MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
            Executive Director

DATE: June 4, 1996

SUBJECT: Overfishing Definition Amendment

ACTION REQUIRED

Final review of plan amendment to revise the overfishing definition for BSAI and GOA groundfish.

BACKGROUND

In 1990, the *602 Guidelines* mandated that overfishing be defined in FMPs as follows:

> "Overfishing is a level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce maximum sustainable yield on a continuing basis", and that "Each FMP must specify, to the maximum extent possible, an objective and measurable definition of overfishing for each stock or stock complex covered by that FMP, and provide an analysis of how the definition was determined and how it relates to reproductive potential."

The Council added overfishing definitions to the GOA (Amendment 21) and BSAI (Amendment 16) fishery management plans in 1990, defining a maximum fishing mortality rate that declines at low stock sizes. Specifically, for any stock or stock complex under management, the maximum allowable mortality rate is set at the level corresponding to maximum sustainable yield (F_{msy}) for all biomass levels in excess of the level corresponding to maximum sustainable yield (B_{msy}). For lower biomass levels, the maximum allowable fishing mortality rate varies linearly with biomass, starting from a value of zero at the origin and increasing to a value of F_{msy} at B_{msy}, consistent with other applicable laws. These relationships are shown in the figure below.

Fishing Mortality Rate (relative to F_{MSY})

Biomass (relative to pristine level)
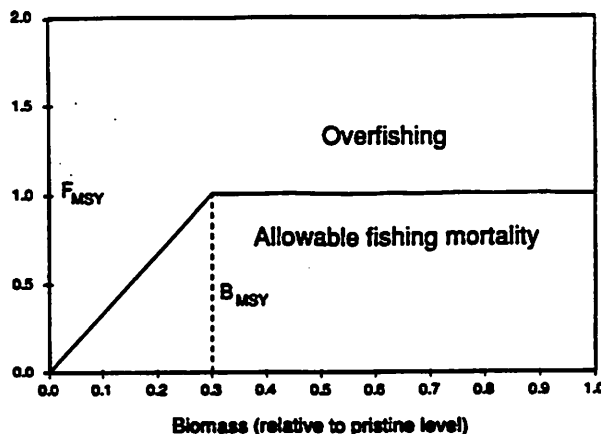
If data are insufficient to calculate F_{msy} or B_{msy}, the maximum allowable fishing mortality rate will be set equal to the following (in order of preference):

(1) the value that results in the biomass-per-recruit ratio (measured in terms of <u>spawning</u> biomass) falling to 30% of its pristine value;

(2) the value that results in the biomass-per-recruit ratio (measured in terms of <u>exploitable</u> biomass) falling to 30% of its pristine value; or

(3) the natural mortality rate (M).

If data are insufficient to estimate any of the above, the TAC shall not exceed the average catch taken since 1977.

The current overfishing definitions do not necessarily provide a buffer between acceptable biological catch (ABC) and the overfishing level (OFL). The Plan Teams and SSC have expressed concern about harvesting stocks to the OFL level as an acceptable target. In April 1996, the Council made an initial review of the Environmental Assessment/Regulatory Impact Review of the analysis for Amendment 44 and released it for public review with minor changes. An executive summary is attached as **Item C-7(a)**. The groundfish plan teams reviewed the analysis and recommended adoption of Alternative 2. (see attached plan team minutes, **Item C-7(b)**). Grant Thompson, NMFS-AFSC will be on hand to present his analysis.

Executive Summary

Reviews of NMFS' Overfishing Definitions Review Panel (ODRP) and the Council's Scientific and Statistical Committee (SSC) have indicated that the definitions of "acceptable biological catch" and "overfishing" contained in the fishery management plans for groundfish of the Bering Sea/Aleutian Islands and Gulf of Alaska could and should be improved. Suggestions for improvement include the following: A) as parameter estimates become more imprecise, fishing mortality rates should become more conservative; B) for a stock below its target abundance level, fishing mortality rates should vary directly with biomass and ultimately fall to zero should the stock become critically depleted; and C) a buffer should be maintained between acceptable biological catch and the overfishing level.

This plan amendment proposal contains two alternatives: Alternative 1 (No Action) maintains the current definitions, and Alternative 2 (Proposed Revision) modifies the current definitions in response to the suggestions made by the ODRP and SSC. The differences between the two alternatives can perhaps best be illustrated by considering the case in which a point estimate of the fishing mortality rate at maximum sustainable yield (F_{MSY}) is available together with a reliable description of the amount of uncertainty surrounding that estimate. Under the current definitions, the target fishing mortality rate (F_{ABC}) and the maximum allowable fishing mortality rate (F_{OFL}, the rate above which overfishing is defined to occur) are both set equal to the point estimate of F_{MSY}, regardless of the level of uncertainty associated with that estimate. Under the proposed revision, the ratio between F_{ABC} and F_{OFL} varies inversely with the level of uncertainty (i.e., the greater the uncertainty in the estimate of F_{MSY}, the lower F_{ABC} is in relation to F_{OFL}).

Even in cases where reliable descriptions of the level of uncertainty associated with a point estimate of F_{MSY} are not available, the proposed revision maintains an appropriate buffer between F_{ABC} and F_{OFL}. Also, whenever a target abundance level can be reasonably identified, the proposed revision reduces fishing mortality rates as stock size falls below that target level. The current definitions do neither of these.

Because the proposed revision institutes new safeguards against overly aggressive harvest rates, particularly under conditions of high uncertainty or low stock size, the revision is expected to result in positive environmental impacts. Because the proposed revision is based explicitly on harvest policies designed to optimize long-term fishery performance, the revision is also expected to result in positive long-term economic impacts. However, it is possible that negative economic impacts could be generated in the short term for a few fisheries, particularly rockfish fisheries targeting on species other than Pacific ocean perch, where total allowable catch might be reduced by 15-25%.

Draft Minutes of the
Joint GOA and BSAI Groundfish Plan Team
Meeting, May 22, 1996

<u>Members Present:</u>

Bering Sea/Aleutian Islands Team	*Gulf of Alaska Team*
Loh-lee Low (NMFS-AFSC, Chair)	*Sandra Lowe (NMFS-AFSC, Chair)*
Dave Ackley (ADF&G)	*Bill Bechtol (ADF&G)*
Dave Colpo (NMFS-AFSC)	*Kaja Brix (NMFS-AKRO)*
Richard Merrick (NMFS-MML)	*Jane DiCosimo (NPFMC)*
Andy Smoker/Ron Berg (NMFS-AKRO)	*Jeff Fujioka (NMFS-AB)*
Grant Thompson (NMFS-AFSC)	*Jim Hastie (NMFS-AFSC)*
Ivan Vining (ADF&G)	*Jon Heifetz (NMFS-AB)*
Dave Witherell (NPFMC)	*Jim Ianelli (NMFS-AFSC)*

The Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Groundfish Plan Teams met by teleconference on May 22. The focus of the meeting was to review the Environmental Assessment/Regulatory Impact Review (EA/RIR) for changing the groundfish overfishing definition.

Grant Thompson, who authored the EA/RIR provided an overview of the analysis. The proposed alternative definition was developed to address the following concerns:

☞ As parameter estimates become more imprecise, fishing mortality rates should become more conservative;

☞ For a stock below its target abundance level, fishing mortality rates should vary directly with biomass and ultimately fall to zero should the stock become critically depleted; and

☞ A buffer should be maintained between acceptable biological catch (ABC) and the overfishing level (OFL).

The proposed alternative sets a maximum allowable fishing rate as prescribed through a set of six tiers which are listed in a descending order of preference, corresponding to information availability. The SSC would have final authority (in the Council process) for determining whether information is "reliable" for purposes of this definition. The team noted the following points:

● The proposed definition was generally more conservative, and a buffer between ABC and OFL would be established. ABC's would be reduced for flatfish, sablefish, and many rockfish species in both the GOA and BSAI. Impacts on TAC would be much less, but would reduce TAC of sablefish (8%) and many rockfish species (about 25% for GOA stocks and 15% for BSAI stocks).

● Given our current state of knowledge (F_{MSY} estimated), OFL's for GOA Pacific Ocean Perch and BSAI walleye pollock would be increased under the proposed definition.

● No species or complex falls into the proposed tier 1 definition as a probability density function (pdf) has not yet been described for optimal fishing rates.

● For GOA rockfish, data are available to compute $F_{30\%}$ and $F_{40\%}$, and hence would fall into the tier 4 definition. However, OFL and ABC have been based on an F=M strategy.

- If a reliable point estimate for biomass cannot be made, OFL would be defined as the average catch from 1978-1995 (tier 6). The team was concerned about locking into this definition without incorporating other information such as abundance trends or CPUE, particularly in the case of a developing fishery. If the case of a collapsing stock, this is less of a concern because ABC can be set at less than 75% of average catch.

- The amendment's primary objective is to optimize the long-term biological performance of single species. The team also has concerns about economic performance, as well as other objectives (multispecies and ecosystem interactions). Several member expressed concern about the definition mandating an OFL and ABC set at zero when stock falls to less than 5% of B_{MSY}, as other fisheries could be adversely impacted if no bycatch was available.

The team commended Grant on his work and agreed that the proposed alternative was a good improvement over our current overfishing definition. **The groundfish plan teams recommend that the Council adopt Alternative 2, and implement the revised overfishing definition for the 1997 fisheries.**

The meeting adjourned at about 11 a.m.

Others in attendance at the joint team meeting were:

Lauri Jansen   *Jon Gauvin*   *Jim Hale*

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SUMMARY OF CORRECTIONS AND OTHER CHANGES

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/
INITIAL REGULATORY FLEXIBILITY ANALYSIS
FOR
AMENDMENT 44 TO THE FISHERY MANAGEMENT PLAN FOR
THE GROUNDFISH FISHERY OF THE BERING SEA AND ALEUTIAN ISLANDS AREA
AND
AMENDMENT 44 TO THE FISHERY MANAGEMENT PLAN FOR
THE GROUNDFISH FISHERY OF THE GULF OF ALASKA

TO REDEFINE ACCEPTABLE BIOLOGICAL CATCH AND OVERFISHING

Prepared by

Staff
National Marine Fisheries Service
Alaska Fisheries Science Center

June 10, 1996

Following release of the Public Review Draft of the EA/RIR for Amendments 44/44, some errors in the draft were discovered, and reviews by the Groundfish Plan Teams and others have indicated that some additional changes are appropriate. *Generally, these corrections and changes have the effect of reducing the likely short-term economic impacts of the proposed revision.* The following paragraphs summarize the suggested corrections and changes.

1) Table 1 (page 22) in the Public Review Draft contains errors in the "ABC Fishing Mortality Rate" column for several GOA rockfish species, specifically, shortraker, rougheye, "other slope," northern, "pelagic shelf," and "demersal shelf" rockfish. Although the current SAFE report does not list $F_{40\%}$ values for any of these stocks, the 1996 OFLs were all set according to the $F_{30\%}$ criterion, meaning that (in principle) $F_{40\%}$ rates *could* have been computed and used to set 1996 ABCs. Because the published $F_{30\%}$ rates are so much higher than the respective M values used to set 1996 ABCs, it is likely that the (yet-to-be-computed) $F_{40\%}$ rates would have been higher than M as well, meaning that the proposed redefinition of ABC would likely *not* have had an impact on 1996 GOA rockfish ABCs. The errors in Table 1 result in parallel errors in Table 2 (page 23). In other words, Table 2 should indicate that the proposed redefinition would likely *not* have had an impact on 1996 GOA rockfish TACs. Corrected versions of Tables 1 and 2 are attached.

2) Because of the errors in Tables 1 and 2, several statements in the Public Review Draft need to be corrected as well. These are listed below, with areas of change shown in bold type:

A) In the Executive Summary (page 3), the last sentence should read: "However, it is possible that negative economic impacts could be generated in the short term for a few fisheries, particularly **Bering Sea and Aleutian Islands fisheries targeting on rockfish species other than Pacific ocean perch, where total allowable catch might be reduced by about 15%.**" The same wording should replace the last sentence in Section 5.0 (page 20).

B) In Section 3.1.2, the list of impacted species near the bottom of page 16 should read: "From Table 1, for example, it appears that 1996 ABCs for most flatfish stocks would have decreased on the order of 15-20% **and that 1996 ABCs for BSAI rockfish stocks other than Pacific ocean perch would have decreased on the order of 25%** (assuming that ABC is roughly proportional to F_{ABC})." The list of impacted species near the top of page 17 should read: "This leaves only GOA rex sole (with a reduction in 1996 TAC of about 1-5%); GOA sablefish (with a reduction in 1996 TAC of about 8%); **GOA shortraker/rougheye rockfish (with a reduction in 1996 TAC of about 9%);** and BSAI rockfish other than Pacific ocean perch (with reductions in 1996 TAC of about 15%) as requiring modification in the final TAC had Alternative 2 been in place during the 1996 specification process."

C) In Section 4.1 (page 19), the first few sentences should read: "According to Table 2, the only 1996 TACs that would have needed modification had Alternative 2 been in place were GOA rex sole (a reduction of about 1-5%); GOA sablefish (a reduction of about 8%); **GOA shortraker/rougheye rockfish (a reduction of about 9%);** and BSAI rockfish other than Pacific ocean perch (reductions of about 15%). Given these results, it is likely that less than 20% of the groundfish fleet would suffer losses amounting to more than 5% of gross revenues as a result of implementing Alternative 2. **For example, the largest reductions (in percentage terms) would have come in the BSAI rockfish fisheries (excluding Pacific ocean perch). However,** of the

486 vessels which participated in the overall BSAI groundfish fishery in 1995, only 35 vessels (or 7% of the total) targeted BSAI rockfish of *any* type (Angie Greig, NMFS/AFSC, pers. commun.). In order for a vessel to experience a 5% drop in revenue as the result of a 15% drop in its rockfish catches, rockfish catches would need to have accounted for at least 33% of the vessel's revenue prior to the drop (assuming that the vessel would not make up the difference in some other fishery)."

3) Concern has been expressed by the SSC, AP, and Plan Teams regarding the rigidity of the "average catch" criterion in tier (6) of the proposed redefinition. One way to increase the degree of flexibility in this tier would be to substitute the following in Section 1.2.2 (page 9):

"6)   *Information available: Reliable catch history from 1978 through 1995.*

OFL = the average catch from 1978 through 1995, **unless an alternative value is established by the SSC on the basis of the best available scientific information**

ABC ≤ 0.75 × OFL"

The above would necessitate the following changes in other parts of the draft:

A) In Section 1.2.3 (page 10), the similarities and differences for tier 6 should read: "Similarities: F_{OFL} is set equal to average catch, at least as a default value. Differences: Alternative 2 fixes the terminal year of the time series used to compute average catch at 1995; Alternative 1 does not. **Alternative 2 allows the default OFL value to be adjusted in special cases on the basis of the best available scientific information; Alternative 1 does not.** Alternative 2 caps ABC at 75% of OFL; Alternative 1 does not."

B) In Section 3.1.2, the last sentence on page 17 should read: "If it qualifies for management only under tier (6), ABC and OFL would be based on the species' average catch prior to 1996 (i.e., when it was taken as bycatch only) **unless an alternative OFL value is established by the SSC on the basis of the best available scientific information.**"

4) In Section 1.2.3 (pages 9 and 10), the summaries of similarities and differences between the two alternatives are incorrect with respect to tiers (3) and (4), and should be changed as shown below:

A) Tier (3): "Similarities: For healthy stocks (3a), F_{OFL} is set at $F_{30\%}$, independent of biomass level. Differences: **For healthy stocks (3a), Alternative 2 caps F_{ABC} at the $F_{40\%}$ level; Alternative 1 does not.** For moderately depleted stocks (3b), Alternative 2 forces both F_{OFL} and the upper limit on F_{ABC} to vary linearly with biomass level; Alternative 1 does not. For severely depleted stocks (3c), Alternative 2 sets both F_{OFL} and F_{ABC} equal to zero; Alternative 1 does not."

B) Tier (4): "Similarities: F_{OFL} is set at $F_{30\%}$. Differences: Alternative 2 caps F_{ABC} at the $F_{40\%}$ level; Alternative 1 does not."

5) The Plan Teams feel that the wording regarding potential economic benefits of the proposed revision should include more caveats. The following changes are suggested:

A) In the Executive Summary (page 3), the second sentence in the final paragraph should read: "**The revision would also be expected to result in positive long-term economic impacts in those cases where the objective of optimizing long-term average yield on a species-by-**

species basis is a suitable proxy for maximizing long-term economic impacts." In addition, the following sentence should be added to the end of the paragraph (i.e., immediately after the sentence describing likely short-term costs): "The assumptions or conditions under which the net economic impacts of such short-term costs might outweigh those of the expected long-term benefits have not been determined." The same changes should be made in Section 5.0 (page 20).

B) In Section 3.1.2, the final sentence on page 18 should read: "This means that increases in long-term benefits are expected eventually to outweigh any short-term losses, assuming that long-term average yield (or something like it) is a reasonable measure of long-term benefits and that the discount rate is sufficiently low." Also, the following sentence should be added to the end of the paragraph: "On the other hand, it should be noted that different measures of long-term benefits or a sufficiently high discount rate could lead to different conclusions. The specific assumptions or conditions under which the net economic impacts of short-term costs might outweigh those of the expected long-term benefits have not been determined."

Table 1: Summary of impacts on 1996 ABC and OFL fishing mortality rates had Alternative 2 been in place (see footnotes).

<u>Gulf of Alaska</u>

Species	ABC Fishing Mortality Rate			OFL Fishing Mortality Rate		
	1996 Actual [1]	Alternative 2 [2]	%Change [3]	1996 Actual [1]	Alternative 2 [2]	%Change [3]
Walleye pollock	FABC=0.30	same	0	F30%=0.50	same	0
Pacific cod	F40%=0.40	same	0	F30%=0.57	same	0
Deepwater flatfish	F35%=0.125	F40%=? [4]	-? [4]	F30%=0.146	same	0
Rex sole	F35%=0.125	F40%=? [4]	-? [4]	F30%=0.146	same	0
Shallow water flatfish	F35%=0.149	F40%=? [4]	-? [4]	F30%=0.175	same	0
Flathead sole	F35%=0.145	F40%=? [4]	-? [4]	F30%=0.159	same	0
Arrowtooth flounder	F35%=0.125	F40%=? [4]	-? [4]	F30%=0.146	same	0
Sablefish	F35%(adj.)=0.112	F40%=0.103	-8	F30%=0.153	same	0
Pacific ocean perch	F44%(adj.)=0.052	same	0	FMSY(adj.)=0.065	FMSY(adj.)=0.082	+26
Shortraker	F=M=0.03	M x 0.75 = 0.023	-25	F=M=0.03	same	0
Rougheye	F=M=0.025	same (?) [5]	0	F30%=0.046	same	0
Other slope rockfish	F=M=0.05	same (?) [5]	0	F30%=0.08	same	0
Northern rockfish	F=M=0.06	same (?) [5]	0	F30%=0.113	same	0
Pelagic shelf rockfish	F=M=0.09	same (?) [5]	0	F30%=0.151	same	0
Demersal shelf rockfish	F=M=0.02	same (?) [5]	0	F30%=0.04	same	0
Thornyhead rockfish	F40%=0.059	same	0	F30%=0.09	same	0
Atka mackerel	F=M/2=0.15	same	0	F30%=0.45	same	0

<u>Bering Sea and Aleutians</u>

Species	ABC Fishing Mortality Rate			OFL Fishing Mortality Rate		
	1996 Actual [1]	Alternative 2 [2]	%Change [3]	1996 Actual [1]	Alternative 2 [2]	%Change [3]
EBS Walleye pollock	F40%=0.30	same	0	FMSY=0.38	FMSY(adj.)=0.46	+21
AI Walleye pollock	F40%=0.34	same	0	F30%=0.45	same	0
Bogoslof Walleye pollock	F40%/2=0.11	same	0	FMSY(adj.)=0.11	FMSY(adj.)=0.17	+54
Pacific cod	F40%=0.30	F40%=0.30	0	F30%=0.43	same	0
Yellowfin sole	F35%=0.13	F40%=0.11	-15	F30%=0.16	same	0
Greenland turbot	F40%(adj.)=0.184	same	0	F30%=0.37	same	0
Arrowtooth flounder	F35%=0.27	F40%=0.22	-19	F30%=0.34	same	0
Rock sole	F35%=0.18	F40%=0.15	-17	F30%=0.22	same	0
Flathead sole	F35%=0.19	F40%=0.16	-16	F30%=0.23	same	0
Other flatfish	F35%=0.17	F40%=0.14	-18	F30%=0.20	same	0
Sablefish	F35%(adj.)=0.112	F40%=0.103	-8	F30%=0.15	same	0
EBS True POP	F44%=0.06	same	0	F30%=0.096	same	0
EBS Other red rockfish	F=M=0.05	M x 0.75 = 0.038	-25	F=M=0.05	same	0
AI True POP	F44%=0.06	same	0	F30%=0.096	same	0
AI Sharpchin/northern	F=M=0.06	M x 0.75 = 0.045	-25	F=M=0.06	same	0
AI Shortraker/rougheye	F=M=0.03	M x 0.75 = 0.023	-25	F=M=0.03	same	0
EBS Other rockfish	F=M=0.07	M x 0.75 = 0.053	-25	F=M=0.07	same	0
AI Other rockfish	F=M=0.07	M x 0.75 = 0.053	-25	F=M=0.07	same	0
Atka mackerel	F40%=0.49	same	0	F30%=0.75	same	0
Squid	Fave=?	Fave x 0.75 = ?	-25	Fave=?	same	0
Other species	Fave=?	same	0	F=M=0.20	same	0

Notes:

1) "1996 Actual" lists the fishing mortality rate corresponding to the ABC or OFL approved by the Council for 1996.
   Rates bearing the suffix "(adj.)" have been adjusted by the ratio of current biomass to target biomass.
2) If Alternative 2 would have required a reduction in the 1996 rate, this column lists the maximum rate that would have been allowed.
   If Alternative 2 would *not* have required a reduction in the 1996 rate, a listing of "same" is given.
   Rates bearing the suffix "(adj.)" have been adjusted by the ratio of current biomass to target biomass. However, adjustments that
   might have been required as a result of biomass falling below B40% are not shown, as estimates of B40% are generally unavailable.
3) "%Change" lists the percentage change between "1996 Actual" and "Alternative 2."
4) Estimates of F40% for GOA flatfish are not available. If BSAI flatfish rates are used as a proxy, F40% is 15-19% less than F35%.
5) Estimates of F40% for some GOA rockfish are not available. However, it appears likely that F40% would be greater than '96 F(ABC).

Table 2: Estimated net impacts on 1996 TAC had Alternative 2 been in place (see footnotes).

Gulf of Alaska Species	Actual 1996 ABC	Actual 1996 TAC	[1] Actual % Difference (ABC:TAC)	[2] % Reduction in ABC Required by Alternative 2	[3] % Reduction in TAC Required by Alternative 2
Walleye pollock	54810	54810	0	0	0
Pacific cod	65000	65000	0	0	0
Deepwater flatfish	14590	11080	24	15-19	0
Rex sole	11210	9690	14	15-19	1-5
Shallow water flatfish	52270	9740	81	15-19	0
Flathead sole	28790	18630	35	15-19	0
Arrowtooth flounder	198130	35000	82	15-19	0
Sablefish	17080	17080	0	8	8
Pacific ocean perch	8060	6959	14	0	0
Shortraker/rougheye	1910	1910	0	0	0
Other slope rockfish	7110	2020	72	0	0
Northern rockfish	5270	5270	0	0	0
Pelagic shelf rockfish	5190	5190	0	0	0
Demersal shelf rockfish	950	950	0	0	0
Thornyhead	1560	1248	20	0	0
Atka mackerel	3240	3240	0	0	0

Bering Sea and Aleutians Species	Actual 1996 ABC	Actual 1996 TAC	[1] Actual % Difference (ABC:TAC)	[2] % Reduction in ABC Required by Alternative 2	[3] % Reduction in TAC Required by Alternative 2
EBS Walleye pollock	1190000	1190000	0	0	0
AI Walleye pollock	35600	35600	0	0	0
Bogoslof Walleye pollock	121000	1000	99	0	0
Pacific cod	305000	270000	11	0	0
Yellowfin sole	278000	200000	28	15	0
Greenland turbot	10300	7000	32	0	0
Arrowtooth flounder	129000	9000	93	19	0
Rock sole	361000	70000	81	17	0
Flathead sole	116000	30000	74	16	0
Other flatfish	102000	35000	66	18	0
Sablefish	2500	2300	8	8	0
EBS True POP	1800	1800	0	0	0
EBS Other red rockfish	1400	1260	10	25	15
AI True POP	12100	12100	0	0	0
AI Sharpchin/northern	5810	5229	10	25	15
AI Shortraker/rougheye	1250	1125	10	25	15
EBS Other rockfish	497	447	10	25	15
AI Other rockfish	952	857	10	25	15
Atka mackerel	116000	106157	8	0	0
Squid	3000	1000	67	25	0
Other species	27600	20125	27	0	0

Notes:

1) This column gives the percentage by which actual 1996 ABC was higher than actual 1996 TAC.

2) This column gives the percentage by which actual 1996 ABC would have been reduced had Alternative 2 been in place. Listings do not include any adjustments that might have occurred as a result of biomass falling below B40%. Required reductions for GOA flatfish ABCs are assumed to be in the 15-19% range by analogy with the BSAI flatfish species. Required reductions for some GOA rockfish (see Table 1) are assumed to be 0 on the basis of the large buffer between 1996 F(ABC) and F30% (i.e., F40% is assumed to be higher than 1996 F(ABC) and therefore not constraining).

3) This column gives the percentage by which actual 1996 TAC would have been reduced had Alternative 2 been in place. Species for which Alternative 2 would likely have had a noticeable impact on TAC in 1996 are shaded.