Work Sheet
GOA

SSC
12/4/04

B.S. figures.

	Level 1 (MT)	Notes.
Pollock		
Western + Central	305,000	Harvest Level not to exceed,
Eastern	16,600	Harvest level not to exceed.
Pacific Cod		
Western	16,500	
Central	33,540	No change
Eastern	9,900	
Atka Mackerel		
Western	4,678	ABC we recommend no change to the plan
Central	-	By-catch amounts only.
Eastern	-	By-catch amount only

RHC. Recom. harvest level

	EY	OY	Notes
SABLEFISH			
Western	2,225	1,670	The SSC recommendation
Central	4,075	3,060	No change fo... EY. The SS... notes that ... the current ... OY are 75% ... of EY for ... purpose ... of rebuildi...
W. Yakutat	2,240	1,680	
E Yakutat	1,135-1,510	851-1,133	
SE (Total)	1,290-2580	968-1935	

	LEVEL	Notes
FLOUNDER		
Western	10,400	No change from current OY's.
Central	14,700	
Eastern	8,400	

POP Complex

	EY	OY or ABC	
Westen	1,736	?	See SSC minutes
Central	5,208	?	
Eastern	4,530	?	

OTHER Rockfish

Gulf wide	current OY is 7,600 mt.	See SSC minutes

[illegible] concerned [illegible] Cncl [illegible] indic [illegible] sustain [illegible] massive harvest.

Thorny head.

Gulf Wide	3750

Squid

Gulfwide	5,000

Other Species

Gal/mile 5% of total

AGENDA D-2(a)
DECEMBER 1984

M E M O R A N D U M

TO: Council, SSC and AP Members

FROM: Jim H. Branson
Executive Director

DATE: November 27, 1984

SUBJECT: Gulf of Alaska Groundfish Fishery Management Plan

ACTION REQUIRED

Review 1984 status of stocks and adjust 1985 biological quotas where necessary.

BACKGROUND

You received a report on the status of the Gulf groundfish resource at the September Council meeting. Since then, new information has become available. The Plan Team met on November 14-16 to review the earlier assessment following the receipt of INPFC documents and preliminary results from last summer's NMFS Gulf of Alaska triennial survey. This survey, the most comprehensive Gulf survey since the early 1960s, provided the first estimate of exploitable biomass for Atka mackerel, new estimates for pollock and flounder, and a clearer overview of stock condition in the Gulf of Alaska. As a result of this information, major revisions to the Team's September report were made. A summary table of the Team's findings and a worksheet are included here as Item D-2(a)(1) and (2). In addition to changes in OY, the Plan Team recommends changes to several biomass, ABC and EY values. Their recommendations are provided in detail in their updated status of stocks report, Item D-2(a)(3). Their recommendations constitute a formal proposal to be considered during the groundfish amendment cycle.

Table 1.--Current status of Gulf groundfish resources.

	OY in 1984	84 catch	Stock condition	Current trend in abundance	Team's recommends 1984 harvest level
Pollock	416,600	280,000	good	exploitable biomass declining to 1.2 million t in 1985	170,000 to 300,000 t
Pacific cod	60,000	20,000	good	stable, biomass is 530,000 t	OY 84
Atka mackerel	28,700	1,000	depressed	stock disappearing in the central Gulf	rebuild, incidental species, <1,000 t
Sablefish	9,480	9,000	fair	exploitable biomass @ 125,000 (EY = 12,500)	9,370 t
Flounder	33,500	5,000	good	biomass @ 1.5 million t	OY 84
Pacific ocean perch complex	11,475	4,000	depressed	biomass 267,000 mt Gulf-wide 173,000 mt, west and central Gulf, EY <5000 t west and central Gulf	rebuild incidental catch, < 5,575 t
Other rockfish	7,600	1,700	depressed	unknown, some species in SE declining	1,500 t
Thornyhead rockfish	3,750	100	unknown	about 50,000 t Gulfwide	OY 84
Squid	5,000	<100	unknown	assumed stable	OY 84

BIOLOGICAL QUOTA WORKSHEET

Species	1984 OY	1984 Catch	PT Guidelines	Tentative Council OY
Pollock	416,600 mt	280,000	170,000-300,000	
Pacific cod	60,000 mt	20,000	60,000	
Atka mackerel	28,700 mt	1,000	1,100 2/	
Sablefish	9,480 mt	9,000	9,370	
Flounder	33,500 mt	5,000	33,500	
POP complex	11,475 mt	4,000	5,575 2/	
Other rockfish	7,600 mt	1,700	1,500	
Thornyhead	3,750 mt	100	3,750	
Squid	5,000 mt	100	5,000	
Other species	28,780 mt	1,400	28,780	

1/ These figures reflect quotas Gulfwide. They will be apportioned by areas as a function of exploitable biomass.

2/ For rebuilding purposes, the Plan Team recommends a zero harvest. The Council may wish to allow small harvests to be taken in an incidental fishery only. The presented values represent maximum ceilings that bycatch amounts should not exceed for biological purposes.

Gulf of Alaska Plan Team Report

Status of Gulf of Alaska Groundfish Stocks, 1984

November 16, 1984

Status of Gulf of Alaska Groundfish Stocks, 1984

The Plan Team (PT) for the fishery management plan for groundfish of the Gulf of Alaska (FMP) met in Seattle for three days, November 14-16, 1984, to update the PT's August 29, 1984 report on the status of stocks of the ten species or species groups which have a specified OY in the FMP. Table 1 provides a summary of PT's updated findings. Tables 2 and 3 summarized 1983 and 1984 catches.

In general, the current information on the status of stocks available for the team's review consisted of the final 1984 INPFC groundfish documents; two preliminary NMFS reports on the estimates of biomass from the 1984 Gulf of Alaska triannual trawl survey by Eric Brown, NWAFC RACE Divison, Seattle and by Jeff Fjuioka, NWAFC Auke Bay Laboratory, Auke Bay; and a status report on nearshore rockfish in southeastern Alaska by Barry Bracken, ADF&G, Petersburg. The PT reviewed and discussed the condition and fisheries of each stock or species group taking into account the new information. From this review, the PT developed recommendations for 1985 harvest levels to provide a basis for possible changes in OY values for 1984. In most cases, the actual value of the recommended harvest could not be specified until a by-catch level of the full utilized species is determined.

A summary of these recommendations are included. Species by species summaries of the team's deliberations and conclusion on the conditons of the resources are included in this report. The recommendation are the team's proposal for plan amendments for adjusting OY levels.

Plan Team Harvest Recommendations

The following recommendations for harvest levels in 1984 are based on the PT's assessment of the current productivity of fishery resources in the Gulf of Alaska. The establishment of a final harvest level or OY values must

also take into account the potential by-catch of fully utilized species, i.e. Pacific ocean perch complex, Atka mackerel, and sablefish.

1. The pollock harvest in the western and central area be set to achieve a rate of exploitation between 14 and 24% or 168,000 to 305,000 mt such that the 1984 harvest does not exceed the 1984 harvest. No change in eastern area OY of 16,600 t is recommended. The team's recommendation is lower than the upper range of ABC (350,000 mt) because of the concern of the dependence of the fishery on the two dominant year classes and the projected decline in the exploitable biomass resulting from continued poor recruitment.
2. For Pacific cod, the PT recommends no change in the OY for 1984 and no change in proportionment of the OY among western, central, and eastern regulatory areas.
3. The Plan Team recommends that the Atka mackerel harvest be substantially reduced for 1985 to a level that will only provide a sufficient by-catch for the continued operations of domestic joint venture and foreign fisheries. The 1984 harvest levels (<1,000 mt in the western area, <100 in the central area, and near zero in the eastern area) provide a guideline for setting the 1985 OY levels by management level.
4. The team recommends that the 1985 harvest levels for sablefish be set at 75% of the estimated EY for the exploitable biomass deeper than 300 meters. The OY should be apportioned amongst the management areas according to the relative distribution of biomass estimated from the 1983 and 1984 surveys. Since these surveys did not cover the inside waters of southeastern Alaska and Prince William Sound, the team's recommended harvest levels do not apply to those fisheries within the state's jurisdiction.

5. No changes are recommended in the optimum yield level for the flounder species category. Given that domestic fisheries are interested in some species other than arrowtooth flounder, the PT recommends that in the future harvest levels be assigned by species within the flatfish complex.
6. For the Pacific ocean perch complex, the PT recommends that the harvest be set at a level which allows an incidental catch fishery only and that the future catch limits be set for individual species within the complex.
7. The EY for the "other rockfish" category which primarily includes other species on the slope not in the POP complex is not expected to exceed the average harvest of 1,500 mt for recent year. The rockfish categories should be redefined to include slope species, pelagic shelf species and nearshore demersal species. The management of each group should be independent of the others. Management of the nearshore demersal category should be conducted in cooperation with the state.
8. The PT recommends no change in the harvest levels or OY values for the thornyhead rockfish and squid categories.

Table 1.--Current status of Gulf groundfish resources.

	OY in 1984	84 catch (approximate)	Stock condition	Current trend in abundance	Team's recommended 1985 harvest level
Pollock	416,600	290,000	good	exploitable biomass declining to 1.2 million t in 1985	170,000 to 300,000 t
Pacific cod	60,000	22,000	good	stable, biomass is 530,000 t	OY 84
Atka mackerel	28,700	1,000	depressed	stock disappearing in the central Gulf	rebuild, incidental catch policy, <1,000 t
Sablefish	9,480	10,000	fair	exploitable biomass @ 125,000 (EY = 12,500)	9,370 t
Flounder	33,500	6,500	good	biomass @ 1.5 million t	OY 84
Pacific ocean perch complex	11,475	4,500	depressed	biomass 267,000 mt Gulf-wide 173,000 mt, west and central Gulf, EY <5000 t west and central Gulf	rebuild, incidental catch policy
Other rockfish	7,600	1,300	depressed	unknown, some species in SE declining	1,500 t for slope species
Thornyhead rockfish	3,750	200	unknown	about 50,000 t Gulfwide	OY 84
Squid	5,000	100	unknown	assumed sable	OY 84

Table 2.--Gulf of Alaska groundfish OY, DAH, TALFF and catch statistics for 1983.

SPECIES	AREA	OY	INITIAL DAH	DOMESTIC LANDINGS	JV CATCH	FINAL TALFF	FINAL ALLOCATION	FOREIGN CATCH	TOTAL CATCH
Pollock	W	57,000	5,775	5	498	56,225	47,719	39,319	39,821
	C	183,000	109,400	118	133,634	45,000	43,790	41,997	175,750
	E	16,600	2,215	0	0	16,505	85	41	41
	Total	256,000	117,390	123	134,132	117,730	91,594	81,357	215,612
Pacific Cod	W	16,560	1,880	142	469	14,968	11,318	8,635	9,246
	C	33,540	6,050	4,105	1,957	26,148	26,048	19,181	25,242
	E	9,900	2,070	26	0	9,820	7,384	1,962	1,988
	Total	60,000	10,000	4,273	2,426	50,936	44,750	29,778	36,476
Atka mackerel	W	4,678	290	0	789	3,952	2,879	2,594	3,383
	C	20,836	1,080	0	1	20,656	10,137	8,876	8,877
	E	3,186	700	0	0	3,186	109	tr	tr
	Total	28,700	2,070	0	790	27,794	13,125	11,471	12,260
Flounder	W	10,400	700	7	171	9,700	3,323	2,020	2,197
	C	14,700	1,120	84	2,521	13,580	8,249	7,460	10,065
	E	8,400	1,360	249	0	8,200	159	51	300
	Total	33,500	3,180	340	2,692	31,480	11,731	9,531	12,562
Pacific Ocean Perch	W	2,700	345	7	1,934	2,031	1,170	672	2,612
	C	7,900	1,255	8	41	6,745	6,279	4,726	4,775
	E	875	500	0	0	825	290	19	19
	Total	11,475	2,100	15	1,975	9,601	7,739	5,417	7,406
Sablefish	W	1,670	270	14[2]/	134	1,400	1,400	1,363	1,511
	C	3,060	1,220	430[2]/	141	2,660	2,660	2,521	3,092
	E	4,750[1]/	3,600	3,376[2]/	0	1,414	1,364	1,083	4,458
	Total	9,480[1]/	5,090	3,820[2]/	275	5,474	5,424	4,967	9,061
Squid	Total	5,000	150	-	4	4,990	4,550	267	271
Rockfish	Total	7,600	900	420	289	7,000	6,296	1,712	2,001
Thornyhead Rockfish	Total	3,750	6	-	12	3,724	3,494	718	730
Other Species	Total	20,805[4]/	4,200	101[3]/	390	20,105	13,732	2,253	2,646
Total	W	93,008	9,260	175	4,322	88,276	67,809	54,603	58,770
	C	263,036	120,125	4,745	138,662	114,789	97,163	84,761	227,801
	E	43,711	10,445	3,651	0	39,950	9,391	3,156	6,806
	Total	436,910	145,086	9,092	142,984	278,834	202,435	147,470	299.025

[1]/OY value is high number of OY range.

[2]/Domestic catches converted to round weight using factor 1.42.

[3]/Domestic catch of other species category may include squid, thornyhead rockfish and many more species besides those identified in FMP.

[4]/OY value is 5% of the sum of OY numbers, may differ from official OY value for 1983.

Table 3.--Gulf of Alaska groundfish OY, DAH, TALFF and catch statistics for 1984 reported and compiled by November 3.

SPECIES	AREA	OY	INITIAL DAH	DOMESTIC LANDINGS	JV CATCH	INITIAL TALFF	ALLOCATION TO DATE	FOREIGN CATCH	TOTAL CATCH
Pollock	W			0					
	C	400,000[1]/	215,500[1]/	330	199,539[1]/	105,000[1]/	128,336[1]/	85,694[1]/	285,563[1]/
	E	16,600	300	0	0	12,980	15	0	0
	Total	416,600	215,800	330	199,539	117,980	128,351	85,694	285,563
Pacific Cod	W	16,560	750	25	272	12,498	12,420	10,647	10,944
	C	33,540	26,300	2,080	4,000	3,532	6,956	4,621	10,701
	E	9,900	120	32	0	7,800	4,937	0	32
	Total	60,000	27,170	2,137	4,272	23,830	24,313	15,268	21,677
Atka mackerel	W	4,678	800	0	569	2,942	2,442	223	792
	C	20,836	1,500	0	7	15,169	18,392	58	65
	E	3,186	0	0	0	2,549	53	0	0
	Total	28,700	2,300	0	576	20,660	20,887	281	857
Flounder	W	10,400	10	0	541	8,310	7,845	375	916
	C	14,700	8,720	243	2,497	3,040	2,322	2,392	5,132
	E	8,400	300	64	0	6,420	635	0	64
	Total	33,500	9,030	307	3,038	17,770	10,802	2,767	6,112
Pacific Ocean Perch	W	2,700	1,770	86	1,377	390	294	182	1,645
	C	7,900	2,620	0	278	3,700	3,304	2,399	2,677
	E	875	460	3	0	240	17	0	3
	Total	11,475	4,850	89	1,655	4,330	3,615	2,581	4,325
Sablefish	W	1,670	300	271	254	1,038	1,038	615	1,140
	C	3,060	1,650	3,099	157	798	662	328	3,584
	E	4,750[2]/	4,414	5,194	0	40	15	0	5,194
	Total	9,480[2]/	6,364	8,564	411	1,874	1,715	943	9,918
Squid	Total	5,000	110	0	5	3,890	4,081	90	95
Rockfish	Total	7,600	895	584	284	5,185	3,379	410	1,278
Thornyhead Rockfish	Total	3,750	200	17	18	2,800	3,004	148	183
Other Species	Total	18,718	500	tr	278	14,474	14,779	521	799
Total	W	36,008	3,630m	382	3,013	25,176	24,039	12,042	15,437
	C	480,036	256,290	5,752	206,478	159,972	159,972	95,492	307,722
	E	43,711	5,594	5,293	0	30,029	5,672	0	5,293
	Total	594,823	267,219	12,028	210,076	212,793	214,926	108,703	330,807

[1]/Pollock values of Western and Central areas combined.
[2]/OY value is high number of range.

POLLOCK

Annual foreign and U.S. catches of pollock in the Gulf of Alaska have increased steadily since 1978 (Table 4). U.S. catches by domestic fishermen delivering to U.S. processors continue to remain small. U.S. catches by domestic fishermen delivering to foreign processors in joint ventures operating in Shelikof Strait have increased markedly from 1,100 mt in 1980 to over 174,000 mt in 1984. As a result, U.S. catches surpassed foreign catches for the first time in 1983.

Table 4.--Annual pollock catch in the Gulf of Alaska by foreign and U.S. fisheries, 1977-84 (in 1000's metric tons).

Year	Foreign fisheries	Joint-Venture Fisheries	Domestic	Total
1977	120.4	--	N.A.	120.4
1978	96.3	--	N.A.	96.3
1979	103.2	--	4.5	107.7
1980	113.0	1.1	2.2	116.3
1981	130.3	16.9	1.8	149.0
1982	92.6	73.9	2.2	168.8
1983	81.4	134.1	0.1	215.5
1984	64.2[1/]	190.9	.3	255.4

1/ Preliminary estimates for October 13, 1984.
N.A. = Not available.

Acoustic surveys have been conducted to estimate pollock biomass in the Shelikof Strait Region of the Gulf of Alaska during the years 1980, 1981, 1983, and again in 1984. On the basis of five surveys conducted during March and April, 1984, total pollock biomass is now estimated to be between 1,574,634 and 2,034,857 mt with a mean estimate of 1,789,186 mt. This estimate represents the total biomass in the central and western regulatory areas combined, because few pollock were found elsewhere in the western/central areas while surveying during the spawning period. Results of the 1984 survey indicate that total biomass continues to decrease from its peak level in 1982. Length and age composition and hydroacoustic survey data from 1984 joint-venture fishery in Shelikof Strait confirms that the 1980 year class (age 4 fish) is weak. The 1981 year class (age 3 fish) appears also to be weak. The abundance estimate of age 3 fish (1981 year class) in 1984 is about the same as age 3 fish (1980 year class) in 1983.

Estimates for MSY for pollock in the western/central areas of the Gulf of Alaska range from 166,200 to 334,000 mt based on exploitable biomass levels during 1973-1977. A cohort analysis of the 1976-82 catch-at-age data provided revised estimates of exploitable biomass and exploitable annual surplus production (ASP). Estimates of average exploitable biomass increased from 1,040,000 mt for 1976-1981 to 1,430,000 mt for 1976-1982. The corresponding average ASP values are 344,000 mt ($\pm$ 328,000 mt, 95% C.L.), and 408,000 mt ($\pm$ 206,000 mt, 95% C.L.). These estimates of average exploitable biomass and corresponding ASP values have not been updated for the 1983 data.

The exploitable biomass of pollock at the beginning of 1985 is projected to decline to 1,200,000 to 1,270,000 mt, a decrease of about 500,000 mt from 1984. This forecast is based on an exploitable biomass

of 1,690,000-1,740,000 estimated for 1984 given a 1984 harvest of 300,000 mt and a below average to average recruitment of age 3 fish in 1984. Furthermore, the decline in biomass can be expected to continue through 1987 for any level of harvest except if the stock experiences above average recruitment in 1986 and 1987 (based on the stock forecasts for the six recruitment scenarios shown in Figure 1). Thus for the four recruitment scenarios which assume below-average or average recruitment through 1987, the annual surplus production for the 1985 fishing season is zero. Using this criterion, the lower range of ABC for 1985 would be zero. In addition the majority of the 1985 harvest will come from the age 6 and 7 fish, the two dominant year classes (1978 and 1979) remaining out of the original five (1975-79).

The 1984 harvest is projected to total 240,000-280,000 mt. The exploitable biomass at the beginning of 1984 is estimated at 1,690,000 to 1,740,000 mt depending on whether the abundance of the 1981 year class is at a below-average or average level. Based on these values, the actual rate of exploitation in 1984 will fall between 13.8-16.6%. If the harvest would have attained the 1984 OY of 400,000 mt, then the rate of exploitation would have reached 23-24%. From the catch-at-age analysis presented last year, the ratio of the average ASP and average exploitable biomass of 408,000 mt and 1,430,000 mt implies a rate of exploitation of 28.5% would achieve ASP. Given that this rate was derived for the years when the population was increasing because of successive years of strong recruitment, the 28.5% average rate is probably an upper limit particularly for a declining stock.

Given the 1985 projected biomass of 1,200,000 to 1,270,000 mt, the PT recommends that the upper level of ABC should not exceed 350,000 mt, approximately 28.5% of the exploitable biomass. For an OY of 400,000 mt, the rate would be 31.5-33.5%.

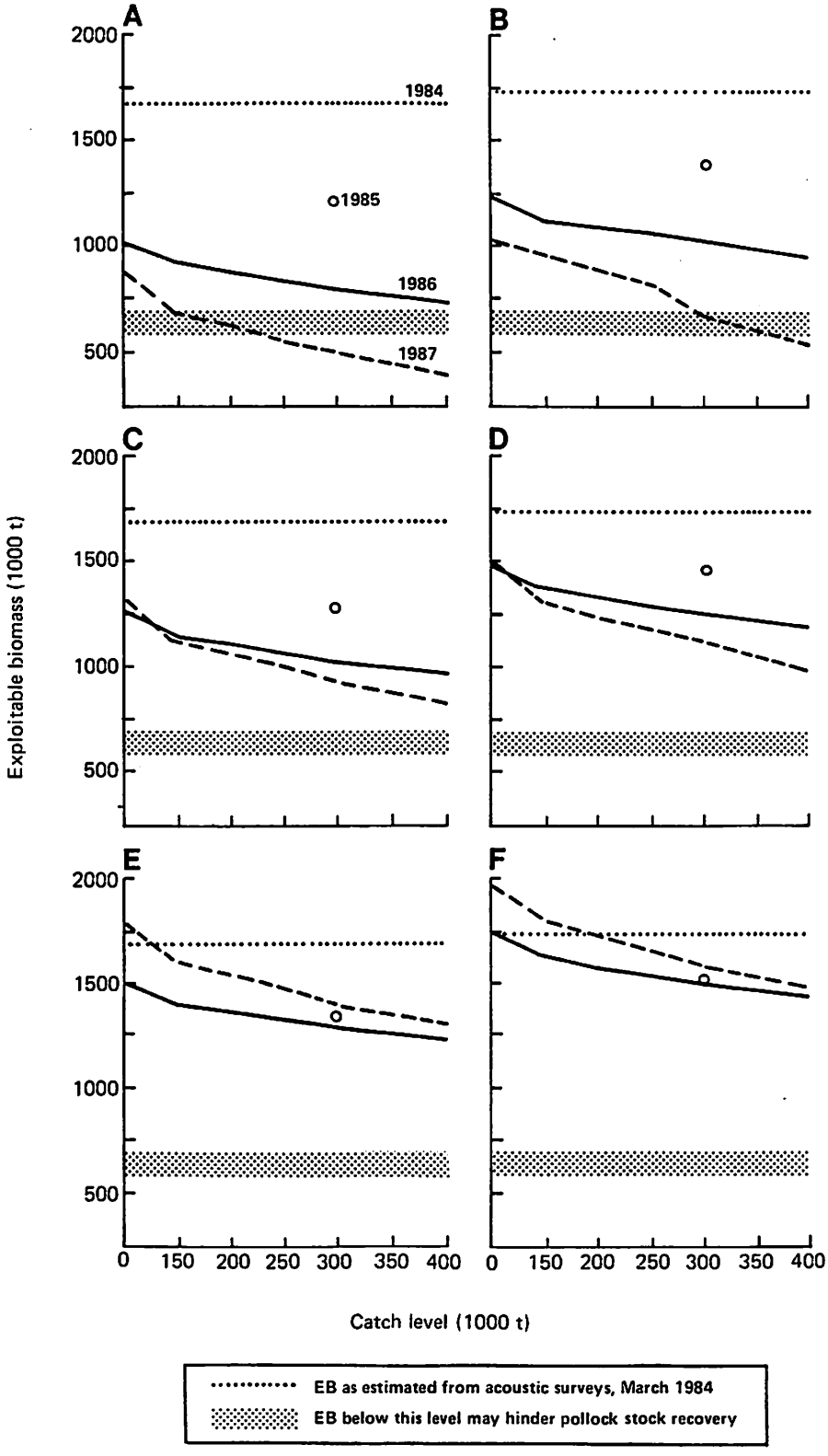

Figure 1.1.--Changes in exploitable biomass of pollock for various catch and recruitment levels: a. below average recruitment in 1984-87; b. average recruitment in 1984 and below average recruitment in 1985-87; c. below average recruitment in 1984 and average recruitment in 1985-87; d. average recruitment in 1984-87; e. below average recruitment in 1984 and above average recruitment in 1985-87; f. average recruitment in 1984 and above average recruitment in 1985-87. (Recruitment refers to the population of 3-year-old fish.)

Given that the forecasts of the biomass project that the decline will continue for the likely recruitment scenarios, the PT recommends that the harvest level for 1985 be set to achieve a rate of exploitation between 14 and 24% or 168,000 to 305,000 mt such that the 1985 harvest does not exceed the 1984 harvest. Our recommendation is lower than the upper range of ABC because of the team's concern over the reliance of this fishery on the two dominant year classes and the signs of continued poor recruitment. No data exist for the eastern regulatory area to warrant a change in the OY of 16,600 mt.

PACIFIC COD

Catch rates (No. of fish/hachi) and length frequency data from the Japan-U.S. cooperative longline survey have indicated that the 1977 year-class has largely supported the foreign longline fishery since 1981.

Recruitment from the two subsequent year-classes may have been masked by the large 1977 year-classes. The 1980 year-class apparently began recruiting to the fishery during the last quarter of 1982 and first quarter of 1983, although examination of the length frequency data from the 1983 Japanese commercial longline catch does not show any significant year-classes entering the fishery. Lengths of 60-70 cm dominate the 1983 Japanese longline commercial cathches. On the basis of a comparison of 1983 catch rates (fish/hachi) from the Japan-U.S. cooperative longline survey, the relative abundances of Pacific cod among the Western, Central, and Eastern Regulatory Areas are 16.3%, 61.8%, and 21.8%, respectively.

MSY for Pacific cod has been estimated to be between 88,000 mt and 177,000 mt. No information has been forthcoming to modify the EY, which has been considered equal to MSY. Because significant numbers of Pacific halibut frequent the same ground as Pacific cod, resulting in large Pacific halibut by-catches in the Pacific cod longline and trawl fisheries, OY was set at 60,000 in previous years as a measure to minimize the by-catch of Pacific halibut. Catches in 1984 through October total about 21,700 mt, with about 11,000 mt, 10,700 mt, and less than 50 mt coming from the Western, Central, and Eastern Regulatory Areas, respectively.

Preliminary results of the 1984 Gulf of Alaska triennial groundfish survey indicate that the total biomass of Pacific cod is 530,000 mt, distributed among the Western, Central, and Eastern Regulatory Areas as 119,000 mt,

386,000 mt, and 25,000 mt, respectively, with a respective percentage distribution of 22.4%, 72.8%, and 4.7%. These percentages do not compare with the above longline-derived percentages nor do they compare with the current apportionments of the 60,000 mt OY of 27.6%, 55.9%, and 16.5%, respectively.

Because these percentage distributions are so disparate, the team has no justification for recommending changes from in the present distribution of Pacific cod for 1985. The total OY of 60,000 mt, therefore, by distribution among the Western, Central, and Eastern Regulatory Areas would remain 16,560, 33,540, and 9,900 mt, respectively.

ATKA MACKEREL

Recent analysis indicates that the lower estimate of MSY for Atka mackrel in the Gulf of Alaska is 7,800 mt, less than one-half of the previously established lower level. Biomass estimates for Atka mackerel based on a 1979 U.S.-U.S.S.R. cooperative trawl survey were 32,500 mt for the Gulf of Alaska between 148° to 164° W longitude and 69,000 and 89,000 mt based on a CPUE analysis. Potential yield estimates of MSY using these biomass estimates range from 7,800 to 26,800 mt. In addition, the catches in the Kodiak INPFC area have declined to less than 100 mt in 1982 and 1983 down from a high of 23,700 mt in 1975. The catches for 1984 are projected to be less than 1,000 mt in the western area, less than 100 mt in the central area, and near zero in the eastern area. Length frequencies have shifted to larger sizes in the western and central area with no apparent recruitment occurring in the central area. The biomass estimates from the 1984 trawl survey are 38,000 mt in the western area and 1,000 mt in the central area. The 95% confidence interval for the 39,000 mt total is $\pm$ 115%, indicating this estimate is not very reliable. Given this apparent collapse in the Atka mackerel stocks in the Gulf of Alaska and the westward shift in the fishery and the stock distribution, the ABC is as near zero as practical. The 1984 OY in the Gulf totalled 28,700 mt; 4,678 mt in the western area, 20,836 mt in the central area, and 3,186 mt in the eastern area. The Plan Team recommends that the Atka mackerel harvest be substantially reduced for 1985 to a level that will only provide a sufficient by-catch for the continued operations of domestic, joint venture, and foreign fisheries. The 1984 harvest levels provide a guideline for setting the 1985 OY level by management area.

FLOUNDER

The fishery for flatfish, excepting halibut, has usually been incidental to fisheries for other species. Arrowtooth flounder is the dominant species in the catch although all species are managed as a single stock. The foreign catch dropped sharply from 14,460.1 mt in 1981 to 9,004.5 mt in 1982, probably as a result of a ban on foreign fishing east of 140° W longitude. The foreign catch in 1983 of 9,531 mt is similar to 1982. The MSY has been previously calculated at 67,000 mt and was based on a biomass estimate of 772,000 mt. Preliminary results from the 1984 triennial survey indicate that the flounder biomass is at least 1,500,000 mt Gulfwide. The allowable biological catch (ABC) which has been set equal to MSY, has probably increased but no new value has been determined. However, flounder stocks are probably in satisfactory condition because catches are small relative to the estimated biomass and MSY. OY has been set at 33,500 mt; 50% of the ABC to protect halibut stocks. The 1983 domestic, joint-venture, and foreign fisheries harvested 340, 2,691, and 9,531 mt, respectively. In 1984 these fisheries harvested through October about 310, 3,000, and 2,800 mt respectively. It should be noted that within the flounder species category, arrowtooth flounder provide more than half (62%) of the exploitable biomass of the flatfish complex. Given that there is some domestic interest in species (flathead sole, rock sole) other than arrowtooth flounder, the PT recommends that there be some investigation toward assigning harvest levels by species within the flatfish complex.

SABLEFISH

Maximum sustained yield (MSY) of sablefish in the Gulf of Alaska was originally calculated from a surplus production model fit to Japanese catch and effort data for the entire northeastern Pacific Ocean for 1964 to 1977. MSY was then allocated to the Gulf of Alaska based on the historical proportions of catches in each area. Equilibrium yield (EY) was initially determined by reducing this MSY based on the observed decline in Japanese longline CPUE from the peak CPUE observed in 1970.

Since this initial calculation, the EY was further reduced in the western and central areas and in the west Yakutat district based on additional declines in foreign longline CPUE. In the eastern Yakutat and Southeastern districts, EY has been reduced based on results of the NMFS pot indexing survey. In response to these declines in EY, the OY for 1983 was reduced from 13,000 mt to 8,230-9,480 mt by Amendment 11. Indices of abundance for medium and large sablefish in the Shumagin-Yakutat area show a substantial increase from 1979 to 1983. Based on the longline surveys, the increase in relative abundance has been 62%. This increase is consistent with the 69% increase in CPUE from the U.S. Observer data for fish larger than 57 cm west of 140° W taken in waters deeper than 500 m. The high CPUE levels declined slightly in 1983.

Indicators of the Gulf-wide abundance of large fish ($\geq$67 cm) have not shown an increasing trend however, and remained nearly stable for the period 1977 through 1983. Indices of abundance for the Eastern Gulf are still conflicting. The relative abundance estimates from the joint longline survey show a declining trend from 1981 through 1983. Results of the 1984 NMFS pot indexing survey show an increase in abundance from 1982 to 1984, for the two northern survey sites where a major portion of the fishery takes place.

The index values for the two southern sites declined in 1984. Port sampling of the U.S. fishery indicated an increase in CPUE from 0% to 44% between 1983 and 1984 depending on the adjustment value used to offset an increase in gear efficiency.

The 1977 year class, which has contributed substantially to the fishable biomass in recent years, is now declining in biomass and future increases in the stock will depend on recruitment from other year classes. There are indications of a relatively strong 1980 or 1981 year class in the Central Gulf but its contribution to the exploitable biomass below 300 meters depth has been negligible to date. From age composition data collected aboard the 1983 cooperative longline survey, it appears that some recruitment has resulted from other recent year classes.

Recent research has better defined natural mortality, growth, biomass, recruitment and movements of sablefish so that reasonably reliable estimates of EY can be determined. EY has been calculated from an age structured forward simulation model by determining the annual harvests which provide constant biomass levels over a ten year period, given current estimates of the age distribution of the population, growth rates, natural mortality rates and recruitment.

The exploitation rates which will stablize biomass trends are related to the average level of recruitment over the period of the projection. Cohorts of moderate strength have been observed in the population from the 1976, 1978 and 1979 year classes by Canadian scientists in British Columbia waters and in the U.S.-Japanese longline survey. These moderate year classes each constituted 15%-18% of the exploitable population which was present in 1983 when they began recruiting to the fishery at age 3. This contrasts with the strong 1977 year class which Canadian scientists have estimated recruiting at 40% of the 1983 population size and with weak year classes of the early 1970's

estimated at approximately 10.3% of the 1983 population size. Constant recruitment at 18% of the present population size results in constant near term biomass trends if yields are 10% of the current biomass levels. Recruitment strength of these moderate levels appears reasonable for the near term, given the pattern of the late 1970's year classes and recent indications of a strong pre-recruit cohort present in shallow waters of the continental shelf in 1984.

Exploitable biomass for Gulf of Alaska sablefish is defined as the biomass of the population occurring on the outer edges of the continental shelf and slope in depths greater than 300 m which are aged 4 and above. These ages include most (90%) of the biomass present in these depths and constitute the population harvested by the Gulf of Alaska longline fishery. While sablefish are concentrated in these areas, small sablefish also occur at low densitites in shallower waters of the continental shelf. Local concentrations of small sablefish are occasionally available on the shelf when strong year classes are present. Shelf sablefish appear to be younger pre-recruits which move to deeper shelf edge and slope waters between ages 3 and 5.

Two estimates of current exploitable biomass levels are available for determining EY. The recently completed 1984 NMFS trawl survey has provided preliminary estimates of exploitable biomass as 66,987 metric tons for all areas of the Gulf of Alaska. There are indications from comparative trawl and trap sampling that trawl survey estimates may underestimate exploitable sablefish populations. Using different methodology, the 1983 U.S.-Japanese longline survey estimate of exploitable biomass is 182,938 metric tons. Results of the 1984 longline survey are not yet available in sufficient detail to determine exploitable biomass. The average of the trawl and longline

survey biomass estimates of 124,963 metric tons provides the best available estimate of exploitable biomass. The distribution of biomass among INPFC areas is given in Table 5.

Specifying EY as 10% of the exploitable biomass as indicated by the forward simulation model results in a 1985 Gulf of Alaska EY estimate of 12,496 metric tons. Amendment 11 to the FMP set sablefish OY's at 75% of the EY to allow for rebuilding. This procedure would set 1985 Gulf of Alaska OY at 9,372 metric tons.

The team recommends that the 1984 harvest levels for sablefish be set at 75% of the estimated EY for the exploitable biomass deeper than 300 meters. The OY should be apportioned amongst the management areas according to the relative distribution of biomass estimated from the 1983 and 1984 surveys. Since these surveys did not cover the inside waters of southeastern Alaska and Prince William Sound, the team's recommended harvest levels do not apply to those fisheries within the state's jurisdiction.

Table 5.--Summary of 1984 exploitable (age 4+ and >300 m) biomass estimates, equilibrium yield, and 1985 optimum yield values for Gulf of Alaska sablefish.

	NMFS trawl survey	U.S. - Japanese longline survey	Average	% by area	EY	1985 OY[1/]	1984 OY
Shumagin	8,908	29,234	19,071	15%	1,907	1,430	1,670
Chirikof	15,666	46,233	30,950	25%	3,095	2,321	3,060
Kodiak	12,447	45,425	28,936	23%	2,894	2,170	
Yakutat	24,526	26,831	25,678	21%	2,568	1,926	2,815
Southeast	5,440	35,215	20,327	16%	2,033	1,525	1,935[2/]
Total	66,987	182,938	124,963	100%	12,496	9,372	9,480

1/Based on Amendment 11, OY = 75% EY.

2/Includes 500 assigned to southeastern inside area.

OTHER ROCKFISH

The current OY for other rockfish is 7,600 mt Gulf-wide. This level was established as the lower end of the "other rockfish" species catch in the foreign fisheries for Pacific ocean perch (POP) during the period 1973-75. Foreign by-catch was estimated to represent the MSY range and, therefore, EY has not been established in the FMP for this species complex.

A review of observer data collected during the 1973-75 period indicates that the dominant by-catch species in the POP fishery have been incorporated into the POP complex (northern rockfish, rougheye rockfish, sharpchin rockfish) or have been established as another category with a separate OY (shortspine thornyhead).

The foreign and joint-venture catches of other rockfish are expected to reach 300 mt and 400 mt, respectively, in 1984. The domestic catch is expected to approach 1,000 mt, however, that fishery concentrates on a near shore species group that has not been previously addressed in the FMP.

Preliminary results of the 1984 trawl survey show that only one species other than those in the POP and Sebastolobus sp. groups was present in significant numbers. Biomass of dusky rockfish was estimated to be between 5,000 and 28,000 mt in the western and central Gulf. They were encountered primarily on the shallow water zone inside the area where the commercial fishery operates. Other species occurred in trace amounts with densities of well below one pound per hectare.

For these reasons, the MSY and EY for other rockfish need to be re-evaluated. Because of the removal of predominant species from the other rockfish category, the 7,600 mt OY in the FMP is no longer appropriate. The average harvest of other rockfish in the foreign and joint-venture fisheries during the period 1982-84 is approximately 1,500 mt. With the poor showing

in the trawl survey, there is no evidence that a greater harvest can be sustained.

Rockfish comprise a vast species complex, which includes at least 30 species in the Gulf of Alaska. These can be separated into three groupings by distribution. Currently, the plan addresses only the slope complex which includes POP and associated species and the two sebatolobus species. The domestic fishery concentrates on the near-shore demersal or on-bottom species. The third group, the near-shore pelagic species, are not currently exploited but are the subject of increasing domestic interest. A list of species groups is presented in Table 5. There is some species overlap but the categories better define the resource than the current system.

In view of the evaluation, the team recommends that the three species categories be managed separately under the FMP. The "other rockfish" category as it now exists should include only those species in the slope complex not included in the POP and thornyhead groups. The EY for that category is not expected to exceed the recent year average harvest of 1,500 mt. The evaluation of EY levels for the nearshore species categories is incomplete.

Table 1.--Categories of rockfish present in the Gulf of Alaska by habitat area.

Slope Category	Nearshore Demersal Category
POP	Yellowye rockfish
Northern rockfish	Quillback rockfish
Rougheye rockfish	Canary rockfish
Shortraker rockfish	China rockfish
Sharpchin rockfish	Tiger rockfish
Red banded rockfish	Rosethorn rockfish
Rosethorn rockfish	Silvergray rockfish
Darkblotch rockfish	Copper rockfish
Redstripe rockfish	
Splitnose rockfish	
Harlequin rockfish	
Aurora rockfish	
Yelloweye rockfish	

Nearshore Pelagic Category
Black rockfish
Dusky rockfish
Yellowtail rockfish
Widow rockfish
Boccacio
Blue rockfish

PACIFIC OCEAN PERCH COMPLEX

In September 1984 the PT reported a substantially reduced EY estimate between 7,232 and 19,432 mt. This estimate was based on analysis assuming current biomass between 152,000 and 508,000 mt. Preliminary results from the 1984 trawl surveys estimate current biomass at 267,000 mt with 20%, 45%, and 34% in the Western, Central and Eastern areas respectively. Apportioning the lower bound of the EY estimate accordingly, results in 1,446 for the Western area, 3,254 for the Central area, and 2,531 for the Eastern area, substantially lower than previous OY for the Western and Central areas. In amendment 10 to the FMP, the Council set the Eastern area OY at 875 mt, allowing only incidental catches.

Given the Council's current policy, the OY should be lowered in the Western and Central areas. Biologically, the fastest rebuilding will occur at zero fishing mortality. This may be impossible due to by-catches in other groundfish fisheries. Therefore, the next fastest rebuilding would occur at an OY level which allows only by-catches in the foreign and domestic groundfish fisheries. An OY could be set at a level which allows other groundfish fisheries to continue but discourages targetting on Pacific ocean perch. However, it is possible that domestic fishermen may want a directed fishery on Pacific ocean perch, such as the 1983 U.S.-Korean joint venture in the Western Gulf of Alaska.

To maximize the opportunity for the resource to rebuild, the PT recommends that the OY be set at a level which allows an incidental catch fishery only.

There are five species included in the Pacific ocean perch complex. Some of these are increasing in relative abundance and Pacific ocean perch (S. alutus) no longer dominates this complex consistently. With

increased observer coverage and catch sampling, species will be better distinguished in the catches. The PT recommends that for the future the total allowable catch level for this complex be conditioned on catches of individual species not exceeding target catch levels for individual species.

THORNYHEAD ROCKFISH

The two species of Sebastolobus commonly referred to as thornyhead rockfish are harvested in association with deep-water fisheries for sablefish. The 3,750 mt estimate of MSY in the FMP is not documented. Analyses to update MSY have not been conducted. The average foreign catch is 1,050 mt for 1980-1983. The overall average length of shortspine thornyhead rockfish for the area has varied between 33 and 35 cm. The CPUE for Japanese longline fishery for sets deeper than 500 m declined about 50% in 1982 from the 1977-1981 values. Part of this decrease can be attributed to the increase in sablefish catch rates. The present condition of the stock is unknown. The trends in CPUE from observer records for the Japanese longline fishery suggest the abundance was relatively stable until 1982. The 1982 and 1983 values are nearly identical. There is no biological reason to alter OY for 1984.

SQUID

Squid abundance and potential yield has not been evaluated through research findings. Catches of Berrytheuthis magister, Berrytheuthis anonoychus and Gonatus sp. by commercial fishing and research vessels and their occurrance in the stomach of fish and marine mammals indicate a large standing stock. OY has been set at 5,000 mt which is far greater than the present and past harvest levels.

The commercial catch is primarily by foreign trawlers occurring in the central and western Gulf. The annual foreign squid catch averaged nearly 550 mt during the years 1978 through 1983 which were essentially incidental to the directed fisheries of other species.

OTHER SPECIES

The other species group includes sculpins, sharks, skates, octopus, eulachon, smelts, and capelin. The current OY of 16,200 mt was originally derived from lowest historical catch levels. Under current procedures the OY is set at 5% of the sum of the OY's for the 9 other species categories. The highest foreign catch during the period 1977 through 1983 was 7,144.9 mt in 1981. The average foreign catch for this period is 4,592 mt, far below the OY level. The 1983 total catch for all fisheries was 2,646 mt.