AGENDA D-2
SEPTEMBER 1985

M E M O R A N D U M

TO: Council, AP, and SSC Members

FROM: Jim H. Branson
Executive Director

DATE: September 18, 1985

SUBJECT: Bering Sea/Aleutian Islands Groundfish FMP

ACTION REQUIRED

Review preliminary DAP, JVP, and TAC estimates for 1986 and release to public review.

BACKGROUND

The Bering Sea/Aleutian Islands groundfish amendment cycle began with the preparation of the 1985 Resource Assessment Document (RAD) by the Plan Team in July. The RAD provides the Team's appraisal of the status of each groundfish stock and preliminary recommendations for TACs. Item D-2(a) is the Executive Summary of the RAD which summarizes current status and TAC recommendations. Species of special interest include:

(1) Pollock - stock status is declining but there is disagreement about the cause of the decline and appropriate management response.

(2) Pacific cod - continued rapid decline, recommended TAC 165,000 mt.

(3) Yellowfin sole - high king crab bycatches occurred in 1985, but sole abundance remains at very high levels.

(4) Atka mackerel - abundance declining rapidly, with EY down from 37,700 in 1985 to 30,800 in 1986.

Item D-2(b) is a table from NMFS which includes the preliminary estimates of DAP and JVP for 1986. These values are based on projected 1985 totals rather than on survey results as has been done in the past. The NMFS survey will be conducted later in the year to allow the industry to more accurately assess their 1986 needs. At this meeting the Council will propose preliminary TACs, DAPs, and JVPs. These proposed values will be published in the Federal Register for a 30-day public review and comment period. Survey results, public comments, and any other new information will be presented to the Council at the December at which time they will finalize their recommendations. Item D-2(c) is a table showing the 1986 TAC, DAP, JVP and TALFF estimates from the RAD and NMFS catch projections.

Status of Amendment 9

Secretarial review of Amendment 9 is still going on, with the public comment period scheduled to end on September 27. The review will end on October 17 and a report on NMFS's decision will be available prior to the December meeting.

Bering Sea Sablefish Closure

On September 4 NMFS closed the Bering Sea sablefish fishery for the first time. All fishing at or beyond the 200 fathom contour is prohibited and no sablefish may be retained anywhere in the Bering Sea management area.

AGENDA D-2(a)
SEPTEMBER 1985

RESOURCE ASSESSMENT DOCUMENT FOR BERING SEA-ALEUTIANS GROUNDFISH

FOR 1985 AND

RECOMMENDED CATCH LEVELS FOR 1986

Prepared by

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July 1985

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NOTICE ON DATA UPDATE

This Resource Assessment Document is based on data analyses through July 1985. Between July and December, when the Council is scheduled to make final determinations of catch levels for each species group, new data from the commercial fishery and the summer field research program would become available which may change some of the recommendations made in this RAD. The user is therefore referred to take notice of such new data that are expected over the next several months.

RESOURCE ASSESSMENT DOCUMENT FOR BERING SEA-ALEUTIANS GROUNDFISH FOR 1985 AND RECOMMENDATIONS FOR MANAGEMENT IN 1986

INTRODUCTION

This Resource Assessment Document (RAD) for the Bering Sea-Aleutians groundfish resources is applicable for management of the 1986 fishery under Amendment #1 of the Fishery Management Plan. In this RAD, the rationale and management recommendations are presented from a biological perspective only. These recommendations, together with socio-economic and other considerations, will be used by the North Pacific Fishery Management Council to determine optimum yield and other management strategies for the fishery under the Magnuson Fishery Conservation and Management Act.

NEW INFORMATION

Since the RAD and its supplement for management of the 1985 fishery were issued (NPFMC 1984), the following new sources of data have become available to update the status of stocks:

1. Data from the 1984 summer trawl surveys conducted by the Northwest and Alaska Fisheries Center and those in cooperation with Japan and the U.S.S.R.

2. Data collected by U.S. observers aboard foreign fishing and processing vessels in 1983 and to date in 1985.

3. Data and analyses provided by Japan in documents at the International North Pacific Fisheries Commission in 1984.

4. Data and analyses provided by Japan and the U.S.S.R. at bilateral meetings this year (NWAFC 1985a,b).

Relevant and more detailed information from the updated assessment are described for each species group in Parts I and II of this RAD. These parts describe:

Part I: Species-by-species analyses of resource condition--where the more traditional single species assessment and population dynamics techniques are used. Information such as (a) historical catch trends; (b) biological condition of individual stocks, and (c) estimation of the maximum sustainable yield (MSY), and equilibrium yield (EY), of individual species groups are found in this section of the document.

Part II: Multi-species and ecosystem analyses--where the long-term dynamics of the groundfish complex are evaluated by an ecosystem simulation model.

MANAGEMENT AREA

The management area lies within the 200 mile U.S. Exclusive Economic Zone (EEZ) of the eastern Bering Sea (EBS) and Aleutian Islands (Fig. 1). International North Pacific Fisheries Commission (INPFC) statistical areas 1 to 5 are also illustrated. Some species, including pollock, Theragra chalcogramma, sablefish, Anoplopoma fimbria, and rockfishes, Sebastes and Sebastolobus spp., have independent stocks in the EBS and Aleutians and the populations in these two regions are therefore managed independently. Other species are probably of single stocks, but they are managed separately because the fisheries and management in the two regions have become distinctively different.

SPECIES OF CONCERN

The North Pacific Fishery Management Council (NPFMC) has established four categories of finfishes and invertebrates for management purposes (Table 1). Assessments of the conditions of stocks and estimates of MSY and EY are required for each of the target species of groundfish and the category of "other species." This latter category accounts for species which are currently of slight economic value and not generally targeted, but have potential economic value or are important ecosystem components. Catch records for this species category must be maintained by the fishery and a total allowable catch is established for this group.

A second category of noncommercial species, "nonspecified species," which includes fish and invertebrates of no current or foreseeable economic value, has also been established. These species are only taken in the fishery as a by-catch of target fisheries. There is no quota for this category and the total allowable catch is any amount taken by the fishery, whether retained or discarded, while fishing for target species. If retained, catch records must be kept.

The fourth category is "prohibited species." These are species of special socioeconomic interest to U.S. fisheries which cannot be retained by groundfish fisheries and, therefore, must be returned to the sea when caught.

HISTORICAL CATCH STATISTICS

Although groundfish fisheries operated in the EBS prior to World War II (Forrester et al. 1978), they were minor in nature compared to the modern-day fishery which started in 1954. Since the inception of groundfish fisheries in the Bering Sea, distant water fleets from Japan, the U.S.S.R., and the Republic of Korea (ROK) have exclusively or predominately harvested these resources. Not until recent years, as will be described in individual species sections of this report, have U.S. domestic and joint venture fisheries taken a significant portion of the catch.

Historical catch statistics since 1954 are shown for the EBS in Table 2. In this region, the initial target species for Japan and the U.S.S.R. was yellowfin sole, Limanda aspera. During this early period of the fisheries, total catches of groundfish reached a peak of 684,000 metric tons (t) in 1961. Following a decline in abundance of yellowfin sole, other species were

targeted, principally pollock, and total catches rose to 2.2 million t in 1972. Catches have since declined to about 1.2 million t as catch restrictions were placed on the fishery because of declining stock abundance of pollock and other species.

Catches in the Aleutian region (Table 3) have always been much smaller than those in the EBS and target species have generally been different. Pacific ocean perch (POP), Sebastes alutus, was the initial target species and during the early stages of exploitation overall catches of groundfish reached a peak of 111,000 t. With a decline in abundance of POP, the fishery diversified to other species including turbots, Reinhardtius hippoglossoides and Atheresthes stomias; Atka mackerel, Pleurogrammus monopterygius; Pacific cod, Gadus macrocephalus; and pollock, and overall catches declined to less than 100,000 t annually. Starting in 1980, catches of pollock increased markedly in the Aleutian region; as a result, the overall catch has again exceeded 100,000 t in some recent years.

HISTORICAL OPTIMUM YIELDS

Optimum yields (OY) established by the NPFMC since implementation of extended jurisdiction in 1977 are given in Table 4. The overall OY for all species combined has steadily increased from 1.4 million t in 1977 to 2.0 million t in 1985. Species accounting for the major part of this increase have been pollock, yellowfin sole, and Pacific cod.

RECOMMENDED CATCH LEVELS FOR 1986

Amendment #1 to the Bering Sea-Aleutians groundfish FMP provides the framework to manage the resources as a complex. The MSY of the complex ranges from 1.4 to 2.4 million t. The OY is set at 85% of the MSY range, or 1.4 to 2.0 million t. The updated status of stocks analyses (Part I) of this RAD shows that the EY for the groundfish complex for 1986 exceeds 2 million t (Table 5, EY = 2,003,570 t). The multispecies/ecosystem analyses (Part II) shows that the long-term sustainable catch level is about 1.8 million t. Since the ecosystem simulations assume a substantially lower biomass for the flatfish and cod components than are presently the case, it is determined that the estimated catch level of 1.8 million t is too low. Therefore, the 1986 catch level for the groundfish complex should be set at the high end of OY or 2.0 million t.

Since the EY values of individual species groups add up to more than 2.0 million t, the catch levels of some species will have to be adjusted from their EY values in order that the total not exceed the high end of OY. The adjustment factor will vary from species to species depending on the status and outlook of stock conditions. Table 6 summaries a proposed combination of species catch levels for 1986. A species-by-species discussion follows:

Pollock: Part I shows that EY equals 1.1 million t in the eastern Bering Sea (EBS) and 100,000 in the Aleutians. The ecosystem model (Part II) also shows a sustainable catch of 1.1 million t, and pollock abundance is 2-3 years on a down cycle and may be just passing the trough of the cycle. Since the status of stock analysis (Part I) shows that overall pollock abundance is still relatively high, it is proposed that the catch levels be held at EY. These proposed catch levels are 1,100,000 t for the EBS and 100,000 t for the Aleutian region.

Pacific cod: Pacific cod was at a historic high level of abundance in 1984 and is projected to decline through 1986 as the strong 1977 year class dies off. The total allowable catch (TAC) for 1986 is projected to be 165,000. It is proposed that the catch level be set the same because the TAC is already derived to take maximum advantage of the 1977 year class while protecting subsequent weaker year classes.

Yellowfin sole: Yellowfin sole is at a historic high level of abundance and catch levels can be set equal to EY (310,000 t) or higher. The proposed catch level for 1986 is 339,780 t and is set so that the total for all the species combined equal the groundfish complex TAC of 2.0 million t.

Turbot: The catch level for the turbot category is proposed to be similar to the 1985 TAC level. One of the two species (Greenland turbot) in the group has been declining in abundance, and it is not desirable to set the catch level equal to EY (57,500 t). Therefore, the catch level for 1986 is proposed to be 37,100 t.

Other flatfish: The other flatfish category, just like yellowfin sole, is high in abundance. This group can be exploited at the EY level of 150,200 t.

Pacific ocean perch: The stocks in both the EBS and Aleutian region have remained stable for many years. Although EYs have been estimated at 1,360 t in the EBS and 11,400 t in the Aleutians, the stocks have been known to be substantially higher in abundance. Therefore, the stock biomass could be rebuilt higher if catch levels are set lower than EY. In the EBS, the 1985 catch level was set at 1,000 t. This catch level was set mostly for incidental catch purposes to allow fisheries for other groundfish species to continue. In the Aleutian region, the 1985 catch level was set below 50% of EY at 3,800 t to promote faster rebuilding of the stock. Since the stock conditions have not changed, it is recommended that the same catch levels be set for 1986.

Other rockfish: The other rockfish group is stable in abundance. The 1985 catch level was set equal to EY in the EBS (1,120 t), since a reasonably large amount has to be available as incidental catches. In the Aleutian region, the 1985 catch level was set to equal the 1984 TAC (5,500 t) and is slightly lower than estimated EY (7,790 t) to promote some rebuilding. Since the stock conditons have not changed, it is recommended that the same catch levels be set for 1986.

Sablefish: Sablefish stocks are continuing to recover from the low abundance levels during 1977-80 but are still below historical high levels. Although EYs have been estimated to be 3,000 t in the EBS and 4,200 t in the Aleutians, the catch levels should be set below EYs to continue the rebuilding program. The 1985 catch levels were set below their EYs for this purpose. Since the need to rebuild has not changed, the 1985 catch levels should be maintained for 1986, that is 2,625 t in the EBS and 1,875 t in the Aleutian region.

Atka mackerel: Abundance of Atka mackerel is declining rapidly as strong year classes pass through the fishery. Equilibrium yield for 1985-86 is estimated at 30,800 t. Despite declining trends, the 1986 catch level could be set equal to EY since U.S. joint-ventures can utilize all the yield potential.

Squid: The 1985 catch level for squid is conservatively set at 10,000 t, since the resource size is believed to be substantially large in size.

Other groundfish: The other groundfish group may be exploited at the estimated EY level of 51,200 t.

Table 1. --Species categories established for management of Bering Sea-Aleutian groundfish fishery.

Prohibited species[a]	Target species[b]	Other species[c]	Nonspecified species[d]
		FINFISHES	
Salmonids	Walleye pollock	Sculpins	Eelpouts (Zoarcidae)
Pacific halibut	Cod	Sharks	Poachers (Agonidae) and alligator fish
	Yellowfin sole	Skates	Snailfish, lumpfishes, lumpsuckers (Cyclopteridae)
	Turbots	Smelts	Sandfishes (Trichodon sp.)
	Other flatfishes		Rattails (Macrouridae)
	Atka mackerel		Ronquils, searchers (Bathymasteridae)
	Sablefish		Lancetfish (Alepisauridae)
	Pacific ocean perch		Pricklebacks, cockscombs, warbonnets, shanny
	Other rockfish		Prowfish (Zaprora silenus)
			Hagfish (Eptatretus sp.)
			Lampreys (Lampetra sp.)
			Blennys, gunnels, various small bottom dwelling fishes of the families Stichaeidae and Pholidae
		INVERTEBRATES	
King crab	Squids	Octopuses	Anemones, Jellyfishes
Snow (Tanner) crab			Starfishes, Tunicates
Coral			Egg cases, Sea cucumbers
Shrimp			Sea mouse, Sea pens
Clams			Sea slugs, Isopods
Horsehair crab			Sea potatos, Barnacles
Lyre crab			Sand dollars, Polychaetes
Dungeness crab			Hermit crabs, Crinoids
			Mussels, Crabs - unident.
			Sea urchins, Misc. - unident.
			Sponge-unident.

[a]Must be returned to the sea.
[b]Optimum yield established for each species.
[c]Aggregate optimum yield established for the group as a whole.
[d]List not exclusive; includes any species not listed under Prohibited, Target, or "Other" categories.

Table 2.--Groundfish and squid catches (metric tons) in the eastern Bering Sea, 1954-84[a].

Year	Pollock	Pacific cod	Sablefish	Pacific ocean perch	Other rockfish	Yellowfin sole	Turbots	Other flatfish	Atka mackerel	Squid	Other species	Total all species
1954						12,562						12,562
1955						14,690						14,690
1956						24,697						24,697
1957						24,145						24,145
1958	6,924	171	6			44,153					147	51,401
1959	32,793	2,864	289			185,321					380	222,647
1960			1,861	6,100		456,103	36,843					500,907
1961			15,627	47,000		553,742	57,348					673,717
1962			25,989	19,900		420,703	58,226					524,818
1963			13,706	24,500		85,810	31,565	35,643				191,224
1964	174,792	13,408	3,545	25,900		111,177	33,729	30,604			736	393,891
1965	230,551	14,719	4,838	16,800		53,810	9,747	11,686			2,218	344,369
1966	261,678	18,200	9,505	20,200		102,353	13,042	24,864			2,239	452,081
1967	550,362	32,064	11,698	19,600		162,228	23,869	32,109			4,378	836,308
1968	702,181	57,902	14,374	31,500		84,189	35,232	29,647			22,058	977,083
1969	862,789	50,351	16,009	14,500		167,134	36,029	34,749			10,459	1,192,020
1970	1,256,565	70,094	11,737	9,900		133,079	32,289	64,690			15,295	1,593,649
1971	1,743,763	43,054	15,106	9,800		160,399	59,256	92,452			33,496	2,157,326
1972	1,874,534	42,905	12,758	5,700		47,856	77,633	76,813			110,893	2,249,092
1973	1,758,919	53,386	5,957	3,700		78,240	64,497	43,919			55,826	2,064,444
1974	1,588,390	62,462	4,258	14,000		42,235	91,127	37,357			60,263	1,900,092
1975	1,356,736	51,551	2,766	8,600		64,690	85,651	20,393			54,845	1,645,232
1976	1,177,822	50,481	2,923	14,900		56,221	78,329	21,746			26,143	1,428,575
1977	978,370	33,335	2,718	6,600	1,678	58,373	37,162	23,602		4,926	35,902	1,182,666
1978	979,431	42,543	1,192	2,200	12,222	138,433	45,781	42,947	832	6,886	61,537	1,334,004
1979	913,881	33,761	1,376	1,700	10,097	99,017	42,919	35,599	1,985	4,286	38,767	1,183,910
1980	958,279	45,861	2,206	800	1,367	87,391	62,618	20,457	4,697	4,040	33,949	1,221,665
1981	973,505	51,996	2,604	1,200	1,110	97,301	66,394	23,428	3,028	4,179	35,551	1,260,296
1982	955,964	55,040	3,184	600	862	95,712	54,908	32,666	328	3,837	18,200	1,221,301
1983	982,363	83,212	2,695	200	461	108,385	53,659	35,239	116	3,455	11,062	1,280,847
1984	1,092,403	110,944	2,793	461	137	159,526	29,709	43,110	57	2,798	7,349	1,449,287

[a]See individual species sections of this report for details of the catch statistics.

Table 3.--Groundfish and squid catches (metric tons) in the Aleutian Islands region, 1962-84[a].

Year	Pollock	Pacific cod	Sablefish	Pacific ocean perch	Other rockfish	Turbots	Atka mackerel	Squid	Other species	Total all species
1962			-	200						200
1963			664	20,800		7				21,471
1964		241	1,541	90,300		504			66	92,652
1965		451	1,249	109,100		300			768	111,868
1966		154	1,341	85,900		63			131	87,589
1967		293	1,652	55,900		394			8,542	66,781
1968		289	1,673	44,900		213			8,948	56,023
1969		220	1,673	38,800		228			3,088	44,009
1970		283	1,248	66,900		559	949		10,671	80,610
1971		2,078	2,936	21,800		2,331			2,973	31,728
1972		435	3,531	33,200		14,197	5,907		22,447	79,717
1973		977	2,902	11,800		12,371	1,712		4,244	34,006
1974		1,379	2,477	22,400		11,983	1,377		9,724	49,340
1975		2,838	1,747	16,600		3,754	13,326		8,288	46,553
1976		4,190	1,659	14,000		3,437	13,126		7,053	43,465
1977	7,625	3,262	1,897	5,900	9,587	4,488	20,975	1,808	16,170	71,712
1978	6,282	3,295	821	5,300	8,737	6,548	23,418	2,085	12,436	68,922
1979	9,504	5,593	782	5,500	14,543	12,847	21,279	2,252	12,934	85,234
1980	58,156	5,788	274	3,700	1,366	8,299	15,793	2,332	13,004	108,712
1981	55,516	10,462	533	3,500	1,394	8,040	16,661	1,762	7,274	105,142
1982	57,978	11,526	955	1,500	2,792	8,732	19,546	1,201	5,167	109,397
1983	59,026	9,955	673	600	1,140	7,869	11,610	524	3,193	94,586
1984	77,595	22,216	1,043	823	98	3,130	35,998	335	733	142,704

[a]See individual species sections of this report for details of the catch statistics.

Table 4.--Optimum yields (t) for groundfish of the eastern Bering Sea and Aleutian Islands region 1977-1985.

	1977	1978	1979	1980	1981	1982	1983	1984	1985
Eastern Bering Sea[a]									
Pollock	950,000	950,000	950,000	1,000,000	1,000,000	1,000,000	1,000,000	1,200,000	1,200,000
Yellowfin sole	106,000	126,000	126,000	117,000	117,000	117,000	117,000	230,000	229,900
Turbots	-	-	-	90,000	90,000	90,000	90,000	59,610	37,100
Other flounders[b]	100,000	159,000	159,000	61,000	61,000	61,000	61,000	111,490	111,400
Pacific cod	58,000	70,500	70,500	70,700	78,700	78,700	120,000	210,000	220,000
Sablefish	5,000	3,000	3,000	3,500	3,500	3,500	3,500	3,740	2,625
Pacific ocean perch	6,500	6,500	6,500	3,250	3,250	3,250	3,250	1,780	1,000
Other rockfish	-	-	-	7,727	7,727	7,727	7,727	1,550	1,120
Herring	21,000	18,670	18,670	-[c]	-	-	-	-	-
Squid	10,000	10,800	10,000	10,000	10,000	10,000	10,000	8,900	10,000
Other species	59,600	66,600	66,600	74,249	74,249	74,249	77,314	40,000	37,580
Aleutians[a]									
Pollock	-	-	-	100,000	100,000	100,000	100,000	100,000	100,000
Sablefish	2,400	1,500	1,500	1,500	1,500	1,500	1,500	1,600	1,875
Pacific ocean perch	15,000	15,000	15,000	7,500	7,500	7,500	7,500	2,700	3,800
Other rockfish	-	-	-	-	-	-	-	5,500	5,500
Atka mackerel	-	24,800	24,800	24,800	24,800	24,800	24,800	23,130	37,700
Other species	34,000	34,000	34,000	-	-	-	-	-	-
Total all areas	1,367,500	1,486,370	1,485,570	1,571,226	1,579,226	1,579,226	1,623,591	2,000,000	2,000,000

[a]Except for pollock in 1980-1984, "other species" in 1977-1979, other rockfish in 1984, and sablefish and Pacific ocean perch for all years, catch limitations apply to the eastern Bering Sea and Aleutian Islands areas combined.
[b]Excludes halibut but includes turbot until 1980.
[c]After 1979 herring no longer included with groundfish.

2.2.34.1

Table 5.--Estimates of maximum sustainable yields (MSYs) and comparisons of equilibrium yields (EYs) for 1984 and 1985-86 with remarks on current condition of the resources for the eastern Bering Sea (EBS) and Aleutians.

Species/Region	MSY (t)	EY (t)		Condition of Stocks
		1984	1985-86	
Pollock	...	...	...	Relatively high but declining
EBS	1,500,000	1,200,000	1,100,000	due to recent poor year classes.
Aleutians	100,000	120,000	100,000	
Pacific cod	...	291,300	...	Relatively high but declining
EBS	48,200	...	141,000	rapidly due to natural decline
Aleutians	...	...	24,000	of strong 1977 year class.
Yellowfin sole	150,000-175,000	310,000	...	At historic high levels of abundance.
EBS		...	309,000	
Aleutians		...	1,000	
Turbots	86,700	64,200	...	Generally in good condition
EBS	...	...	46,500	except for Greenland turbot
Aleutians	...	...	11,000	
Other flatfish	88,100-150,200	150,200	...	At high levels of abundance
EBS		...	146,000	
Aleutians		...	4,200	
Sablefish	...	...	...	Abundance increased due to
EBS	<13,000	2,600	3,000	strong 1977 year class, but
Aleutians	2,100	3,360	4,200	still substantially below historical levels.
Pacific ocean perch	12,000-17,000	...	...	Abundance stable.
EBS		1,360	1,360	
Aleutians		11,400	11,400	
Other rockfish	...	...	...	Abundance stable.
EBS	<7,000	1,120	1,120	
Aleutians	<23,000	7,790	7,790	
Atka mackerel	38,700	37,700	...	Lacking information on abundance
EBS	...	...	800	and condition. Abundance declining
Aleutians	...	...	30,000	rapidly as strong year classes pass through peak.
Squid	>10,000	10,000	...	Lacking information but estimates
EBS	...	...	7,500	are conservative.
Aleutians	...	...	2,500	
Other species	67,200	51,200	...	Abundance at average levels.
EBS	...	...	39,400	
Aleutians	...	...	11,800	
Total groundfish	2,146,000-2,476,200	2,262,230	2,003,570	Overall abundance declined from 1984 due largely to declines in pollock and cod resources
EBS		...	1,795,680	
Aleutians		...	207,890	

2.2.34.2

Table 6.--Recommended catch levels (t) for 1986 for the groundfish complex in the eastern Bering Sea (EBS) and Aleutian region; and comparisons to their estimated equilibrium yields for 1986 and total allowable catches (TAC) in 1985.

Species/Region	1985 TAC	(Part I) 1986 EY	Part II Ecosystem Long-term Catch	Recommended 1986 Catch Levels
Pollock	...	...	1,100,000	...
EBS	1,200,000	1,100,000	...	1,100,000
Aleutians	100,000	100,000	...	100,000
Pacific cod	220,000	...	100,000	...
EBS	...	141,000	...	141,000
Aleutians	...	24,000	...	24,000
Yellowfin sole	229,900	...	130,000	...
EBS	...	309,000	...	338,780
Aleutians	...	1,000	...	1,000
Turbots	37,100	...	85,000	...
EBS	...	46,500	...	28,320
Aleutians	...	11,000	...	8,780
Other flatfish	111,400	...	120,000	...
EBS	...	146,000	...	146,000
Aleutians	...	4,200	...	4,200
Sablefish	...	...	9,000	...
EBS	2,625	3,000	...	2,625
Aleutians	1,875	4,200	...	1,875
Pacific ocean perch	...	...	12,000	...
EBS	1,000	1,360	...	1,000
Aleutians	3,800	11,400	...	3,800
Other rockfish	...	...	14,100	...
EBS	1,120	1,120	...	1,120
Aleutians	5,500	7,790	...	5,500
Atka mackerel	37,700	...	>28,000	...
EBS	...	800	...	800
Aleutians	...	30,000	...	30,000
Squid	10,000	...	--	...
EBS	...	7,500	...	7,500
Aleutians	...	2,500	...	2,500
Other species	37,580	...	--	...
EBS	...	39,400	...	39,400
Aleutians	...	11,800	...	11,800
Total groundfish	2,000,000	2,003,570	1,800,000	2,000,000
EBS		1,795,680		
Aleutians		207,890		

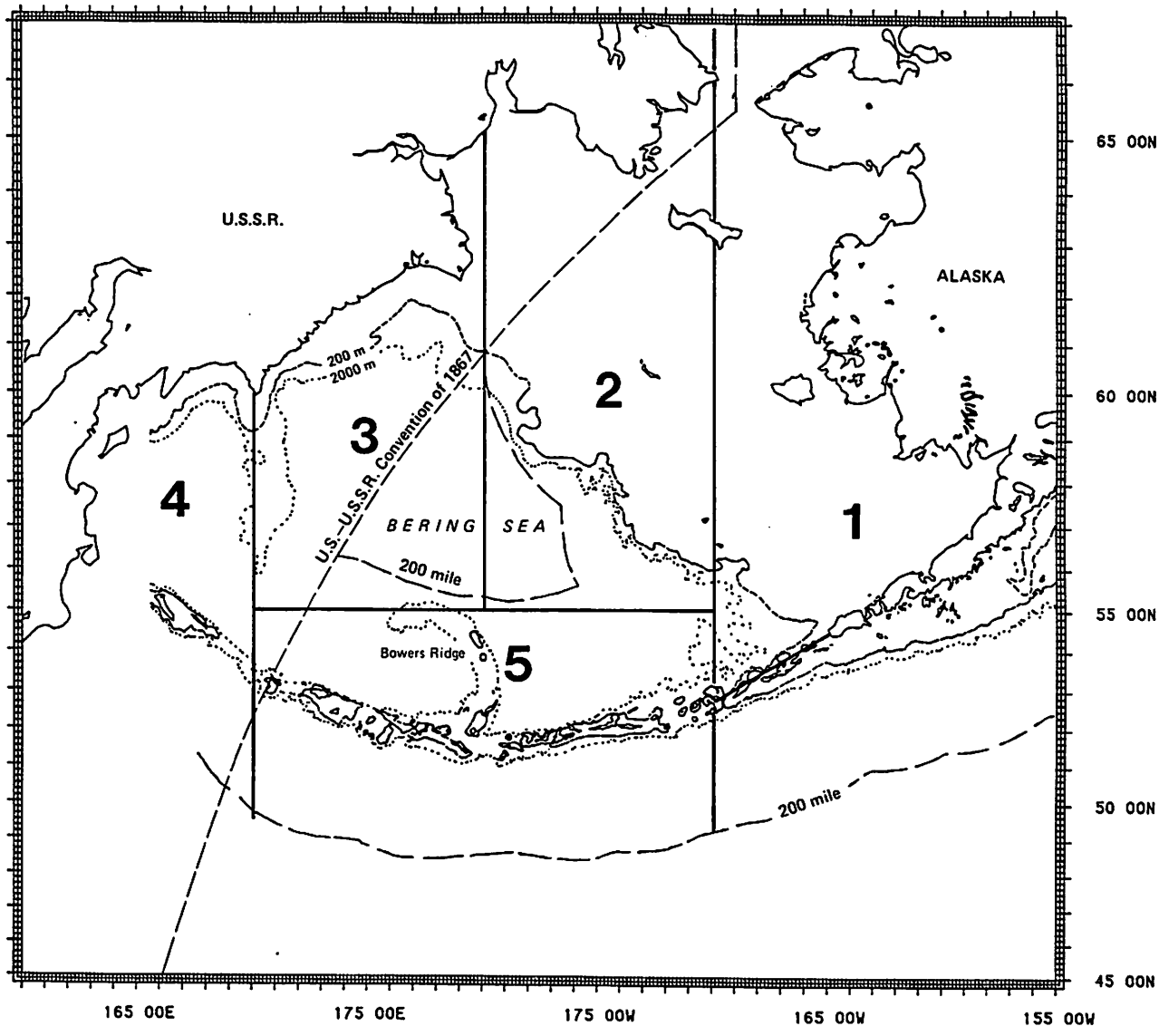


Figure 1.--Bering Sea showing U.S. 200-mile fishery conservation zone and eastern Bering Sea (areas 1 and 2) and Aleutian Islands region (area 5) management areas. Areas 1-5 are International North Pacific Fisheries Commission statistical areas.

Footnote on Area Notations

INPFC Areas	1	2	3	4	5
U.S. Management Areas ...	I	II	III	None	IV

BERING SEA/ALEUTIAN ISLANDS

	1985 DAP PROJECTED CATCHES	DAP SURVEY RESULTS	1985 JVP PROJECTED CATCHES	JVP SURVEY RESULTS	1985 DAH PROJECTED CATCHES	DAH SURVEY RESULTS
POLLOCK						
BERING	20000	15395	361000	363670	381000	379065
ALEUT.	4000	10346	7500	5280	11500	15626
YELL. SOLE	100	1769	111200	111127	111300	112896
TURBOT	5	50	300	2375	305	2425
FLOUNDERS	360	1313	45500	53000	45860	54313
PAC. COD	82400	104879	35300	40452	117700	145331
POP						
BERING	1000	6495	10	50	1010	6545
ALEUT.	100	3970	450	1968	550	5938
ROCKFISH						
BERING	150	986	5	0	155	986
ALEUT.	5	800	15	2520	20	3320
SABLEFISH						
BERING	2625	2124	30	1585	2655	3709
ALEUT.	1605	5354	65	0	1670	5354
ATKA MACK	0	0	37700	54600	37700	54600
SQUID	0	0	10	0	10	0
OTHERS	1000	0	4900	400	5900	400
TOTAL	113350	153481	603985	637027	717335	790508

DRAFT

AGENDA D-2(c)
SEPTEMBER 1985

BERING SEA/ALEUTIAN ISLANDS
Initial Apportionments (mt) of Total Allowable Catch for 1986

Species	Area	TAC	DAP[1/]	JVP[2/]	DAH	RESERVE[3/]	TALFF
Pollock	BS	1100000	20000	361000	381000		554000
	AI	100000	4000	7500	11500		73500
Pacific	BS	1000	850	0	850		0
Ocean perch	AI	3800	100	450	550		2680
Rockfish	BS	1120	150	5	155		797
	AI	5500	5	15	20		4655
Sablefish	BS	2625	2231	0	2231		0
	AI	1875	1594	0	1594		0
Pacific cod	BS	141000	82400	35300	117700		22550
	AI	24000					
Yellowfin sole	BS	338780	100	111200	111300		177513
	AI	1000					
Turbots	BS	28320	5	300	305		31230
	AI	8780					
Other flatfish	BS	146000	360	45500	45860		81810
	AI	4200					
Atka mackerel	BS	800	0	26180	26180		0
	AI	30000					
Squid	BS	7500	0	10	10		8490
	AI	2500					
Other species	BS	39400	1000	4900	5900		37620
	AI	11800					
TOTAL		2000000	112795	592360	705155	300000	994845

1/ DAP is set equal to the NMFS projected catch, but less than or equal to 85% of TAC.

2/ JVP is set equal to the NMFS projected catch, but less than or equal to the remainder of 85% of TAC minus DAP.

3/ In cases where JVP or TALFF is equal to or approaching zero, some reserves may be apportioned to those fisheries for bycatch. Currently, those fisheries are POP (BS), sablefish, and Atka mackerel.

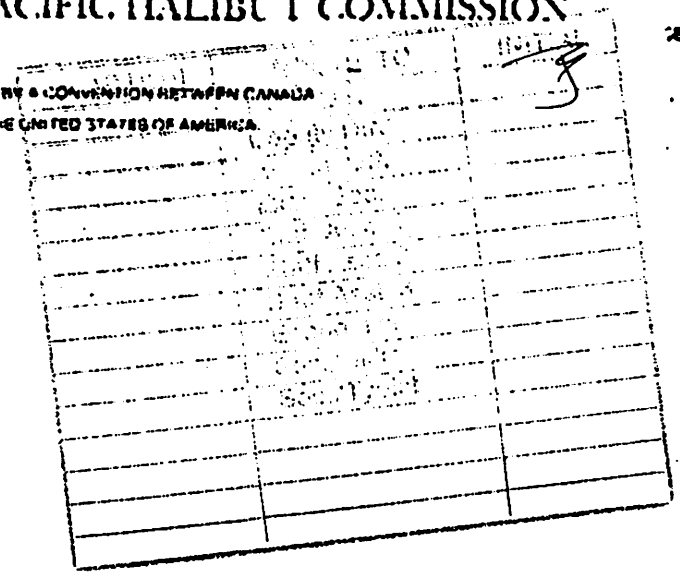
COM1/TABLE

AGENDA D-2
SUPPLEMENTAL

INTERNATIONAL PACIFIC HALIBUT COMMISSION

DIRECTOR
DONALD A. MCCAUGHRAN
P.O. BOX 95009
SEATTLE, WA 98145-2009
TELEPHONE
(206) 634-1838

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



September 19, 1985

Dr. R. Ian Fletcher
Great Salt Bay Experimental Station
Box 1056
Damariscotta, Maine 04543

Dear Ian:

I read your report on the pollock stock of the S.E. Bering Sea with a great deal of consternation. This was not the type of project I had agreed to help you with. I am also surprised you did'nt allow me to review it before you submitted it to the Tanadgusix Corporation. The project I had agreed to help with was an analysis of the sensitivity and variability of estimates of pollock biomass and productivity. As a member of the Bering Sea PMT, I thought it better to help on this study rather than see someone outside the team and NMFS help setup the analysis. Besides, I enjoy doing research on my free time.

There are a number of statements in the report that I disagree with.

1. The catch-age method in Deriso, Quinn, and Neal (1985) was used in this study, not because of reliability considerations, but rather because our catch-age method is amenable to the analysis of sensitivity and variability of abundance estimates.

2. New results are not statistically significantly different from earlier NMFS estimates of abundance since 1979. This can be seen in Figure 1 for Table 1 estimates since NMFS cohort estimates lie within two standard deviations of the Table 1 estimates.

3. The drop in surplus production from 1981 through 1983 does not signify overfishing. Surplus production dropped after 1980 because of below average recruitment. The surplus production in 1980 was above average. I believe estimates of short term changes in surplus production are not very useful for helping to determine catch quotas. In earlier reports by Alton and myself we recommend focusing more on a moving average of the surplus production. Using the averages in Tables 1 and 2 as a benchmark, the pollock fishery has been managed conservatively. Average catch since 1975 is more than 100,000 metric tonnes below surplus production.

4. An earlier version of CAGEAN for analysis of the Gulf of Alaska pollock has been operational on the NMFS computer for over a year. In fact, Miles Alton at NMFS and I have written several reports over the last three years on applications of catch-age analysis to GOA pollock.

With regards,

Richard B. Deriso Ph.D.
Population Dynamicist

RBD/cc

cc: Dr. Aron
Mr. Branson
Mr. Glock
Dr. Marasco
Dr. McCaughran
Mr. Wespestad

REVIEW OF FLETCHER'S REPORT PREPARED FOR THE TANADGUSIX CORPORATION ON POLLOCK STOCK ABUNDANCE IN THE EASTERN BERING SEA

by

James Balsiger,[1/] Richard Deriso,[2/] Daniel Kimura,[1/]
Bernard Megrey,[1/] and Vidar Wespestad[1/]

We have reviewed the report entitled Estimates of Stock Abundance, Productivity, and Other Measures of Consequence on the Pollock Stock of the S.E. Bering Sea and reject the conclusion that the southeastern Bering Sea pollock is in a precipitous decline. We do not agree that short-term changes of surplus production are an appropriate indicator of the condition of a stock characterized by variable recruitment. Surveys in 1985 indicate that the succession of weak year classes referred to in the report has ended. The 1978 year class which Fletcher identifies as the first of several weak year classes has been shown in several surveys and analyses to be the strongest ever observed in the eastern Bering Sea.

We are also enthusiastic about Deriso's generalization of Doubleday's separable VPA. This model has been in use at the NWAFC for more than a year, primarily in the analysis of the Gulf of Alaska pollock stocks. Assessments using traditional VPA or cohort analysis employ the same general procedure as the analysis reported by Fletcher. The major difference being that model "tuning" or "fitting" of results with Deriso's model allows the incorporation of ancillary data in a direct repeatable manner. Deriso's version also allows, via the separability assumption and Monte Carlo simulation, a measure of the variability of the results. While these features are useful in evaluation of results, it is extreme to present the model as "significantly" different from other VPA methods.

Several analytical models including Deriso's have been used by the NWAFC to evaluate eastern Bering Sea pollock. The results obtained from these applications are provided in figures 1 and 2 of Fletcher's report. Fletcher's results are not significantly different in a statistical sense from earlier NMFS estimates since 1979. This can be seen in figure 1 since NMFS cohort estimates lie within two standard deviations of the Table 1 estimates.

Fletcher's characterization of the pollock resource as "... a stock heavily overfished, with productivity depressed, and abundance in a precipitous decline owing to a succession of failed year classes" is misleading. His conclusion that "Unless fishing is curtailed, we believe a stock collapse is likely" is unwarranted. Assumptions which led to these conclusions are not sufficiently addressed in the report.

Surplus production is a basic measure of how fast stocks change and includes changes due to growth, recruitment, and natural mortality, as well as fishing mortality. However, in the report, the reader is led to believe that the only

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1/ Northwest and Alaska Fisheries Center.
2/ International Pacific Halibut Commission.

force that causes productivity to vary is fishing. It is clear, as acknowledged, that recruitment for eastern Bering Sea pollock is not constant. Therefore, it does not make sense to talk about negative production and "payback" to the stock when the increase in stock size may not enhance future recruitment.

An examination of exploitation rates instead of surplus production provides more insight into the intensity of the fishery operating on the pollock stocks. Using data from Fletcher's table 1, we calculated the estimated exploitation since 1975 as follows:

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983
Catch/biomass	.29	.22	.19	.20	.20	.11	.10	.11	.12

Exploitation has been decreasing largely due to the entry of the extremely large 1978 year class to the fishery. Even in the late 1970's with catches at a higher level, the catch/biomass ratio was conservative considering natural mortality is about M = .3. Tables 1 and 2 also show that, on average, catches have been less than average surplus production. Some yield analyses done at the NWAFC indicate that, on average, yield may biologically be as high as 2.2 million t (Wespestad and Terry 1984).

The concept of year class variation is the central theme of any analysis of pollock in the Bering Sea. For adequate management of such volatile stocks, recruitment information is vital. None of the analytical models yield reliable information on the most recent years recruitment. This information must come from the NWAFC groundfish surveys. These surveys indicate that in recent years the 1979, 1980, and 1981 year classes are weak. Fletcher's report states that the 1978 year class is also weak, however, all other indices and analyses show that this year class was the largest on record.

The occurrence of three relatively weak year classes in succession did cause some alarm last year. However, modelling exercises employing stochastic recruitment indicated poor recruitment must continue for additional years or the level of fishing increased to adversely impact the stock (Bakkala et al. 1985). Preliminary information from the 1985 survey indicates that the recent series of reduced recruitment has ended and one good year class (1982 or 1983), and possibly a second (1984) are entering the fishery. This appears to be maintaining the pollock resource at levels intermediate to those estimated from the 1979 and 1982 surveys.

References:

1. Bakkala, Richard G., Vidar G. Wespestad and Jimmie J. Traynor. 1985. In R. G. Bakkala and L. L. Low (eds.) Condition of groundfish resources of the eastern Bering Sea and Aleutian Islands Region in 1984. NOAA Tech. Memo. NMFS/NWC-83. 196 p.

2. Wespestad, Vidar G. and Joseph M. Terry. 1984. Biological and economic yields for eastern Bering Sea walleye pollock under different fishing regimes. N. Amer. J. fish. Mgmt. 4(204-215).

DRAFT

BERING SEA/ALEUTIAN ISLANDS
Initial apportionments (mt) of total allowable catch for 1986

Species	Area	85TAC	86TAC	DAP	JVP	DAH	RESERVE	TALFF	85TALFF
Pollock	BS	1200000	1100000	20000	361000	381000		554000	772929
	AI	100000	100000	4000	7500	11500		73500	72699
Pacific	BS	1000	1000	850	0	850		0	BYCATCH
ocean perch	AI	3800	3800	100	450	550		2680	BYCATCH
Rockfish	BS	1120	1120	150	5	155		797	BYCATCH
	AI	5500	5500	5	15	20		4655	BYCATCH
Sablefish	BS	2625	2625	2231	0	2231		0	BYCATCH
	AI	1875	1875	1594	0	1594		0	BYCATCH
Pacific cod	BS	220000	141000	82400	35300	117700		22550	52317
	AI	*****	24000						
Yellowfin sole	BS	226900	338780	100	111200	111300		177513	123382
	AI	*****	1000						
Turbots	BS	42000	28320	5	300	305		31230	27355
	AI	*****	8780						
Other flatfish	BS	109900	146000	360	45500	45860		81810	40507
	AI	*****	4200						
Atka mackerel	BS	37700	800	0	26180	26180		0	BYCATCH
	AI	*****	30000						
Squid	BS	10000	7500	0	10	10		8490	9731
	AI	*****	2500						
Other species	BS	37580	39400	1000	4900	5900		37620	33888
	AI	*****	11800						
TOTAL		2000000	2000000	112795	592360	705155	300000	994845	1132809