 fishery. Team recommendations are discussed in the SAFE summary chapter, and therefore not repeated here. Rather, these minutes reflect team deliberations and suggestions to assessment authors regarding future assessments.

Neal Williamson of the AFSC briefed the team on pollock status in the Bogoslof area. Preliminary results from the 1996 echo-integration survey were presented. Biomass is down from last year; 1.10 million mt in 1995 versus 682,000 mt this year. Neal estimated confidence intervals for the survey at ±25-30%. The survey indicated a distinct difference in size distribution in the eastern and western portions of the Bogoslof survey area, with bigger fish to the west. Aging of fish samples will be done this fall. It was noted that a Japanese research vessel also conducted a hydroacoustic survey of the area and estimated pollock biomass at about 500,000 mt (preliminary estimate). Based on conditions specified in the "Donut Convention", no fishery is expected to occur in the Donut Hole in 1997.

The Plan Team discussed possible impacts of a fishery in Russian waters. Available information indicated that the 1995 reported catch from Russian waters was 399,000 mt. Actual catches that include discards of young fish are unknown. Most fishing in the western Bering Sea occurred in the Cape Navarin region. The Russian scientists believe that more than 90% of the Navarin fish are of US origin from the eastern Bering Sea stock. The Russian scientists also believe that a harvest rate of 30% for pollock stocks is scientifically sound. Since the U.S. harvests about 18-20% of the exploitable biomass in the EBS, the Russian catch quota in the Navarin area was apparently set so that the total catch from the EBS pollock stock would represent about 30% exploitation of the stock. US scientists are concerned that catches above ABCs calculated for the EBS would negatively impact the stock. Since much of the Russian catch in the Navarin area are of the EBS stock, the Plan Team recommends that the Russian fishery data be incorporated into our EBS stock assessments, if appropriate.

The Plan Team had a number of recommendations to assessment authors, and ideas to revise SAFE report guidelines. The Team noted that maps showing distribution of catches from surveys and fisheries would be useful. It was also suggested that authors provide some type of retrospective analysis of biomass projections to see if there was any systematic bias. Specific recommendations are listed below for individual species assessments.

Sablefish: the plan team recommended that a sensitivity analysis be conducted to examine how different recruitment scenarios affect biomass projections. Authors should examine the Japanese longline survey data prior to 1977 for recruitment strength and biomass estimates. The Plan Team also requested that authors provide more information on age structure of the population in a matrix of population numbers at age for years 1977-1996.

Other Flatfish: The Plan team requested that the author report the catch of the "other flatfish" category by species. If targeted, the minor species in this group could be over harvested, given that the ABC is based primarily on Alaska plaice.

Other Rockfish: The Plan Team requested that authors attempt an age structured model of the AI and GOA thornyhead stock together, using longline survey data. Species composition of the other rockfish group should be clearly listed, and trawl biomass estimates should be provided for each species separately. Catch of each species should also be provided separately, and broken down by gear type.

The Plan Team also discussed assessments for other groundfish species, ecosystems considerations, and reviewing updated status of seabirds and marine mammals. This information is included in the SAFE document.

Others in attendance at the BSAI team meetings were:

Lauri Jansen
Wally Pereyra
John Roos
Fran Bennis
Tamra Farris
Ken Stump
Dan Waldeck
Thorn Smith
Jude Hensler
Mike Szymanski
Lowell Fritz
Paul McGregor

Table 6-- Summary of stock abundance (biomass), overfishing level (OFL), and fishing mortality rates (*F*) for the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district as projected for 1997. Biomass and OFL are in metric tons, reported to three significant digits. *F*s are reported to two significant digits.

Species	Area	Biomass[a]	OFL[b]	F_{OFL}[c]	F_{ABC}[d]
Walleye pollock	EBS	7,360,000	2,210,000	0.58	0.30
	AI	87,200	28,800	0.45	0.39
	Bogoslof	680,000	204,000	0.40	0.27
Pacific cod	BSAI	1,600,000	347,000	0.28	0.20
Yellowfin sole	BSAI	2,850,000	342,000	0.16	0.11
Greenland turbot	BSAI	135,000	25,100	0.37	0.24
Arrowtooth flounder	BSAI	576,000	162,000	0.34	0.22
Rock sole	BSAI	2,360,000	433,000	0.22	0.15
Flathead sole	BSAI	593,000	140,000	0.23	0.16
Other flatfishes	BSAI	590,000	120,000	0.20[e]	0.14[e]
Sablefish	EBS	14,400	1,170	0.13	0.086
	AI	12,000	1,320	0.13	0.086
POP complex					
True POP	EBS	48,400	2,380	0.091	0.045
Other red rockfish[f]	EBS	29,700	1,400	0.047	0.036
True POP	AI	332,000	27,300	0.10	0.047
Sharp/Northern[g]	AI	96,800	5,810	0.060	0.045
Short/Rougheye[h]	AI	45,600	1,250	0.027	0.021
Other rockfish	EBS	7,100	497	0.070	0.053
	AI	13,600	952	0.070	0.053
Atka mackerel	AI	578,000	81,600	0.50	0.36
Squid	BSAI	n/a	2,620	n/a	n/a
Other species	BSAI	687,000	137,000	0.20	0.038

a/ Projected exploitable biomass for January, 1997.
b/ Maximum 1997 catch level allowable under overfishing definition (the "overfishing level").
c/ Maximum fishing mortality rate allowable under overfishing definition.
d/ Fishing mortality rate corresponding to acceptable biological catch.
e/ Based on Alaska plaice.
f/ Sharpchin, northern, shortraker, and rougheye rockfish.
g/ Sharpchin and northern rockfish.
h/ Shortraker and rougheye rockfish.

Table 7-- Total allowable catch (TAC) and acceptable biological catch (ABC) for 1996 (as established by the Council) and 1997 (as recommended by the Plan Team) for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district. Figures are in metric tons.

Species	Area	TAC (1996) Council	ABC(1996) Council	ABC(1997) Plan Team
Walleye pollock	EBS	1,190,000	1,190,000	1,290,000
	AI	35,600	35,600	24,400
	Bogoslof	1,000	121,000	150,000
Pacific cod		270,000	305,000	255,000
Yellowfin sole		200,000	278,000	235,000
Greenland turbot		7,000	10,300	17,000
Arrowtooth flounder		9,000	129,000	105,000
Rock sole		70,000	361,000	296,000
Flathead sole		30,000	116,000	97,100
Other flatfish		35,000	102,000	84,000
Sablefish	EBS	1,100	1,200	790
	AI	1,200	1,300	890
POP complex				
True POP	EBS	1,800	1,800	1,550
Other red rockfish	EBS	1,260	1,400	1,050
True POP	AI	12,100	12,100	12,200
Sharp/Northern	AI	5,229	5,810	4,360
Short/Rougheye	AI	1,125	1,250	938
Other rockfish	EBS	497	497	373
	AI	952	952	714
Atka mackerel		106,157	116,000	66,700
Squid		1,000	3,000	1,970
Other species		21,125	27,600	25,800
Groundfish complex		2,000,000	2,820,809	2,670,835

e 8-- Summary of stock biomass, harvest strategy, 1997 recommended acceptable biological catch (ABC), and stock condition for groundfish in the eastern Bering Sea (EBS), Aleutian Islands (AI), and Bogoslof district. Biomass and ABC are in metric tons, reported to three significant digits. Fishing mortality rates are reported to two significant digits.

Species	Area	Biomass[a]	Rate[b]	ABC	Relative abundance, trend[c]
Walleye pollock	EBS	7,360,000	$F_{40\%}$	1,290,000	Average, stable
	AI	87,200	$F_{40\%}$	24,400	Low, declining
	Bogoslof	680,000	$F_{40\%}$	150,000	Low, unknown
Pacific cod		1,600,000	$F_{40\%}$	255,000	High, stable
Yellowfin sole		2,850,000	$F_{40\%}$	235,000	High, stable
Greenland turbot		135,000	$F_{40\%}$	17,000	Low, declining
Arrowtooth flounder		576,000	$F_{40\%}$	105,000	High, stable
Rock sole		2,360,000	$F_{40\%}$	296,000	High, stable
Flathead sole		593,000	$F_{40\%}$[d]	97,100	High, stable
Other flatfish		590,000	$F_{40\%}$[d]	84,000	High, stable
Sablefish	EBS	14,400	$F_{40\%}$[e]	790	Low, declining
	AI	12,000	$F_{40\%}$[e]	890	Low, declining
True POP	EBS	48,400	$F_{44\%}$[e]	1,550	Low, declining
Other red rockfish	EBS	29,700	$F=M$[d]	1,050	Not available
True POP	AI	332,000	$F_{44\%}$[f]	12,200	Average, stable
Sharp/Northern	AI	96,800	$F=M$[d]	4,360	Not available
Short/Rougheye	AI	45,600	$F=M$[d]	938	Not available
Other rockfish	EBS	7,100	$F=M$[g]	373	Not available
	AI	13,600	$F=M$[g]	714	Not available
mackerel	AI	578,000	$F_{40\%}$	66,700	High, declining
.d	BSAI	n/a	F_{his}	1,970	Not available
Other species		687,000	F_{his}	25,800	Not available
Groundfish Complex Total		18,695,800		2,670,835	Above average, stable

a/ Projected exploitable biomass for January, 1997.
b/ Harvest strategy used to compute ABC.
c/ Relative abundance based on long-term average, trend based on short-term projection.
d/ Weighted average of species-specific rates.
e/ Adjusted on the basis of the relationship between projected biomass and $B_{40\%}$.
f/ Adjusted so as to set ABC equal to the equilibrium catch corresponding to $F_{44\%}$.
h/ Fishing mortality rate implied by setting ABC equal to historic average catch.

Table 1. **Final 1996 BSAI Trawl Fisheries PSC Apportionments and Seasonal Allowances**

Fishery Group	Halibut Mortality Cap (mt)	Herring (mt)	Red King Crab (animals) Zone1	C. bairdi Zone1	C. bairdi Zone2
Yellowfin sole	820	287	50,000	250,000	1,530,000
January 20 - March 31	160		5,000	50,000	
April 1 - May 10	150		15,000	200,000	
May 11 - August 14	100		10,000		
August 15 - Dec 31	410		20,000		
Rocksole/other flatfish	730		110,000	425,000	510,000
January 20-March 29	453				
March 30 - June 28	139				
June 29-December 31	138				
Turbot/sablefish/ Arrowtooth	0				0
Rockfish	110	7			10,000
Jan. 1 - Mar. 29	30				
Mar. 30 - June 28	50				
June 29 - Dec. 31	30				
Pacific cod	1,685	22	10,000	250,000	260,000
January 20-October 24	1,585				
Oct. 25-December 31	100				
Pollockmackerel/o.species	430	154	30,000	75,000	690,000
January 20-April 15	330				
April 16- December 31	100				
Pelagic Trawl Pollock		1,227			
TOTAL	**3,775**	**1,697**	**200,000**	**1,000,000**	**3,000,000**

Note: unused PSC allowances may be rolled into the following seasonal apportionment.

Final 1996 BSAI Non-Trawl Fisheries PSC Bycatch Allowances and fixed gear Pacific cod seasonal apportionements

Fishery Group	Halibut Mortality (mt)	Seasonal Apportion of cod ITAC (mt)
Pacific Cod	800	
Jan 1 - April 30	475	80,000
May 1 - August 31	40	18,000
Sept. 1 - Dec. 31	285	2,980
Other Non-Trawl*	100	
Groundfish Pot	Exempt	
TOTAL	900 mt	100,980

Note: unused PSC halibut from first trimester will be rolled into the third trimester.

* Includes hook & line fisheries for rockfish and Greenland turbot.
Sablefish hook & line fisheries will be exempted from the halibut mortality cap.
Jig gear will also be exempted from the halibut mortality cap.

1996 BERING SEA/ALEUTIAN ISLANDS FISHERIES
PROHIBITED SPECIES BYCATCH MORTALITY
Week Ending: 08/10/96

TRAWL HERRING, BSAI

Fishery group	Herring (mt)	Cap (mt)	%
Midwater pollock	16	1,227	1%
Pacific cod	19	22	87%
Yellowfin sole	206	287	72%
Rockfish	0	7	0%
Other	0	154	0%
Total:	241	1,697	14%

TRAWL SALMON, BSAI

Fishery group	Chinook (#'s)	Other (#'s)	Total (#'s)
Midwater pollock	33,913	937	34,850
Pacific cod	5,852	187	6,039
Yellowfin sole	29	89	118
Rock sole/Other flatfish	481	0	481
Rockfish	395	186	582
Other	4,539	82	4,621
Seasonal Total:	45,209	1,480	46,689
Annual Cap:	48,000		
Remaining:	2,791		

TRAWL BAIRDI TANNER CRAB

	ZONE 1			ZONE 2		
Fishery group	Crabs (#'s)	Cap (#'s)	%	Crabs (#'s)	Cap (#'s)	%
Rock sole/Other flatfish	338,439	425,000	80%	124,051	510,000	24%
Pacific cod	121,386	250,000	49%	34,193	260,000	13%
Yellowfin sole	211,941	250,000	85%	244,873	1,530,000	16%
PLCK/AMCK/OTHER	17,089	75,000	23%	8,164	690,000	1%
Rockfish	0	0	0%	0	10,000	0%
GTRB/ARTH/SABL	0	0	0%	0	0	0%
GTRB/ARTH/SABL	0	0	0%	440	0	0%
Total:	688,856	1,000,000	69%	411,721	3,000,000	14%

TRAWL RED KING CRAB

	ZONE 1		
Fishery group	Crabs (#'s)	Cap (#'s)	%
Rock sole/Other flatfish	9,116	110,000	8%
Pacific cod	2,636	10,000	26%
Yellowfin sole	369	50,000	1%
PLCK/AMCK/OTHER	12	30,000	0%
Total:	12,134	200,000	6%

Yellowfin Sole Fishery Seasons/Quotas:

Red King Crab		
Jan 20 - Mar 31	=	5,000
Apr 01 - May 10	=	15,000
May 11 - Aug 14	=	10,000
Aug 15 - Dec 31	=	20,000
Annual Total		50,000

Bairdi Tanner Crab - Zone 1		
Jan 20 - Mar 31	=	50,000
Apr 01 - Dec 31	=	200,000
Annual Total		250,000

1996 BERING SEA / ALEUTIAN ISLANDS FISHERIES
TRAWL HALIBUT BYCATCH MORTALITY (METRIC TONS)

WED	PACIFIC COD	YELLOWFIN SOLE	ROCK SOLE/ FLATHEAD SOLE/ OTHER FLATFISH	PLCK/AMCK/ OTHER	ROCKFISH	ARROWTOOTH/ SABLEFISH/ TURBOT
01/20/96	4	0	0	0	0	0
01/27/96	38	0	54	20	0	0
02/03/96	24	0	130	36	0	0
02/10/96	41	0	41	33	0	0
02/17/96	16	0	96	93	0	0
02/24/96	20	0	85	8	0	0
03/02/96	88	0	47	14	9	0
03/09/96	125	20	0	17	8	0
03/16/96	83	69	0	2	2	0
03/23/96	115	26	0	7	0	0
03/30/96	126	18	0	1	0	0
04/06/96	108	29	34	10	0	0
04/13/96	168	37	41	0	0	0
04/20/96	171	32	12	3	1	0
04/27/96	87	25	0	0	1	0
05/04/96	166	41	0	0	2	0
05/11/96	75	15	0	0	2	0
05/18/96	33	12	0	0	3	0
05/25/96	0	33	0	2	1	0
06/01/96	0	21	0	0	1	1
06/08/96	0	16	46	0	0	0
06/15/96	0	52	0	1	0	0
06/22/96	10	11	0	0	0	2
06/29/96	1	0	0	0	0	0
07/06/96	0	0	17	35	0	2
07/13/96	0	0	24	11	0	0
07/20/96	0	0	23	2	0	3
07/27/96	0	0	43	4	0	1
08/03/96	0	0	14	7	0	0
08/10/96	0	0	0	0	0	0
	1,498	458	706	307	29	10
SEASONAL CAP:	1,585	820	730	330	110	0
% OF CAP:	95%	56%	97%	93%	26%	0%
REMAINING:	87	362	24	23	81	-10
ANNUAL CAP:	1,685	820	730	430	110	0
% OF CAP:	89%	56%	97%	71%	26%	0%

TOTAL HALIBUT MORTALITY : 3,008
TOTAL ANNUAL HALIBUT CAP: 3,775

1996 BERING SEA / ALEUTIAN ISLANDS FISHERIES
FIXED GEAR HALIBUT BYCATCH MORTALITY (METRIC TONS)

	PACIFIC COD HOOK & LINE		OTHER SPECIES HOOK & LINE, JIG		ALL GROUNDFISH POT GEAR	
WED	WEEKLY	TOTAL	WEEKLY	TOTAL	WEEKLY	TOTAL
01/06/96	47	47	0	0	0	0
01/13/96	22	69	0	0	0	0
01/20/96	22	91	0	0	0	0
01/27/96	20	111	0	0	0	0
02/03/96	28	139	0	0	0	0
02/10/96	14	153	0	0	0	0
02/17/96	16	169	0	0	0	0
02/24/96	19	188	0	0	0	0
03/02/96	20	209	0	0	0	0
03/09/96	25	233	0	0	0	0
03/16/96	22	255	0	0	0	0
03/23/96	25	280	0	0	0	0
03/30/96	17	297	0	0	0	1
04/06/96	17	314	0	0	0	1
04/13/96	18	331	0	0	0	1
04/20/96	27	358	0	0	1	2
04/27/96	37	396	0	0	1	2
05/04/96	20	416	32	32	1	4
05/11/96	14	430	43	75	1	5
05/18/96	10	440	12	87	1	6
05/25/96	0	440	1	88	1	8
06/01/96	0	440	0	89	1	9
06/08/96	0	440	0	89	1	10
06/15/96	0	440	0	89	1	10
06/22/96	0	440	0	89	0	11
06/29/96	0	440	0	89	0	11
07/06/96	0	440	0	89	0	11
07/13/96	0	440	1	90	0	11
07/20/96	0	440	0	90	0	11
07/27/96	0	440	0	90	0	11
08/03/96	0	440	0	90	1	12
08/10/96	0	440	0	90	1	12

PCOD SEASONAL CAP: 515 OTHER SEASONAL CAP: 100 Pot gear is exempt
% OF SEASONAL CAP: 85% % OF SEASONAL CAP: 90% from bycatch allowances

REMAINING PCOD: 75 REMAINING OTHER: 10

1996 BSAI NON-TRAWL PACIFIC COD FISHERY HALIBUT BYCATCH ALLOWANCES

(Jan 01 - Apr 30)	475 MT
(May 01 - Aug 31)	40 MT
(Sep 01 - Dec 31)	285 MT
Annual Total	800 MT

AGENDA D-1(c)(1)
SEPTEMBER 1996

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

September 9, 1996

Mr. Richard B. Lauber
Chairman, North Pacific Fishery
Management Council
P.O. Box 103136
Anchorage, Alaska 99510

Dear Rick,

Bycatch rate standards for trawl fisheries under the Pacific halibut and red king crab vessel incentive program during the first half of 1997 are scheduled to be published in the Federal Register by January 1, 1997. A summary of 1993 - 1996 observer data on fishery bycatch rates is listed in the attached table for review by the Council. Recent halibut and crab bycatch rates in the groundfish trawl fisheries do not appear to warrant a change in the bycatch rate standards recommended by the Council during the past several years. Unless the Council recommends a change in these standards, we will continue to use the halibut and red king crab bycatch rate standards listed in the attached table for the first half of 1997.

Sincerely,

for Steven Pennoyer
Administrator, Alaska Region

Attachment

1993 - 1996 (through August 1996)observed bycatch rates, by quarter, of halibut and red king crab in the fishery categories included in the vessel incentive program. Also listed are the bycatch rate standards established for 1995 and 1996.

Halibut Bycatch (Kilograms Halibut/ MT Allocated Groundfish Catch

Fishery and quarter	Bycatch Rate Standards	Observed Bycatch Rates 1993	1994	1995	1996
BSAI Midwater Pollock					
QT 1	1.0	0.95	0.17	0.05	0.10
QT 2	1.0	0.20	0.01	0.07	0.02
QT 3	1.0	0.06	0.30	0.12	0.10
QT 4	1.0	0.12	0.06	0.19	
Year to date		0.43	0.22	0.09	0.10
BSAI Bottom Pollock					
QT 1	7.5	7.49	2.71	1.93	2.18
QT 2	5.0	2.72	29.67	5.50	12.84
QT 3	5.0	0.84	2.61	1.98	3.68
QT 4	5.0	25.28	0.38	0.14	
Year to date		6.86	2.66	1.92	2.20
BSAI Yellowfin sole					
QT 1	5.0	****	2.70	3.67	2.89
QT 2	5.0	13.02	5.93	4.54	4.19
QT 3	5.0	1.82	1.15	2.93	11.06
QT 4	5.0	3.34	4.57	4.49	
Year to date		6.18	3.92	3.67	4.41
BSAI Other Trawl Fisheries					
QT 1	30.0	8.80	9.02	11.27	10.66
QT 2	30.0	13.69	19.94	16.93	12.70
QT 3	30.0	4.66	3.30	10.33	6.58
QT 4	30.0	3.91	4.00	21.23	
Year to date		9.25	12.04	12.96	10.6
GOA Midwater Pollock					
QT 1	1.0	0.01	0.06	0.34	0.22
QT 2	1.0	0.02	0.07	0.05	0.04
QT 3	1.0	0.03	0.55	0.54	----
QT 4	1.0	0.05	0.04	0.13	
Year to date		0.03	0.17	0.24	0.17
GOA Other Trawl fisheries					
QT 1	40.0	34.49	19.97	16.55	14.71
QT 2	40.0	26.80	42.78	63.93	49.01
QT 3	40.0	33.90	26.49	18.48	24.88
QT 4	40.0	37.81	43.76	48.33	
Year to date		33.04	29.91	28.45	24.91

Zone 1 Red King Crab Bycatch Rates
(number of crab/mt of allocated groundfish

BSAI yellowfin sole					
QT 1	2.5	****	0.68	0.28	0.00
QT 2	2.5	2.19	0.23	0.02	0.01
QT 3	2.5	0.00	0.00	0.00	0.00
QT 4	2.5	0.27	0.00	****	
Year to date		1.30	0.33	0.18	0.00
BSAI Other Trawl					
QT 1	2.5	1.78	1.78	0.31	0.14
QT 2	2.5	0.02	0.02	0.00	0.00
QT 3	2.5	0.00	0.00	0.00	0.00
QT 4	2.5	****	0.00	0.00	
Year to date		1.18	1.18	0.30	0.10

Draft Minutes of the Joint GOA and BSAI Groundfish Plan Team Meeting, August 26-30, 1996

Members Present:

Bering Sea/Aleutian Islands Team
Loh-lee Low (NMFS-AFSC, Chair)
Dave Colpo (NMFS-AFSC)
Rich Ferrero (NMML)
Vivian Mendenhall (USFWS)
Mike Sigler (NMFS-ABL)
Andrew Smoker (NMFS-AKRO)
Grant Thompson (NMFS-AFSC)
Ivan Vining (ADF&G)
Farron Wallace (WDF)
Dave Witherell (NPFMC)

Gulf of Alaska Team
Sandra Lowe (NMFS-AFSC, Chair)
Bill Bechtol (ADF&G)
Kaja Brix (NMFS-AKRO)
Jane DiCosimo (NPFMC)
Jeff Fujioka (NMFS-AB)
Lew Haldorsen (UAF)
Jim Hastie (NMFS-AFSC)
Jon Heifetz (NMFS-AB)
Jim Ianelli (NMFS-AFSC)
Vivian Mendenhall (USFWS)
Tory O'Connell (ADF&G)
John Sease (NMML)
Farron Wallace (WDF)

The Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Groundfish Plan Teams met August 26-30 at the Alaska Fisheries Science Center. The meeting was open to the public, and several industry representatives attended. A packet of materials was distributed to team members prior to the meeting, and several additional documents were distributed at the meeting. The focus of the meeting was to review new assessments, ecosystem considerations chapter, and amendment proposals.

The meeting began on Monday afternoon with introductions and a review of the agenda (attached). The teams welcomed new members Vivian Mendenhall and John Sease. The teams met again jointly on Thursday and Friday to review amendment proposals and the ecosystem chapter.

The teams reviewed 43 amendment proposals. The teams classified proposals into management actions and primary effects and ranked their priority for Council action. General comments were added where appropriate to assist the Council and public with evaluating the merits and staff requirements of these proposals. The teams' evaluation is summarized by the attached table.

New information on Steller sea lions, harbor seals, and seabirds was added to the preliminary ecosystem chapter. The teams spent a considerable amount of time discussing status of sea lions and potential impacts of uplisting western and central Steller sea lions to endangered status. An overall decrease of 7.5% was observed at all Alaska trend sites during 1994-1996. It was noted that under the MMPA, an uplisting would lower the Potential Biological Removal, and trigger formation of "take reduction teams" to look at ways to reduce takes of Stellers. Over the next few months, NMFS will be developing alternative measures that could be taken as a result of the ESA listing. These will be presented to the Council in December.

Others in attendance at the plan team meetings were:

Laure Jansen
Chris Blackburn
Pat Livingston
Lowell Fritz
Thorn Smith
Linda Kozak
Lyn Walton
John Roos
Tamra Faris
Fran Bennis
Jude Hensler
Michuyo Shiner
Ken Stump
Hazel Nelson
Paul McGregor
Dan Weldeck
Neal Williamson
Wally Pereyra
Mike Szymanski
Anne Hallowed
Denby Lloyd

Meeting Agenda for Groundfish Plan Teams
August 26 - 30, 1996

A. Joint Plan Team Meetings

Monday August 26
1:00 -2:00 pm General Issues and Scheduling

Thursday August 29
9:00 am Halibut Issues and Status of Stocks
10:00am Ecosystem Considerations

Friday August 30
9:00 am Rating of Plan Amendment proposals, Other topics as needed

B. Bering Sea/Aleutians Groundfish Plan Team

Monday August 26
2:00 pm General Issues and Scheduling
Status of Stocks Presentations and Discussions
Pollock surveys, Pollock assessment

Tuesday August 27
9:00 am Pacific cod, Yellowfin sole, Rock Sole, Arrowtooth Flounder
Other Flatfishes, Other Species

Tuesday August 27
1:00 pm Atka mackerel
1:30 pm Sablefish (Joint Session with GOA Team)
Pacific ocean perch, Other rockfishes
Ecosystems Considerations

Wednesday August 28
9:00 am Continuation of previous agenda items
Review BSAI FMP revisions
1:30 pm Writing of Team report

C. Gulf of Alaska Groundfish Plan Team

Monday August 26
2:00pm General Issues and Scheduling
Status of Stocks Presentations and Discussions
Flatfish, Arrowtooth Flounder

Tuesday August 27
9:00 am Slope Rockfish
Pelagic Shelf Rockfish (Stock Assessment, Plan Amendment)
Demersal Shelf Rockfish, Thornyhead Rockfish
1:30 pm Sablefish (Joint Session with BSAI Team)
Pacific Cod, Atka Mackerel

Wednesday August 28
9:00 am Pollock
Ecosystem Considerations
1:30 pm Writing of Team Report

Thursday August 29
9:00 am Halibut Issues and Status of Stocks (Joint Session with BSAI Team)
10:00 am Ecosystem Considerations
1:30 pm Review of summary paragraphs
Review of SAFE tables 1-3, Other topics as needed

Plan Team review of 1996 Groundfish amendment proposals received by August 15

No.	Proposal	Proposer	Area	Amendment	Effect*	Comments	Rank
SPECIES ALLOCATIONS							
11	inshore/offshore allocation	NPSC	both	plan	A	sunsets in 98, initiate next year	L
17	small boat trip limit for GOA P. cod	Sullivan	GOA	plan	A	same as #30, #40, small boat fishery	H
22	rollover fixed gear P. cod from 1st to 3rd trimester	KVOA	BSAI	regulatory	E	same as #26, #28	H
26	rollover fixed gear P. cod from 1st to 3rd trimester	NPLA et al.	BSAI	regulatory	E	same as #22, #28	H
28	'C' season fixed gear P. cod shall be contig. w/'B' or next year	NPLA et al.	BSAI	regulatory	E	same as #22, #26	H
30	apportion Central GOA P. cod; 1/1-65%; 9/1 or 10/1-35%	AGDB	GOA	plan	A,E,B	same as #17, #40, small boat fishery	H
40	apportion GOA P. cod seasonally: 60%/5%/35%	UFMA	GOA	plan	A,E,B	same as #17, #30, small boat fishery	H
GEAR / REGULATIONS							
1	limit pollock pelagic trawl gear to 280 ft	PMA	GOA	regulatory	E	anti-efficiency, expand season, alt. to #2	L
7	require pelagic trawling for pollock	IPHC staff	both	plan	E,A	NMFS has authority	L
8	ban night trawling	IPHC staff	BSAI	regulatory		in prep	P
9	require grid-sorting, when pelagic trawling	IPHC staff	both	regulatory		status quo	P
10	working group for pelagic trawl	IPHC staff	both	regulatory		Council designate gear working group	NA
13	time/area closures to separate gear types	Hendricks	both	plan		Am 37 partially addresses	P
19	gear allocations for Central GOA P. cod, w/rollover	ADA	GOA	plan	A	allocation	L
20	reassign trawl sablefish to trawlers excl. from area 650 w/LLP	Fraser	GOA	plan	A	same as #37, reassign sablefish trawl allocation fr LLP	L
24	fixed-gear turbot fishery only; allocate +140 mt halibut PSC	NPLA et al.	BSAI	plan	E,A	halibut bycatch addressed by other methods; H - concept	H/L
27	RD shall project & allocate unused P. cod by gear by 8/15	NPLA et al.	BSAI	regulatory	E		H
37	reassign trawl sablefish to trawlers excl. from area 650 w/LLP	Tyson	GOA	plan	A	same as #20, reassign sablefish trawl allocation fr LLP	L
BYCATCH ALLOCATIONS							
3	vessel-group bycatch account monitoring plan	Fraser	both	plan	E	details of proposal - low	H
4	cover halibut and sablefish bycatch by leasing IFQs	Fraser	both	both	E	refer to IFQ Industry Implementation Team	H
15	RD authority to adjust annual trawl sablefish bycatch rates	AGDB et al.	GOA	plan	E,C	same as 36; in-season management	H
36	expand in-season authority to reduce MRB	NMFS-AK	GOA	plan	E,C	same as 15; in-season management	H
38	set RKC zone 1 and bairdi zone 1 & 2 PSC cap for pot fishery	Tyson	BSAI	plan	B,A	gear modifications may be alternative	H
39	modify VIP, quick-release program for trawl fleet	Tyson	both	both	E	modify existing program	H
42	suite of bycatch reductions	AMCC	both	both	A,E	no specific proposal policy statement	P
TRIP LIMITS							
2	trip limit of 100 mt for pollock in Western GOA	PMA	GOA	plan	A	alt. to #1; better addressed by other proposals	L
18	100-125 mt trip limit for Central GOA pollock	ADA	GOA	plan	A		L
21	revise DFS & require area registration to preclude topping off	KVOA	both	regulatory	E	similar to # 15, #36	H
OTHER							
5	skipper license program	Fraser	both	plan	E	in progress	P
6	registration, check-in, daily reporting requirements	Fraser	both	regulatory	E	similar to #16, #35; RD already has authority	H
12	government fund to replace lost gear	Hendricks	both	NMFS	A	may have Magnuson authority	NA
14	special habitat area closures	Hendricks	both	plan		already done under Am. 37	P
16	daily processor reporting for third quarter trawl rockfish	AGDB et al.	GOA	regulatory		similar to # 6, #35; RD already has authority	P
23	establish buyback program for crab licenses	KVOA	BSAI	Magnuson		same as #41; may have Magnuson authority	NA
25	reduce reserves for P. cod to 5%, 3%, 1%	NPLA et al.	BSAI	plan	E	high impact ($$$) on industry; NMFS in-season authority	L
29	no observer, 1-day pollock mop-up, >3 days from trawl closure	AGDB	GOA	plan	E	daily reporting/in-season management would address	L
31	PT reexamine BSAI, Shumagin, Chirikof reporting areas	AGDB	GOA	Plan Team	B,E	Plan Team will address	NA
32	separate West Yakutat (64) and SEO (65)	NMFS-AK	GOA	plan	E	address area/gear differences under LLP	H+
33	streamline spec process; publish final specs only	NMFS-AK	both	plan	E	incorporate into Am. 48	H
34	require observer sampling station	NMFS-AK	GOA	plan	E	enhanced observer data	H+
35	require fishing area pre-registration	NMFS-AK	GOA	regulatory	E	similar to # 6, #16; RD already has authority	H
41	establish buyback program for crab and groundfish licenses	UFMA	both	Magnuson		similar to #23 (inc. fish); may have Magnuson authority	NA
43	change AI/GOA boundary	Akutan F.A.	both	plan	A	similar to #31	L

A=allocation, B=biological, E=efficiency, P=progress, NA=not applicable

JDC-9/12/96

Draft

Bering Sea and Aleutian Islands Groundfish
Recommended Initial 1997 Catch Specifications (mt)

Species	Area	1997 Biomass	1997 SSC OFL	1997 SSC ABC	1997 AP TAC
Pollock	EBS	7,360,000	1,460,000	1,190,000	1,190,000
	"A" season				45%
	"B" season				55%
	AI	87,200	47,000	39,900	35,600
	Bogoslof	680,000	121,000	51,000	1,000
Pacific cod	BS/AI	1,600,000	347,000	255,000	255,000
Yellowfin sole	BS/AI	2,850,000	342,000	235,000	200,000
Greenland turbot	BS/AI	135,000	25,100	13,700	7,000
	BS				67%
	AI				33%
Arrowtooth	BS/AI	576,000	162,000	105,000	9,000
Rock sole	BS/AI	2,360,000	433,000	296,000	70,000
Flathead sole	BS/AI	593,000	140,000	97,100	30,000
Other flatfish	BS/AI	590,000	120,000	84,000	35,000
Sablefish	EBS	14,400	1,170	790	790
	AI	12,000	1,320	890	890
POP complex					
True POP	EBS	48,400	2,380	1,550	1,550
Other POP	EBS	29,700	1,400	1,050	1,050
True POP	AI	332,000	27,300	12,200	12,100
	Western			6,100	6,050
	Central			3,050	3,025
	Eastern			3,050	3,025
Sharp/Northern	AI	96,800	5,810	4,360	4,360
Short/Rougheye	AI	45,600	1,250	938	938
Other rockfish	EBS	7,100	497	373	373
	AI	13,600	952	714	714
Atka mackerel	AI	578,000	81,600 to 109,300	66,700 to 90,600	66,700
	Western				32,000
	Central				19,500
	Eastern				15,000
Squid	BS/AI	n/a	2,620	1,970	1,000
Other species	BS/AI	687,000	137,000	25,800	20,125
BS/AI TOTAL		18,695,800	3,460,399	2,484,035	1,943,190
			3,488,099	2,507,935	

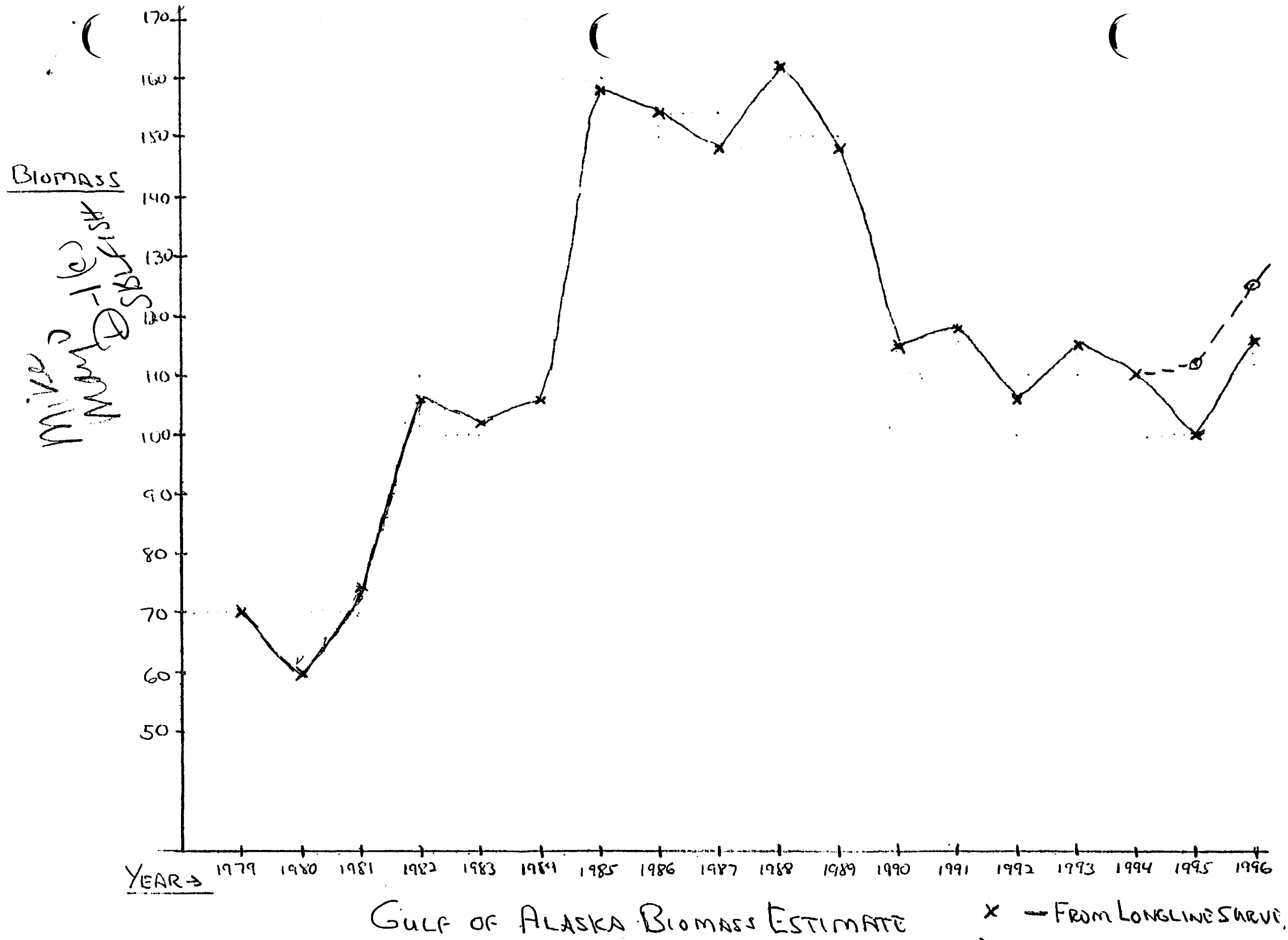
EBS = eastern Bering Sea
BS/AI = Bering Sea & Aleutian Islands
BS = Bering Sea
AI = Aleutian Islands

OFL = overfishing level
ABC = acceptable biological catch
TAC = total allowable catch

1996 Specifications

1996 ABC	1996 TAC	1996 Catch*
1,190,000	1,190,000	496,632
	45%	45%
	55%	55%
35,600	35,600	26,300
121,000	1,000	387
305,000	270,000	199,000
278,000	200,000	100,220
10,300	7,000	5,928
67%	67%	4,349
33%	33%	1,579
129,000	9,000	10,052
361,000	70,000	44,144
116,000	30,000	12,434
102,000	35,000	15,119
1,200	1,100	595
1,300	1,200	612
1,800	1,800	155
1,400	1,260	164
12,100	12,100	12,700
6,050	6,050	
3,025	3,025	
3,025	3,025	
5,810	5,229	6,626
1,250	1,125	929
497	447	117
952	857	258
116,000	106,157	101,800
55,700	45,857	41,505
33,600	33,600	33,600
26,700	26,700	26,700
3,000	1,000	543
27,600	20,125	16,924
2,820,809	2,000,000	1,051,639

* = catch as of 8/31/96.

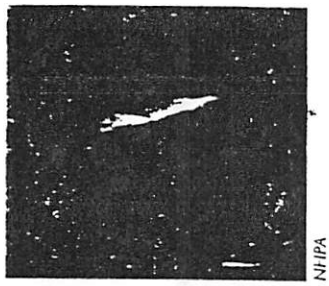


GULF OF ALASKA BIOMASS ESTIMATE
FROM LONGLINE SURVEY

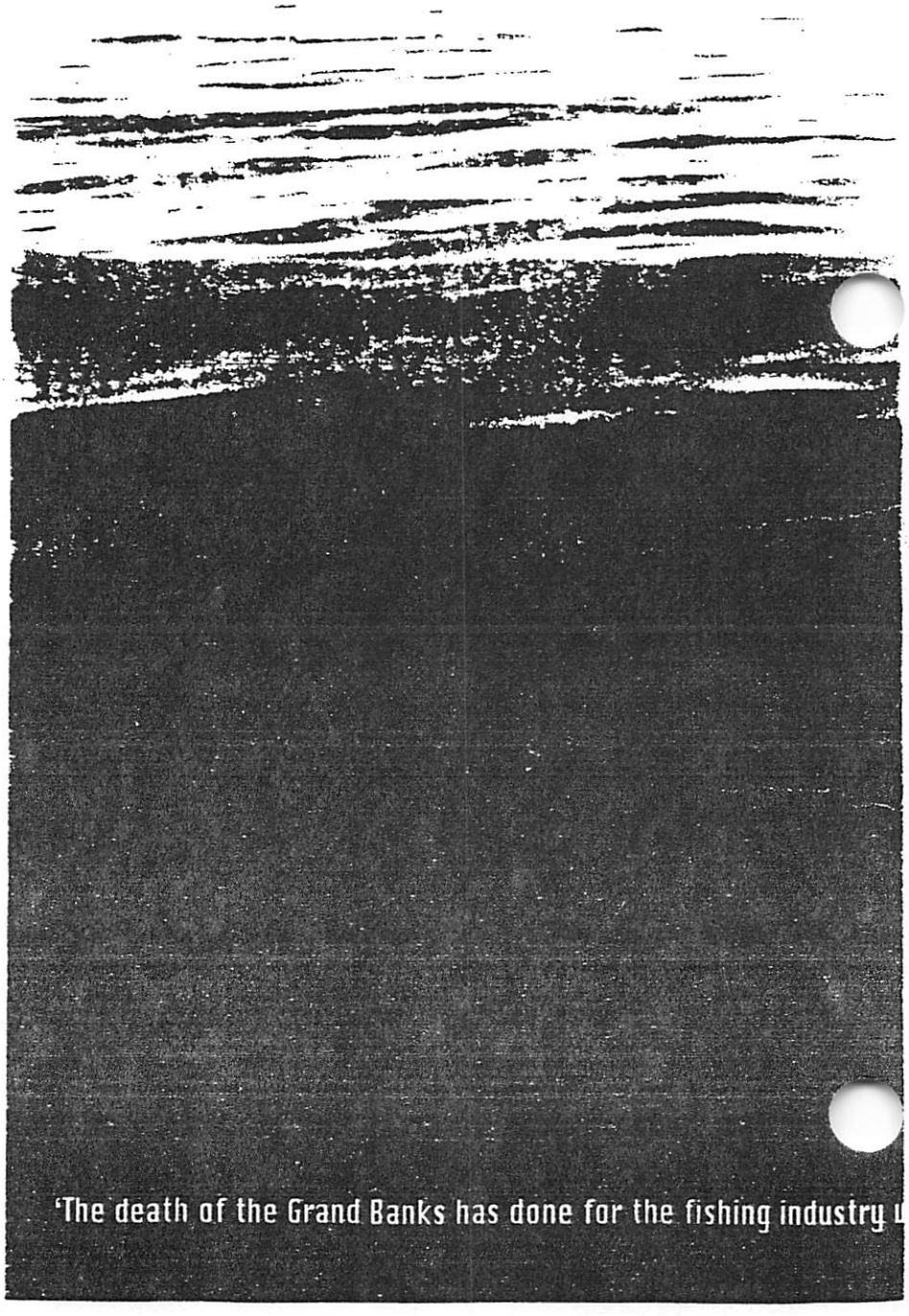
Year	Bering		Aleutians		Gulf of Alaska		
	Catch per 100 hooks	Mean dressed wgt.	Catch per 100 hooks	Mean dressed wgt.	Catch per 100 hooks	Mean dressed wgt.	
1979					17	4.1	69.70
1980			7	3.4	16	3.7	59.2
1981			7	3.4	20	3.7	74.0
1982	14	3.3	8	3.3	28	3.8	106.4
1983	16	3.3	9.	3.7	27	3.8	102.6
1984	18	3.3	10	3.8	28	3.8	106.4
1985	27	3.2	13	4.1	36	4.4	158.4
1986	23	3.6	10	4.3	36	4.3	154.8
1987	9	3.8	10	4.3	33	4.5	148.5
1988	10	3.5	8	3.8	37	4.4	162.8
1989	13	4.1	9	4.6	31	4.8	148.8
1990	8	4.0	5	4.0	24	4.8	115.2
1991	3	4.4	4	4.7	24	4.9	117.6
1992	4	4.3	3	4.9	22	4.8	105.6
1993	1	4.0	4	3.8	24	4.8	115.2
1994	4	4.4	2	4.9	20	5.5	110.0
1995					20	5.0	100.0
1996			3	4.5	21	5.5	115.50

Hello.

The cod that disap



NHPA



'The death of the Grand Banks has done for the fishing industry

THIRTY years ago, children in Newfoundland could catch fish by dipping a basket into the ocean. Now Canadian research vessels sweep the seas in vain, finding not a single school of cod in what was once the world's richest fishery. The destruction of the Grand Banks cod is one of the biggest fisheries disasters of all time. And science helped make it happen.

The Canadian government banned fishing on the Banks in 1992, when scientists discovered there were nearly no adult cod left. That ban is likely to remain in place for at least a decade. Canada has blamed Spaniards, seals and the weather. But the real damage was done by years of "safe" catches that scientists now realise were just the opposite.

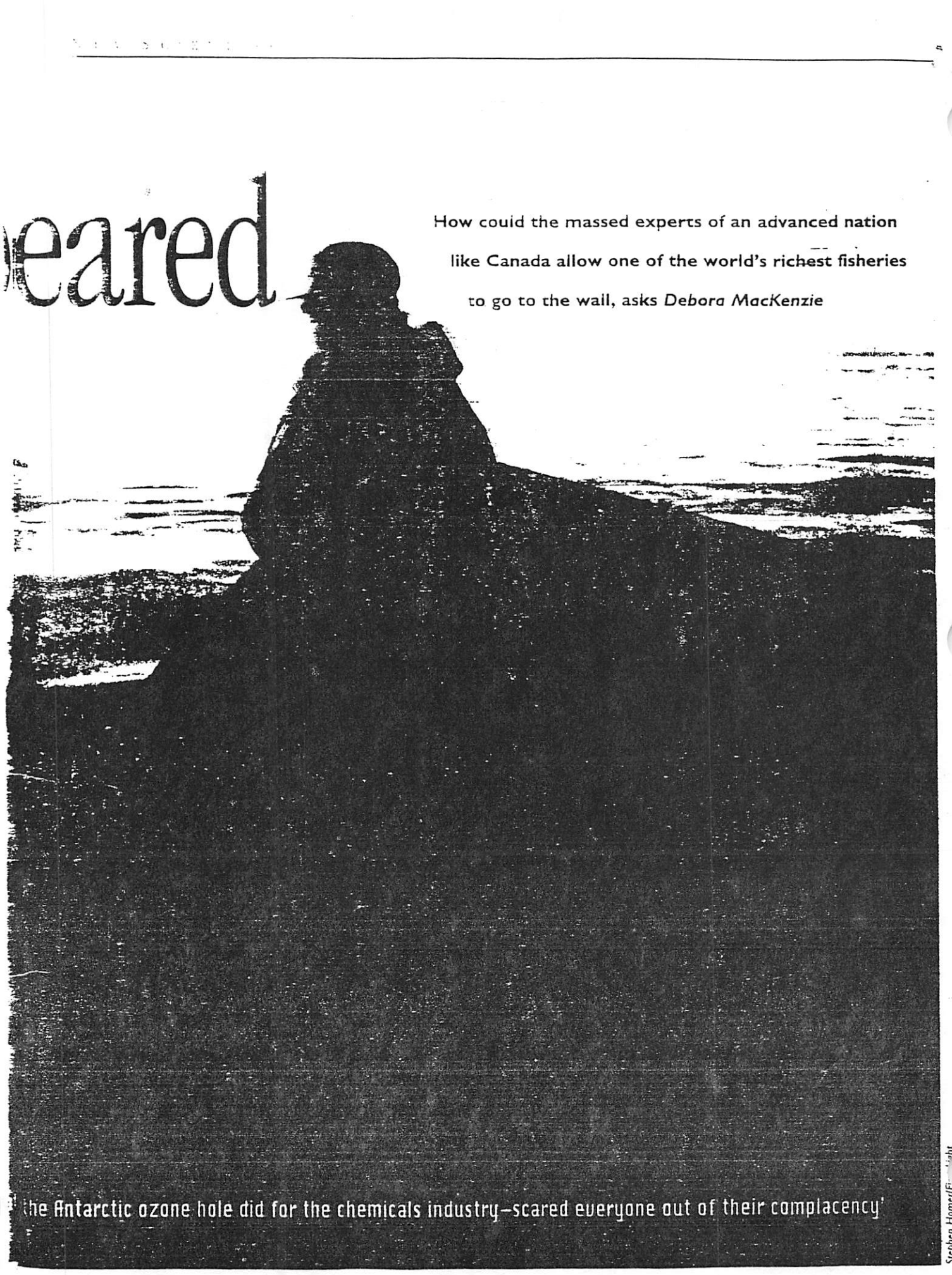
Lost jobs

The aftershock of that realisation is still being felt, and not only by the thousands of fishermen and fish plant workers who lost their jobs. The death of the Grand Banks has done for the fishing industry what the Antarctic ozone hole did for the chemicals industry: scared everyone out of their complacency. How could an advanced nation with an army of scientists allow one of the richest fisheries in the world to go to be destroyed? And if Canada could do that, what hope is there for the coastal fisheries of Europe, hostage to politics as well as science?

The Grand Banks fell prey to the usual list of suspects: a government that set

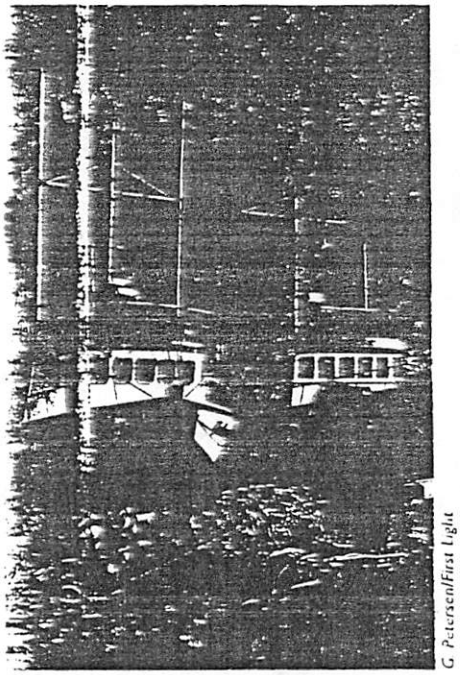
eared

How could the massed experts of an advanced nation like Canada allow one of the world's richest fisheries to go to the wall, asks *Debora MacKenzie*



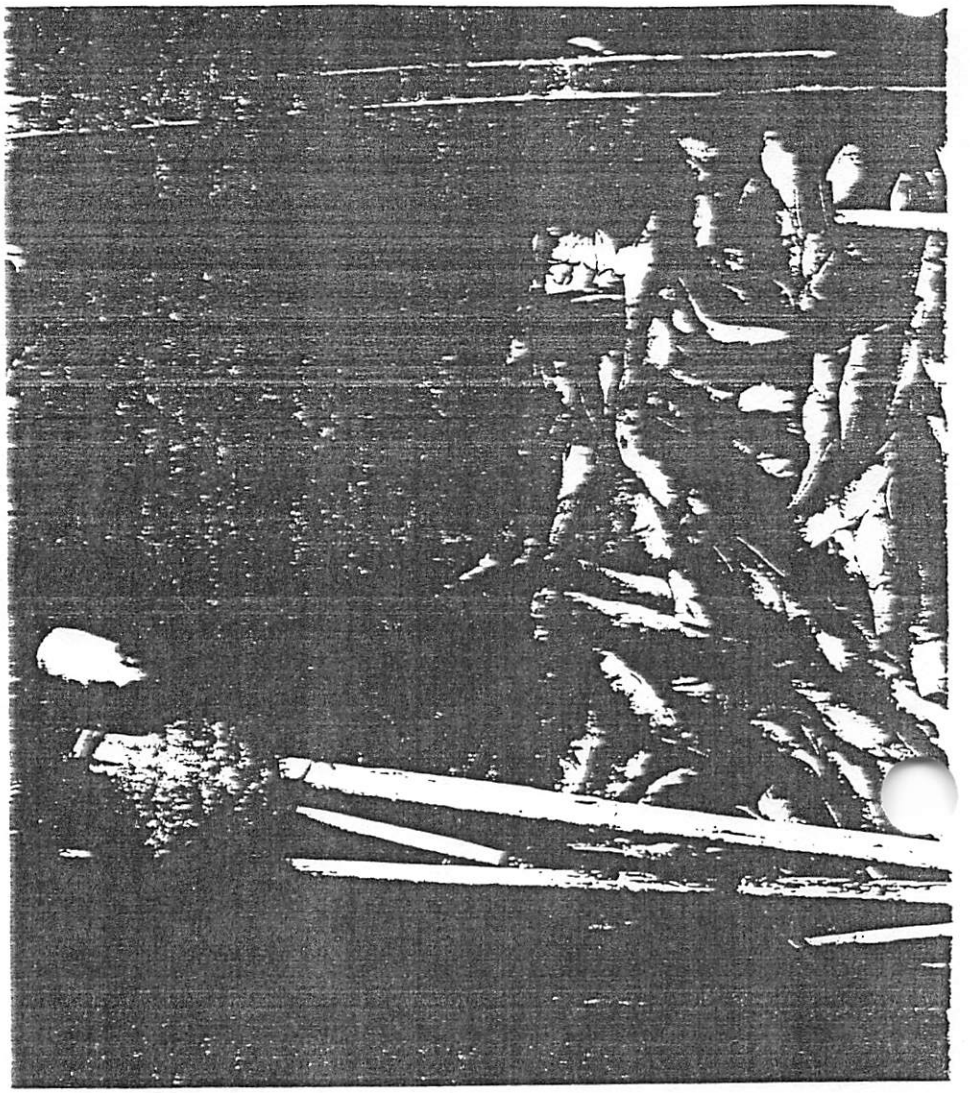
'he Antarctic ozone hole did for the chemicals industry–scared everyone out of their complacency'

Stephen Homer/Fi... ght



G. Petersen/First Light

In the 1980s, the Canadian government poured money into high-tech boats, but the cod bonanza never happened



fishing limits higher than scientists advised: fishermen who cheated on catch quotas; and the lack of restraint that plagues all "open access" fisheries ("if we don't catch them, other boats will"). But press the experts harder and an additional culprit emerges—the scientific models used for estimating sustainable catches. According to those models, the Grand Banks should still be full of fish.

Most experts admit the models are inaccurate. Yet only a few seem to realise the seriousness of the error, and even fewer are trying to come up with something better. In the meantime, the models which failed the Grand Banks are being used to govern fisheries around the world. Daniel Pauly of the International Centre for Living Aquatic Resources Management in the Philippines blames a culture of defensiveness. "It is a commonly held fallacy among fisheries biologists that only the fishers, or the politicians, are at fault when overfishing occurs," he writes. But "models routinely used by biologists...induce overfishing".

The good news is that at least some researchers are starting to make changes. They now realise that Canada's biologists relied too much on data from commercial catches to estimate the sizes of fish stocks (see "How the Banks collapsed"). Nor was this the only problem. Canada's biologists also based their assessments of the number of fish it would be safe to catch on two flawed assumptions about fish biology.

The central problem is that fish live in the sea. You cannot count them or see how many young fish are coming along for future catches. This problem is compounded by the chaotic way fish reproduce. "Recruitment"—jargon for the number of fish that survive to a catchable state in any one year—varies widely and unpredictably from year to year, and there is no way of measuring it directly.

Time travel

So since the 1950s, biologists have instead caught samples of fish, determined their ages and calculated back in time the populations that would be necessary to produce the observed age profile. Such a model tells you, in theory, what

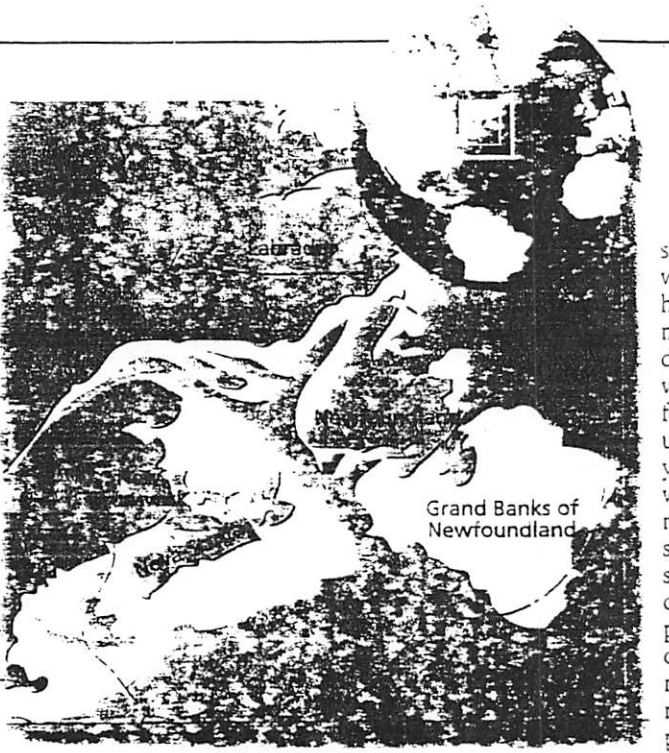
How the Banks collapsed

The disaster of the Grand Banks is a compendium of the mistakes being made in fisheries all over the world.

When scientists began to manage the Banks in the 1950s they promised to assign "safe" quotas to Canadian and foreign fleets. They failed. The cod catch fell from 810 000 tonnes in 1968 to 150 000 tonnes by 1977. Canada blamed foreign disregard for quotas, extended its jurisdiction 200 nautical miles offshore, and evicted the foreigners. Scientists set catch limits calculated to allow stocks to recover, predicting catches of 400 000 tonnes by 1990. In anticipation the government helped people in Canada's Atlantic provinces to buy new boats and fish plants.

The bonanza never happened. Every year scientists of the Canadian Department of Fisheries and Oceans (DFO) estimated the size of the fish stocks, and set the "total allowable catch", or TAC, at 10 per cent of the fish, which theory said should allow stocks to increase. But stocks never rose enough to allow TACs greater than 260 000 tonnes, falling well short of predictions. That wasn't necessarily a disaster, the scientists reasoned. The size of fish populations was held to be dominated by the survival rate of young fish, which varies widely and unpredictably. The slow recovery might

John Eastcott/Yva Momatiuk/DRK Photo



recruitment has been, how the size of the stock has changed, and therefore how much fishing you can allow. But to do this, you need to make some big assumptions. And it's these that are the problem, according to Sidney Holt who studies whaling for the International Fund for Animal Welfare.

As a researcher at the British government's fisheries research lab at Lowestoft in the 1950s, Holt helped to develop the Beverton-Holt model, widely used in fisheries to estimate changes in stock sizes based on age profiles. Now he is critical of the simplistic way fisheries managers have applied the model. And in a message to a conference in Vancouver this year, Holt's former colleague, the late Ray Beverton noted that "there is a strong inverse association between the growth of fisheries science...and the effectiveness with which it is applied".

Part of the problem is that the age profiles of fish populations are not governed by recruitment alone. They also depend on the death rates of fish, and "the data give you no way to untangle the two", says Holt. So scientists calculate recruitment from age data by assuming that natural mortality is constant and independent of age—and that they know, accurately, what mortality from fishing has been. "But if those assumptions are wrong, your estimate can be wildly off," says Holt. Pauly says this sort of error tends to produce estimates of safe catches that are too big. And if you think you have more fish than are actually out there, you will allow too much fishing. Your stock size will then fall.

It gets worse. Because of another wrong assumption, biologists have been slow to heed this warning signal. They have assumed that no matter how stocks dwindle, there will always be enough adult fish to produce the usual number of young; in other words, that recruitment is unaffected by stock size. This assumption may seem counterintuitive to people accustomed to cats or dogs, or humans, for whom the number of babies depends quite closely on the number of parents. But for natural populations of fish, they do not. "A cod produces eight million eggs," explains Lesley Harris, a former president of Memorial University in Newfoundland, who chaired an inquiry into the fishery in 1990. "Only a tiny fraction survive. A tiny difference in that survival rate makes huge differences to the resulting number of fish, far more difference than comparatively small variations in the number of parents."

Most fisheries scientists have assumed that this condition always holds. But Holt says that "even in the 1950s, we knew it didn't and that this could cause problems". As stocks dwindle there comes a point where smaller numbers of adult fish do cause recruitment to fall, perhaps because the total number of eggs laid ceases to be so massively in excess of the numbers that survive, perhaps because the presence of fewer adults exposes the young to more predation.

'Canada's biologists relied too much on data from commercial catches'

simply mean a few bad years. But there were other worrying signs. The fish were smaller, a sign that each stood less and less chance of surviving the year. And the fleet was fishing a smaller and smaller area of ocean. But the scientists had no means of reacting to any of these portents. They were employed simply to go out every year, collect particular data, estimate stocks and set the year's TACs.

Every autumn the DFO research vessel would sail a random course across the Banks, trawling and counting how many fish it caught at different ages, and how long they took to catch, to get data for standard fisheries models. Other data came from the number of fish the commercial fleet caught per hour of fishing. If they caught more fish per hour this year than last, the stock was held to be larger; if fewer, the stock was smaller.

Then in 1989, there was a discrepancy. The commercial data suggested there were twice as many fish as the research data did. The fishermen were catching more fish per hour than the scientists because they were going to warmer patches where they knew cod were congregating. The research vessel, on its random course, was encountering empty ocean. That was the accurate picture.

But the scientists were reluctant to favour their data over the fleet's. After all, they made only one cruise; the fleet made hundreds. And they didn't want to believe that the whole

But whatever the reason, recruitment fails when fishing pressure is intense (see figures). "If the assumption that recruitment is independent of stock size is applied to depleted stocks—as has commonly been done—then sustainable catches will be grossly overestimated," says Holt. This is because of a knock-on effect in successive years: fishing reduces the spawning stock, which reduces recruitment, which reduces the spawning stock, and so on. If you assume that recruitment will fall within its natural range whatever happens, and replenish the stocks accordingly, you will continue to permit these catches, thinking that you are only having a "few bad recruitment years". Instead, the stock can disappear. And this is precisely what happened on the Grand Banks.

But fisheries managers have yet to change their ways. If recruitment declines over a number of years, they still attribute it to unpredictable but natural variations, rather than suspecting excessive catches. "Until about two years ago, we didn't realise the importance of the spawning stock," says Henrik Sparholt of the International Council for the Exploration of the Seas, an intergovernmental body, based in Copenhagen, which recommends catch limits to many governments.

Sparholt blames governments, which regularly set allowable catches higher than the ICES recommends, for the fall in European stocks, not faulty science. Yet he admits that many stocks in Europe may be at or below the threshold where recruitment depends on stock size. This means that overfishing could continue even if scientific advice is heeded because the advice may be wrong. And once depleted, a fishery may not always recover. Other species may fill the ecological niche of the former fish, and keep the recovering stock from resuming its previous place in the ecosystem. A commercial fish called the slipmouth was replaced by squid in the Gulf of Thailand, says Pauly; back on the Grand Banks, yellowtail flounder "may not come back" says Harris, while the haddock population wiped out in the 1950s "has never recovered".

The belief that everything depends on yearly recruitment means that virtually all fisheries are managed on a yearly basis, with no long-term planning. Why plan if your resource depends on unpredictable yearly fluctuations? And why worry unduly about overfishing if even a small spawning stock can in theory bring the population back? "History shows a long-term drop in recruitment after overfishing in every single case," says Harris. "It's been true of herring, redfish, haddock, cod, flounder, American plaice, Greenland halibut." It is time to stop ignoring the evidence, he says.

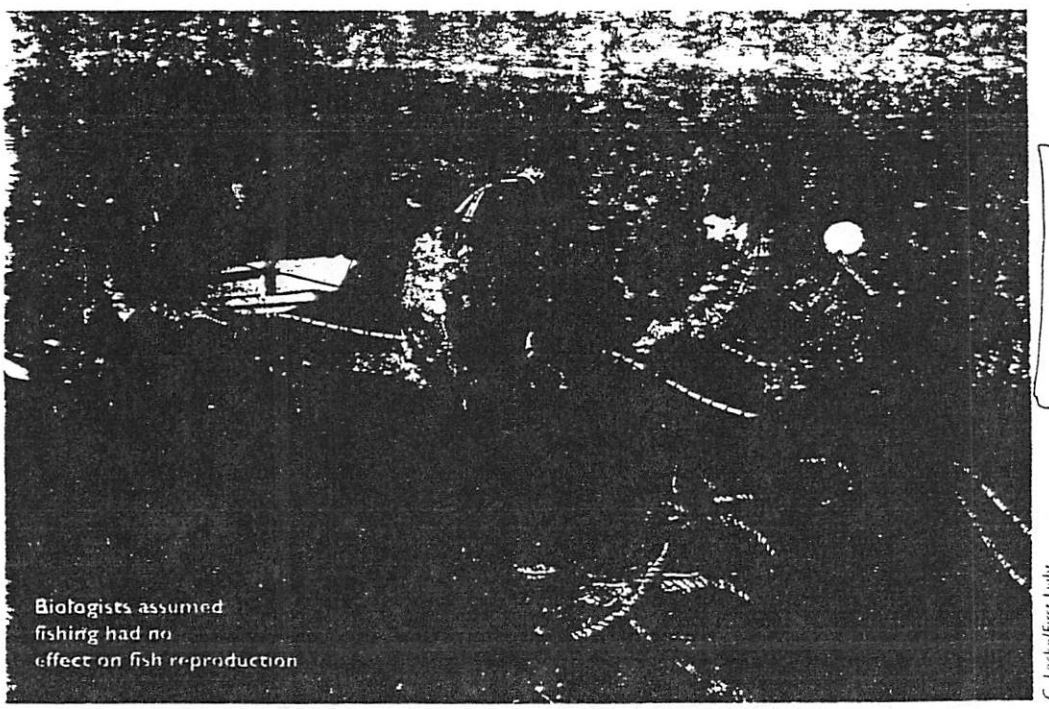
Yet few scientific dogmas have been as difficult to dislodge as the notion that the number of fish produced has nothing to do with the number available to breed. "It has been extraordinarily difficult to dissuade fisheries biologists from applying simple formulas like recipes and getting half-baked answers," says Holt.

In their defence, biologists may not realise what a big difference such critical assumptions make to the success of their models, because they have never tested them. You can't test ecological models by running varying versions of the real world. But you can use computer models to test the theoretical basis for their work was wrong.

The error worsened: in 1992, the DFO reported, the area fished had "decreased substantially" since 1987. Tony Pitcher, of the University of British Columbia, says schools of fish such as cod or haddock huddle together in a small area when they are depleted. There, you get a false impression that there are lots of fish, while the surrounding ocean is empty. By contrast, he says, hake eat each other, and thus stay well apart over their range. For hake, catching effort gives a more accurate picture.

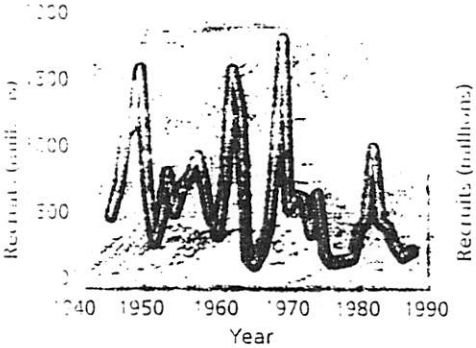
The fishing industry stuck with its false impression. The processing company National Sea Products said in 1990 that scientists only thought fish stocks were low because they surveyed large areas of ocean randomly, and didn't "go where the fish are"—where they would find that "fishing has never been better".

Fishing had never been better, because during the 1980s, aided by subsidies, fishermen bought more powerful boats and new, accurate fish-finding sonars. This was intended precisely to increase the catch per unit effort. Yet scientists took no account of better technology in calculating stock size. So in 1989, the DFO was in a quandary. They lacked confidence in their own data, were reluctant to abandon received wisdom and the region's main employer insisted that fishing was fine. The DFO compromised and

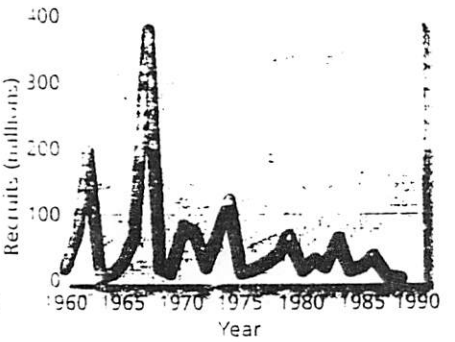


Biologists assumed fishing had no effect on fish reproduction

G Tacke/First Light



Northeast Arctic cod: recruitment



North Sea haddock: recruitment

...uters to simulate overfishing.

...was the experimental use of modelling for evaluating whale management proposals that convinced Holt. He is one of a handful of scientists advocating simulation as a tool to find management procedures that work. The key, he says, is to avoid basing your catch estimates on population models that rely on making assumptions about unmeasurable

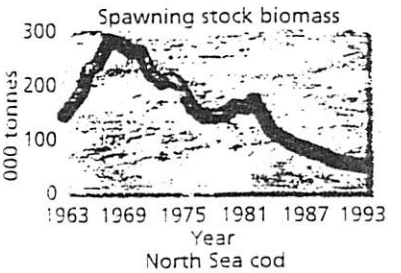
'It has been difficult to dissuade fisheries biologists from applying simple formulas like recipes'

variables. Nor should you assume that you can accurately measure the stock. "You might conclude that it's safe to catch 20 whales this year, and do the same next year and the next," says Holt. "But given the difficulty of counting whales, if that catch is too high, then by the time its cumulative effects show up in stock assessments, the stock might have already been badly damaged." The same applies to fish.

How do you avoid either assumption? You take your computer fishing. "You start with a hypothetical population of fish, about which you know only its size, an estimate of the statistical error of that value, and its catch history," says Holt. This is information scientists can actually collect. "Then, you invent an algorithm, a management procedure, with which, given what you know about the population, you calculate a safe catch limit."

There is nothing special about such algorithms, says Holt, although they can be very complex, changing the permitted catch according to a host of measurable factors that influence fisheries, depending on the type of information available. It may use information about how much fishing effort is required to catch fish, for example, or it may not.

The point is that whatever your method for calculating catches, you test it. You run a simulation, where you use the same method year after year, and see whether it crashes your stock. Then you repeat the simulation, imposing different conditions each time. What if the stock is really half what you think? What if the algorithm says we should cut fishing if the spawning stock falls beneath a certain level, but it really should be another level? "And you run it again," says Holt, "and see if your management procedure is conservative enough to keep the stock from crashing even if you're wrong."



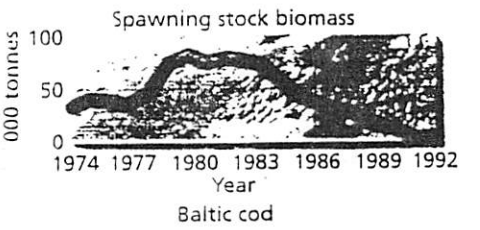
North Sea cod

This allows the setting of long-term goals, such as maximising yield while keeping the risk of depletion to agreed levels. "We can achieve sustainability without significant risk of inadvertent depletion, and reasonably high—but certainly not theoretically maximal—catches in the long run," says Holt. That would suit the fishing industry, says Peter Spohr, head buyer for Nordsee, Europe's largest fish processor. "We prefer a predictable catch to the feast or famine we have now."

Sorry plight

Efforts to apply computer simulation to European fisheries are being made at the British government's fisheries labs in Lowestoft. Such research could help to form long-term fisheries goals, which the European Commission was given the power to propose in 1992. So far, the European Union's fisheries ministers have not agreed even to modest proposals. Scientists remain among the obstacles. There is immense resistance to admitting that the methods are flawed and few scientists want to discuss work on new approaches, such as computer simulation. One who did not wish to be named said that "it would imply that what we are doing now is wrong".

Some believe the sorry plight of the Grand Banks has already proved that. "The population crashed faster than I thought possible in 1990, and I was a pessimist," says Harris. "The northern Banks are a desert. Cruises in the past two years have found no cod at all."



Baltic cod

decided the stock was midway between the research and commercial data. This was still smaller than they had thought. Retrospective calculation of the fishing that would have produced such a stock showed boats had been taking not 16 per cent of the fish each year as planned, but at least 60 per cent. The scientists advised a TAC of 125 000 tonnes, well below the 266 000 of 1988.

Then politics took a hand. The fisheries minister refused to anger fishermen by slashing catches that much. Lesley Harris, a former president of Memorial University in Newfoundland who chaired a government inquiry into the fishery in 1990, says the DFO should have insisted. "But scientists being scientists, they weren't prepared to make absolute statements about anything," he says. "Politicians used the uncertainty to set catches as high as possible." This meant 235 000 tonnes.

In January 1992, the DFO recommended a TAC of 185 000 tonnes. Then it did another research cruise—and cut that to 120 000. Then in June, it recommended banning fishing altogether. Suddenly, the scientists realised there were no cod old enough to spawn left.

By now the fishermen were worried too, and agreed to a fishing moratorium on the Bank and adjacent fisheries. In 1993, it was extended indefinitely.