AGENDA D-2(d, e)
FEBRUARY 2008

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

DATE: January 28, 2008

ESTIMATED TIME
6 HOURS
(all D-2 items)

SUBJECT: Groundfish Management

ACTION REQUIRED

(d) Report on BSAI Pacific cod scientific studies
(e) Report on flatfish stock assessment CIE Review (SSC only)

BACKGROUND

(d) BSAI Pacific Cod

In February 2007, the Council tabled any further action on apportioning BSAI Pacific cod sector allocations between the Bering Sea and Aleutian Islands management areas, pending additional information from the trawl latent license action and ongoing BSAI Pacific cod biological research. For reference, the February 2007 discussion paper is attached as **Item D-2(d)(1).** A short description of the alternatives that were considered is provided below. Note that this proposed action addresses the apportionment of BSAI Pacific cod sector allocations between the BS and AI subareas, should the TAC be split in the future.

- **Alternative 1** is status quo.

- **Alternative 2** would issue sectors their overall amount of BSAI Pacific cod allocation that could be harvested anywhere in the BSAI. This alternative provides the greatest flexibility for sectors and may be the simplest alternative for in-season management to monitor. However, the alternative could cause sectors to race for Pacific cod in the subarea that they expect to close first. Additionally, NMFS has expressed some concern with this alternative relative to the 2001 Biological Opinion for Steller sea lion management. Because Alternative 2 does not establish sector allocations in each subarea, there are no gear specific seasonal apportionments by subarea.

- **Alternative 3** would allocate sectors the same percentage of the BS subarea and AI subarea TACs, as determined by the BSAI sector allocations implemented under Amendment 85. In effect, each sector would be allowed 85% of its BSAI Pacific cod allocation in the BS and 15% of its BSAI Pacific cod allocation in the AI, using the stock assessment apportionments between areas. In general, Alternative 3 is likely to be the most disruptive to the fleet compared to Alternatives 2 and 4. While it may mitigate disproportionate impacts that result from TAC fluctuations, it may force vessels to fish in areas in which they have very limited historical participation and do not want to fish. This alternative also reflects the default scenario under the current regulations, should the Council choose to take no action.

- **Alternative 4** would define the sector allocations for each subarea based on the relative percentages of Pacific cod that were harvested by the sectors during an identified fishing period. Thus, the overall sector splits determined at the combined BSAI level under Amendment 85 would remain in place, and the sector allocations would then be calculated for each subarea. This alternative would divide the AI Interim TAC among the sectors based upon each sector's relative historic harvest in the AI. The remainder of each sector's overall BSAI allocation is allocated in the BS. Overall, this alternative is likely more disruptive to the fleet compared to Alternative 2, but less disruptive than Alternative 3. This alternative, much like Alternative 3, would apportion Pacific cod into subarea and seasonal allocations thus reducing the flexibility of the fleet. However, all options under Alternative 4 are based on a sector's AI harvest, so would be less disruptive to the fleet.

The Council set this issue on the February 2008 agenda to review the status of the trawl license action and ongoing BSAI Pacific cod biological research. The trawl latent license action is scheduled for initial review at this meeting under Agenda Item C-2. With regards to the biological information, NMFS Alaska Fisheries Science Center staff have prepared three brief reports relevant to the management of Pacific cod in the BS and AI which are attached. A brief summary of this information is presented below:

- Aydin and Gaichas (**Item D-2(d)(2)**) present evidence of differences in exploitation rates between the EBS and AI, summarize assessment model results suggesting different population trajectories in the two areas, and present model simulations suggesting different ecological impacts of cod mortality in each ecosystem.

- Cunningham, Canino, and Hauser report (**Item D-2(d)(3)**), which is based on sampled populations along the Alaska Peninsula (Kodiak Is. and Unimak Pass), concluded that Pacific cod populations of the Peninsula are not genetically distinct from each other, but are differentiated from those in the Aleutian Islands. The Aleutian archipelago, particularly deep-water passes, may present barriers to adult movements, restricting gene flow with the relatively homogeneous environments of the eastern Bering Sea.

- Ormseth (**Item D-2(d)(4)**) summarized two recent findings regarding the reproductive biology of female Pacific cod in the western AI and the EBS. While fecundity at length and mean egg size differed significantly between the two areas, the differences were quite small and may not be biologically relevant. However, a principal components analysis revealed a large difference in the fatty acid composition of egg polar lipids from the two areas. While differences in diet can influence fatty acid composition, evidence from other species suggests that polar-lipid fatty acid composition is less influenced by diet and may result from local adaptation. The different fatty-acid profiles of eggs from the western AI and EBS may reflect genetic differences between the two areas.

(e) Flatfish CIE review (SSC only)

At the request of the NMFS Alaska Fisheries Science Center, the Center for Independent Experts conducted a review of stock assessments for arrowtooth flounder and rex sole in the Gulf of Alaska and Greenland turbot, northern rock sole, and yellowfin sole in the Bering Sea/Aleutian Islands. These assessments were selected as examples of the types of approaches and methodologies used by the AFSC. The SSC scheduled its review of the CIE report for this meeting. Dr. Tom Wilderbuer will summarize the CIE review.

The July 2007 CIE summary report, prepared by Dr. Cynthia Jones, was mailed to the SSC on January 18. The Executive Summary of the CIE report is attached as **Item D-2(e)(1)**. Joint Groundfish Plan Team comments are attached as **Item D-2(e)(2)**.

Discussion Paper on Apportionment of BSAI Pacific Cod Sector Allocations to BS and AI Subareas
January 30, 2007

In October 2006, the Council requested staff continue refining the discussion paper on apportionment of the BSAI Pacific cod sector allocations for February 2007 by incorporating (1) updated information for 2004-2005 under Alternative 4, (2) add a new option to each of the alternatives that would make separate Bering Sea and Aleutian Island LLP area endorsements a single BSAI area-wide endorsement for the Pacific cod fishery, only if there is a Bering Sea and Aleutian Island split, and (3) include fishmeal production data in the discussion paper. The following discussion paper provides updated information, the historical background on the issue, and a summary of the impacts of each of the alternatives.

I. Problem Statement and Existing Alternatives

Problem Statement: Apportionment of BSAI Pacific cod Sector Allocations between BS and AI

In the event that the BSAI Pacific cod ABC/TAC is apportioned between the BS and the AI management areas, a protocol needs to be established that would continue to maintain the benefits of sector allocations and minimize competition among gear groups; recognize differences in dependence among gear groups and sectors that fish for Pacific cod in the BS and AI; and ensure that the distribution of harvest remains consistent with biomass distribution and associated harvest strategy.

The following are the existing alternatives that were included in Amendment 85 prior to Council removal:

ALTERNATIVE 1: No action. A methodology to apportion the BSAI Pacific cod allocations to the jig, trawl, and fixed gear sectors between the BS and AI subareas would not be selected.

ALTERNATIVE 2: Sector allocations remain as BSAI (with BS and AI TACs)

No allocation to a sector of a specific percentage of a sub-area. Sectors would have a BSAI allocation to fish in either sub-area (BS and AI) if the sub-area is open for directed fishing and TAC is available.

Option 2.1 Upon splitting the BSAI Pacific cod sector allocations between the Bering Sea and Aleutian Islands, separate BS and AI LLP area endorsements would be converted to BSAI area-wide endorsement for the Pacific cod fishery.

ALTERNATIVE 3: BS and AI sector allocations based on equal percentage from BSAI sector allocations

This alternative provides an allocation to a sector of equal percentage in both sub-areas. The allocation percentage of BSAI TAC a sector receives would result in that same percentage being applied to both the BS and AI sub-areas so that a sector would have the same percentage in both sub-areas.

Option 3.1 Upon splitting the BSAI Pacific cod sector allocations between the Bering Sea and Aleutian Islands, separate BS and AI LLP area endorsements would be converted to BSAI area-wide endorsement for the Pacific cod fishery.

ALTERNATIVE 4: **(Selected as preliminary preferred alternative in February 06).** BS and AI sector allocations based on a sector's historic harvest in the AI with remainder of sector's overall BSAI allocation to be caught in the BS. Sector's BSAI allocation is maintained and used in annual calculation.

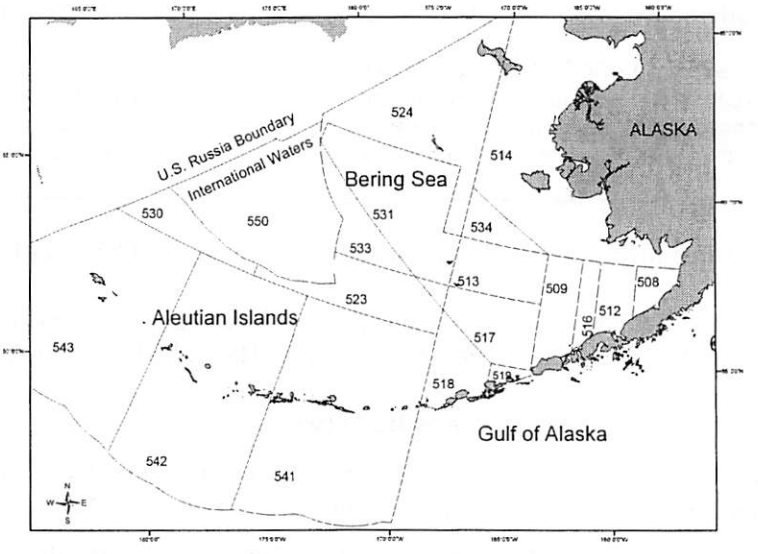
Option 4.1 1995–2002
Option 4.2 1997–2003
Option 4.3 2000–2003
Option 4.4 2002–2003

Option 4.5 Upon splitting the BSAI Pacific cod sector allocations between the Bering Sea and Aleutian Islands, separate BS and AI LLP area endorsements would be converted to BSAI area-wide endorsement for the Pacific cod fishery.

II. Background

The BS and AI management areas are comprised of the Federal management areas shown below in Figure 1. The AI is comprised of Areas 541, 542, and 543. The BSAI Pacific cod ABC is currently based on an Eastern Bering Sea assessment model and expanded by a multiplier into a BSAI-wide amount.

Figure 1 BSAI Federal management areas



The issue of whether to split the combined BSAI ABC (and TAC) by subarea has been raised at Plan Team, SSC, and Council meetings during the last several years. In December 2003, the SSC recommended that the ABC should be split between BS and AI subareas, but noted that management implications may preclude the Council from adopting separate subarea TACs in the specifications process. The SSC requested that the assessment authors evaluate potential methods for splitting the ABC and their potential management implications, so that specific recommendations could be made to the Council in the future. In the November 2005 BSAI Pacific cod SAFE report, the stock assessment authors noted the following:

> *At present, ABC of BSAI Pacific cod is not allocated by area. Pacific cod is something of an exception in this regard. Based on a Kalman filter analysis of the shelf bottom trawl survey time series in the EBS and AI, last year's assessment concluded that the best estimate of the BSAI Pacific cod biomass distribution was 85% EBS and 15% AI (Thompson and Dorn, 2004). The analysis was not repeated for this year's assessment, because no AI survey was conducted this year...if there were no other management complications, setting a separate ABC for the AI would be expected to impose only a modest new constraint on the existing fishery while helping*

> *to control future expansion of the fishery in this area. However, at present, there are potentially significant management complications arising from certain allocation formulas (by gear type, CDQ, etc.) pertaining to Pacific cod in the Fishery Management Plan. Until such time as these complications can be resolved, specification of separate ABCs for the EBS and AI is not recommended.* [excerpt from 2005 BSAI SAFE]

While the decision to split the BSAI cod TAC into BS and AI subarea TACs is not part of of this action, at the February 2006 Council meeting, the SSC requested that the Amendment 85 analysis include additional background information on the biological basis for managing cod as separate BS and AI stocks rather than as a single BSAI stock (SSC minutes, February 2006). The SSC specifically asked whether evidence suggests that the BS and AI stocks are separate and that cod form a single stock throughout the AI, or whether evidence suggests that cod form a suite of independent or partially independent stocks along the length of the AI. The following response from stock assessment scientists at the Alaska Fisheries Science Center indicates that there is not sufficient evidence at this time that Pacific cod stocks in the BS and AI are separate:

At present, there is insufficient evidence to confirm or refute the hypotheses that the BS and AI stocks are separate, that cod form a single stock throughout the AI, or that cod form a suite of independent or partially independent stocks along the length of the Aleutian Islands. The available data, or lack thereof, may be summarized as follows:

1) *Size Composition. The size compositions of catches taken from the AI are typically more heavily weighted toward large fish than the size compositions of catches taken from the BS. However, this could be evidence of a difference in fishing mortality rates or gear selectivities between the two areas rather than evidence of biological structure.*

2) *Length at Age. Although a good collection of age data are available for Pacific cod in the BS, very few (<100) age data are available for Pacific cod in the AI, making it difficult to draw firm conclusions about possible differences in length at age between the two areas. More age data from Pacific cod in the AI should be available within a few weeks.*

3) *Tagging. In a study described by Shimada and Kimura (1994, Fishery Bulletin 92:800-816), substantial numbers of Pacific cod were tagged in both the AI and BS management areas. Over 300 fish tagged in the BS management area were recovered. The vast majority of these were recovered in the BS management area, although there were isolated cases of BS-tagged fish being recovered in the AI management area. Two fish tagged in the vicinity of Unimak Pass were recovered near Seguam Pass within 250 days. Very few recoveries were made of AI-tagged fish. However, two fish tagged in Tanaga Pass near Adak Island were captured on the outer northwest shelf in the BS management area (above 57°N) after 3 and 5 years at liberty. In a separate study, AFSC's Fisheries Interaction Team tagged large numbers of Pacific cod in the vicinity of Unimak Pass. Out of 2,609 tag returns, only 1 was recovered in the AI management area.*

4) *Genetics. Grant et al. (1987, Can. J. Fish. Aquat. Sci. 44:490-498) showed clear differentiation between Pacific cod in the Asian and North American portions of the species' range, but little differentiation within the North American portion. A new study, using more powerful methodology, is currently underway at the AFSC. Although final results will not be available for a few months, preliminary results confirm Grant et al.'s finding of a distinct break between Asian and North American populations, and also indicate the potential for stock structure on scales finer than the species' North American range. Unfortunately, very few data from the Bering Sea were available for the new analysis. Once the present study is completed, the authors hope to conduct further studies (pending availability of funds), including expanded coverage of the Bering Sea portion of the species' range* (Thompson, March 2, 2006).

As noted in the summary above, there are a few ongoing research studies of BSAI Pacific cod, but at the time of updating this discussion paper, no further information is available that would shed any new light on the biology of splitting BSAI Pacific cod TAC between BS and AI.

It is thus uncertain whether the Plan Team and/or SSC would recommend splitting the BSAI Pacific cod ABC/TAC into separate BS and AI subarea ABCs/TACs in the future. While Pacific cod is currently managed as a single unit in the BS and AI, historically, the great majority of the BSAI Pacific cod catch has come from the BS management subarea. The stock assessment model for Pacific cod is configured to represent the portion of the Pacific cod population inhabiting the BS survey area. The model projections are then adjusted to include biomass in the AI survey area. As stated above, the best estimate of long-term average biomass distribution is 85% in the BS and 15% in the AI (Thompson and Dorn). Consider the example that results if separate BS and AI TACs were set in 2006. Using the 2007 TAC of 170,720 mt, if the subarea split was implemented as described above, the BS and AI ITACs would be 129,585 mt and 22,868 mt, respectively.[1]

Given the management implications related to the numerous sector allocations in the BSAI, the Pacific cod TAC has continued to be established for the entire BSAI management area. However, if the Council determines that it is likely that the TAC groupings will be modified in the foreseeable future, it would be beneficial to provide direction to NMFS regarding the formula for establishing new subarea allocations to each sector. This discussion paper provides three alternative approaches for this action in addition to a brief discussion on alternative approaches. The intent is to provide direction to NMFS regarding how to establish sector allocations in the BS and AI management areas prior to separate TACs being issued in the annual specifications process. Absent this direction, there is concern that the time necessary to undergo an analysis and notice and comment rulemaking after the TAC is divided would cause significant disruption of the cod fisheries. Absent any action on this issue, NMFS could likely only implement equal allocations in both areas (e.g., if a sector receives a 40% BSAI allocation, it would receive 40% of the BS TAC and 40% of the AI TAC upon a TAC split). While this is one of the methodologies evaluated (Alternative 2), the public and the Council raised concerns about this methodology being the only potential solution by default. The primary concern being that it does not reflect recent historical catch by sector in the Aleutian Islands subarea.

Note that methods to apportion the BSAI Pacific cod CDQ reserve between the BS and AI subareas are not included in this discussion paper. Alternatives 1–4 only apply to the non-CDQ fisheries. The regulations for the CDQ reserves are at 50 CFR 679.20(b)(1)(iii). Paragraph (C)(1) addresses the apportionment of the overall CDQ groundfish reserves by TAC category, and (C)(2) addresses how to modify the CDQ reserves if overall TACs are split or combined during the final harvest specifications. NMFS has operated such that if a new TAC is established, the CDQ Program receives its 7.5% allocation, unless a species is explicitly allocated at a different percentage (e.g., pollock under the AFA) or explicitly not allocated to the program (e.g., squid). Note that the Magnuson Stevens Act was recently reauthorized. The reauthorization increased the CDQ Program Pacific cod allocation from 7.5 percent to 10.7 percent and makes it a directed fishery allocation (including incidental catch). Thus, if the BSAI Pacific cod TAC is split into BS and AI subarea TACs, under the status quo allocations, the CDQ Program would receive 10.7% of the BS TAC and 10.7% of the AI TAC for directed fishing. For illustrative purposes, the remainder of this paper uses a 10.7% CDQ allocation. The effect of making the split on the CDQ Program and its participants would need to be addressed in the final TAC-setting EA.

[1] Does not include the 3% deduction for State water AI Pacific cod fishery implemented for 2006 and 2007.

III. LLP area endorsements by sector

Groundfish licenses are currently required to participate in the BSAI groundfish fisheries in Federal waters. Groundfish licenses contain endorsements that define what the vessel using the license is allowed to do. Area endorsements define the geographic locations the licenses allow a vessel to fish. Under the groundfish LLP, separate BS subarea and AI subarea endorsements were issued and earned based on historic fishing patterns. Looking just at BSAI, licenses may contain endorsements for both subareas (BS and AI), one of the two subareas, or neither of the subareas. Gear endorsements define what type of gear may be used: non-trawl, trawl, or both. Further, cod gear endorsements are required for non-trawl vessels ≥60' to participate in the BSAI fixed gear Pacific cod fishery: hook-and-line catcher processors, pot catcher processors, hook-and-line catcher vessel, and pot catcher vessel. As stated previously, vessels fishing with jig gear in the BSAI are exempt from the LLP, provided they comply with gear limitations. Table 1 shows the number of groundfish LLPs with a Bering Sea and/or Aleutian Islands endorsement by sector, as of December 2006. Generally, this table shows the number of licenses associated with each eligible sector that may currently fish in the Federal BS and AI management areas for Pacific cod. Regardless of whether the BSAI TAC is split into separate subarea TACs, only those vessels with an AI endorsement may fish in Federal waters in the AI.

In the trawl CP sectors, the majority of licenses are endorsed for the BSAI, with few vessels endorsed in only one area. In the H&G trawl CP sector, 6 LLPs are endorsed only for the BS, while only one LLP is endorsed only for the AI. In the AFA trawl CV sector, more than half of the total LLPs (60) are endorsed only for the BS; the remaining licenses (51) are endorsed for the BSAI. None are endorsed only for the AI. The AFA sectors also benefit to some degree from the cooperative structure in place under the AFA. The H&G trawl CP sector will also potentially benefit from a similar structure under Amendment 80. Thus, it is possible that these sectors could have some limited ability to manage their allocations internally with the existing LLP area endorsements.

In the non-AFA trawl CV sector, the majority (44 of 50) of eligible licenses are endorsed only for the BS. Four are endorsed for the BSAI and two are endorsed for the AI only. Thus, only six LLPS in this sector can be used to fish in the AI. Note that three of these vessels harvested more than half of the total non-AFA trawl CV sector Pacific cod catch during 1995 to 2003, so any alternative that would apportion a majority of the sector's BSAI Pacific cod in the AI, these three vessels would be substantially affected. Under that scenario, theses vessels would need to purchase an LLP with an AI endorsement in order to continue their historical level of Pacific cod catch.

In the hook-and-line sectors, the majority of the eligible vessels (CP and ≥60' CV) are endorsed for the BSAI, with only 2 CPs and 1 CV endorsed only in the BS, and only 1 CV endorsed only for the AI. In the pot CP sector, there are only 8 eligible LLPs, 5 of which are endorsed for the BSAI and 3 for the BS only. In the ≥60' pot CV sector, the great majority (47 of 52) of licenses are endorsed only for the BS, with only 5 licenses endorsed for the BSAI. In the <60' fixed gear sector, of the 115 total licenses being used on <60' vessels, 89 are endorsed only for the BS, 2 only for the AI, and 24 for the BSAI.

Table 1 shows that only six licenses are endorsed for the AI subarea only. Note that because a vessel is not limited to participating in one sector if it has the appropriate license and/or permit, the number of licenses across sectors is not necessarily additive nor does it represent the number of unique vessels. The number of LLPs is higher than the number of unique vessels, as one vessel may carry more than one license or a vessel may not yet have been designated for use on a license. Regardless of the resulting BS and AI sector allocations established under this part, only the vessels with AI endorsements in each sector are allowed to fish in that Federal management area.

Overall, about 46% of the licenses endorsed for trawl gear are endorsed to fish both subareas. About 36% of the non-trawl gear licenses are endorsed to fish both subareas. The majority of licenses (58%) are endorsed for the BS subarea only.

For those sectors with a majority of participants that hold only a BS endorsement, a relatively small proportion of the fleet would be allowed to harvest the AI sector cod allocation. Based on the table below, this appears to be an issue primarily for the non-AFA trawl CV sector, ≥60' pot CV sector, and <60' fixed gear sector. Of these three sectors, however, only the non-AFA trawl CV sector has had a substantial percentage of its overall Pacific cod catch in the AI in recent years. Thus, the possibility that a substantial portion of a sector's overall BSAI allocation is attributed to the AI allocation but only a small portion of the eligible vessels in the sector have AI endorsements appears primarily an issue for the non-AFA trawl CV sector.

Note that this situation, in which only a subset of the sector (vessels with AI endorsements) could fish a portion of the TAC that is established only for the AI, is a factor of the decision to split the BSAI TAC by subarea. That decision is not part of this action, as it is part of the annual specifications process. Unless the LLP program is modified, only those vessels with an AI endorsement will continue to be able to fish in the AI in Federal waters. The Council's decision under this action is limited to determining how to apportion each sector's BSAI allocation into the BS and AI subareas, should the TAC split occur in the future. Recall, however, that the AI endorsements are based on an individual's history in the AI. Thus, if the BS and AI sector allocations are based on actual harvest history (as proposed under Alternative 4), this alternative should serve to mirror actual harvest history by sector in the AI subarea. Recall that LLPs are not required to fish within State waters, thus, all eligible vessels would continue to be allowed to fish in the BS or AI in the parallel Pacific cod fishery within 3 nm and/or in the State water AI Pacific cod fishery for specific gears and vessels sizes.

In October 2006, the Council added a new option to each of the alternatives that would make separate BS and AI LLP area endorsements a single BSAI area-wide endorsement for the Pacific cod fishery. This option would give all groundfish vessels that have historically operated only in the BS, an AI endorsement, despite the lack of catch history in the AI. The purpose of this option is to allow sectors with Pacific cod apportionment in the AI, but have limited AI endorsements, the ability to harvest their AI apportionment. In addition, some industry participants are also concerned that with separate BS and AI TACs, the BS Pacific cod fishery could potentially close earlier than it would under a combined TAC. For those Bering Sea participants that historically fished for Pacific cod later in the year, an early closure could potentially result in some participants reexamining their fishery options.

In general, the most obvious effect of this option would be increase the number of AI endorsements by 253 and the number of BS endorsements by 6 (see Table 1 below). Currently 184 licenses have AI endorsements. The sectors that will receive the most new AI endorsements are the AFA trawl CV sector at 60 new endorsements, non-AFA Trawl CV sector at 44 new endorsements, pot CV > 60' at 47 new endorsements, and the hook-and-line/pot < 60' at 89 new endorsements.

As noted above, the primary reason the Council added the new option was because of concerns that some sectors could be constrained in their ability to harvest their AI sector cod allocation. However, the new option would only be effective in addressing the Council's concern if Alternative 3 were selected. Alternative 2 would have separate TACs for the BS and AI, but apportionments at the sector level would remain BSAI area-wide. In contrast, area apportionments for Alternative 4 would be based on historic catch patterns in each of the areas, so sectors would be apportioned Pacific cod based on the their past harvest abilities. However, under Alternative 3, sector allocations of Pacific cod would **not** be apportioned based on historic fishing in the AI or BS, but instead would be based on an equal percentage in both BS and AI of the sector's combined BSAI Pacific cod allocation. In other words, if the Pot CV

≥60' sector allocation of BSAI Pacific cod is 8.4%, then the sector would be apportioned 8.4% of the AI TAC and 8.4% of the BS TAC despite the sector having very limited catch history in the AI.

In the Trawl Latent License action, the Council is currently considering creating new endorsements for the Aleutian Islands on catcher vessel licenses that have landings in the parallel or State water fisheries in the Aleutian Islands. This action is intended to address a perceived shortage of catcher vessel licenses in the Aleutian Islands, particularly for the Pacific cod fishery. The number of potential new AI LLP created under this action is estimated at most to be 21. In general, if the Council perceives there is a shortage of catcher vessel licenses in the AI, this option could be a more effective tool for addressing those concerns than giving all groundfish vessels with only a BS endorsement an AI endorsement due the potential effects created from this action.

Giving all groundfish vessels with only a BS endorsement an AI endorsement could have impacts on those participants with existing AI endorsements and on the AI fishing environment. One potential effect of this option could be a reduction in the market value of the existing AI endorsements. Given there is 184 AI endorsements currently, the supply of AI endorsements will more than double if this option is selected. Ultimately, the decline in the market price for AI endorsement depends on the demand for the new AI endorsements in each sector. An increase in AI endorsement could also potentially result in more gear conflicts on the fishing grounds and shorter AI openings brought about from a race for fish. The extent of the potentially increase in fishing in the AI cannot be determined with any certainty, but if a sector is apportioned Pacific cod in the AI and if individual participants perceive the benefits of fishing for AI Pacific cod greater than the costs of fishing in that area, then individuals, in general, will enter the AI Pacific cod fishery.

Another potential effect could be an increase in the number of vessels fishing in the AI. An action that could increase the intensity of effort in the Aleutian Islands area could be considered a departure from the fishing conditions that existed at the time of the last FMP level Section 7 consultation under the Endangered Species Act. When the FMP Biological Opinion was prepared in 2000, the Pacific cod fishery was part of a jeopardy determination, and as a consequence the Council and NMFS developed additional restrictions for that fishery (and the pollock and Atka mackerel fisheries) to remove the jeopardy determination, as provided for in the 2001 BiOp. Under the 2001 BiOp, SSL protection measures were established for the Pacific cod fishery based on how that fishery was prosecuted at that time. If those conditions change substantively, such as allowing in increase in effort in the Pacific cod fishery in the AI region, this could be considered a change in the action that was considered in the 2001 BiOp and this might trigger a new consultation. A new FMP level consultation is under way at this time, and a draft BiOp is expected in June 2007 based on how all groundfish fisheries are currently prosecuted. If Pacific cod fishing conditions change appreciably in the AI region, such an action could be folded into that ongoing consultation.

Finally, the new AI endorsements could create latent AI endorsements, running counter to the Council's action in reducing latent licenses in the BSAI. Recall, the Council is currently proposing an action that would make changes to the License Limitation Program to reduce latent capacity in the BSAI and GOA trawl catcher vessel sector. The main focus of the latent reduction amendment is to reduce the future potential for increases in trawl groundfish fishing effort from currently unused or underutilized LLPs, although the action does have an option to increase the number of endorsements in the Aleutian Islands area for the non-AFA trawl CV sector. Ultimately, if the Council removes latent licenses from the AI as part of the BSAI and GOA trawl LLP recency action, but then adds additional AI endorsements in this action, it is likely the Council will have increased the potential for even greater numbers of latent licenses in the AI Pacific cod fishery. Under the BSAI and GOA trawl LLP recency amendment, approximately 5 non-AFA trawl CV AI endorsements and 3 to 22 AFA trawl CV AI endorsements could be removed

depending on which options were selected. Ironically, those same AI endorsements removed in that action would recreated in the BSAI Pacific cod area apportionment action.

Table 1 Number of BS, AI and BSAI LLPs in the BSAI Pacific cod sectors

SECTOR	Permit required and/or eligibility criteria per statute	BS only LLP	AI only LLP	BSAI LLP	Total # of valid LLPs
AFA Trawl CP	AFA CP permit/listed in 208(e)(1)-(20); trawl LLP (CP/BSAI)	1	0	19	20
H&G Trawl CP	CP; must have harvested with trawl gear and processed no less than 150 mt of non-pollock groundfish during 1997 through 2002.	6	1	23 (1 interim)	30 LLPs (on 26 vessels)[1]
AFA Trawl CV	AFA CV permit; trawl LLP (CV/BSAI)	60	0	51 (1 interim)	111
Non-AFA Trawl CV	trawl LLP (CV/BSAI)[2]	44 (2 interim)	2	4	50
Hook-and-line CP	non-trawl LLP (BSAI/H&L CP cod endorsement)	2	0	40 (3 interim)	42
Hook-and-line CV >60'	endorsement)	1	1	7	9
Pot CP	non-trawl LLP (BSAI/pot CP cod endorsement)	3	0	5 (2 interim)	8
Pot CV >60'	non-trawl LLP (BSAI/pot CV cod endorsement)	47	0	5 (2 interim)	52
Hook-and-line/Pot <60'	non-trawl LLP (CV/BSAI)	89 (2 interim)	2	24 (3 interim)	115
Jig CV	the BSAI	N/A	N/A	N/A	N/A
Total Endorsements		253	6	178	437

[1]Note that 45 BSAI trawl CP licenses exist (that are not associated with AFA vessels), but only 26 vessels (on which 30 LLPs are used) qualify under the eligibility criteria to participate in the H&G trawl CP sector for BSAI groundfish authorized in the Consolidated Appropriations Act of 2005. Of the remaining 15 trawl CP licenses currently being used on vessels ineligible for the H&G trawl CP sector, 9 are being used on AFA CVs and 5 others have a BSAI hook-and-line CP cod endorsement and are accounted for in the hook-and-line CP sector.

[2]Note that of the 111 total LLPs held by this sector, there are 102 trawl CV LLPs and 9 trawl CP LLPs (all 9 are transferable; 8 are endorsed for the BSAI and 1 is endorsed for the BS).
Not that a vessel is not limited to participating in one sector if it has the appropriate license and/or permit; thus, the sum of the number of licenses does not represent the number of unique vessels. Note also that the number of LLPs is higher than the number of unique vessels, as one vessel may cary more than one license or a vessel may not yet have been designated for use on a license.

IV. State water Aleutian Islands Pacific cod fishery

At its December 2005 meeting, the Alaska Board of Fisheries (Board) generated a proposal (BOF proposal 399) to create a new regulation establishing a State waters Pacific cod fishery in the Aleutian Islands west of 170° W longitude. In the past, the BSAI Pacific cod fishery in State waters has been managed as a parallel fishery to the Federal fishery; the Federal government manages all harvests (inside or outside State waters) against the Federal BSAI Pacific cod TAC and allocations, opens and closes seasons, establishes gear restrictions, etc. Upon request of the Council, the Board and the Council met jointly to discuss the proposal on February 3 in Anchorage, and the Board took action on this proposal during its February 23–25, 2006 meeting in Ketchikan. The existing State water AI Pacific cod fishery was modified by the Board at the October 14 and 15, 2006 meeting. Among other adjustments to the

regulations, the Board modified the opening date and vessel length restrictions for trawl and fixed-gear vessels. The primary elements of the fishery include:

1. The guideline harvest level (GHL) for the state waters fishery will be an amount calculated as 3% of the Federal BSAI Pacific cod ABC. The future calculation (the "source" of the GHL) will be the Council's decision should the BSAI ABC be split into separate AI and BS ABCs in a future TAC specifications process. The State water fishery, however, would remain the equivalent of 3% of the combined BS and AI ABC.

2. The fishery may occur only from four days after the initial BSAI parallel catcher-vessel trawl fishery is closed through December 31 each year, or until the GHL is taken. All parallel Pacific cod fishery sectors are closed during the state-waters fishery.

3. Legal fishing gear will be pot, jig, hand troll, non-pelagic trawl, and longline gear.

4. Vessels used to harvest Pacific cod with non-pelagic trawl gear in state-waters fishery are restricted to 100 feet in overall length or less. Vessels used to harvest Pacific cod with mechanical jig and longline gear in the state-waters fishery are restricted to 58 feet in overall length or less.

5. A maximum of 70% of the GHL may be harvested prior to June 10. Any unharvested GHL that has not been harvested by April 1, then on that day the state-waters fishery will close and the parallel fishery will open. If adequate state-waters GHL remains after the closure of the parallel fishery that began on April 1, then the state-waters fishery may reopen prior to June 10.

6. Any unharvested 'A' season GHL will be rolled into the second season. A total of 30% of the GHL plus the unharvested amount from the prior season up to a maximum of 70% will be available for the second season.

7. During the year, the Commissioner of ADF&G may determine that a portion of the GHL may be left unharvested. The Commissioner will notify NMFS and the Council of that amount so that it may be reallocated to the Federal fisheries that are still open at that time.

8. The fishery requires registration with ADF&G of the type of gear to be used.

9. The daily trip limit is 150,000 lbs of Pacific cod; there is also a limit of up to 300,000 lbs of unprocessed Pacific cod onboard the vessel. A vessel may not have more processed fish onboard than the round weight equivalent of the fish reported on ADF&G fishtickets during the AI state waters Pacific cod fishery. Participants must notify ADF&G daily of the amount harvested and the total amount on board.

10. All Pacific cod harvested must be retained. If a participant harvests an amount in excess of the daily trip limit, that excess amount of product must be forfeited to the State. No penalty for overages will be assigned to a participant who immediately reports the overage.

11. The Commissioner of ADF&G may impose bycatch limitations or retention requirements.

The State regulations authorizing this fishery allow the fishery to begin four days after the initial BSAI parallel trawl CV fishery is closed, which coincides with the closure of the Federal BSAI CV cod A season. For the 2006 season, NMFS closed the directed trawl CV Pacific cod fishery in the BSAI on March 8, 2006, in order to avoid exceeding the A season allocation, thus, the State water AI fishery began at noon on March 15. As the 2006 TAC had already been specified and sectors were fishing under the

existing allocations, NMFS effected an inseason adjustment under Federal regulations (50 CFR 679.25) to re-specify the TAC on March 14, to account for the 3% reduction for the GHL. This necessitated re-calculating the sector allocations and seasonal apportionments that are currently published in Federal regulations.[2]

This action also necessarily affected the 2006 BSAI Pacific cod CDQ reserve, as that allocated is calculated as a percentage of the BSAI Pacific cod TAC. Thus, all sectors realized a proportional reduction of 3% of their current Federal allocations as a result of this action. Three percent of the 2006 ABC of 194,000 mt represents about 5,820 mt (or 12,830,772 lbs). Note that the State fishery is limited to 70% of the total GHL in the first half of the year (prior to June 10) and any unharvested quota from the first season is rolled over to the second season (on or after June 10). For 2006 season, the 5,820 mt GHL, equated to 4,074 mt in the first season and 1,746 mt in the second season. This provision mirrors the overall Pacific cod seasonal apportionments in place under the current Steller sea lion mitigation measures.

The overall effect of a State waters Pacific cod fishery in the Aleutian Islands west of 170° W longitude is that all sectors, including the CDQ fishery, will realize a proportional reduction of 3% of their current Federal allocations. Because the same gear types are allowed to fish the GHL as are allowed in the Federal fishery, recognizing the limitation on vessel size in the State water fishery, it is not clear to what extent each sector will participate in and benefit from the State water fishery in the Aleutians. The first season of the fishery opened on March 15 and ended on March 24, 2006. Twenty-six vessels registered and participated in the fishery, including one large trawl CP, five hook-and-line CPs, one pot CV ≥60', sixteen trawl CVs ≥60', and three trawl CVs <60'. In addition, two floating processors and two shorebased processors (located in Dutch Harbor and Adak) participated. About 94% of the first season GHL of 8.98 million pounds was harvested.

It is anticipated that while the intent is to allow additional harvests by the identified sectors in State waters west of 170° W longitude, the overall effect will be a redistribution of cod harvests and associated revenues from vessels of all gear types that fish in Federal waters in the AI or in the Bering Sea (within Federal or State waters) and from ports east of 170° W. Thus, there will likely be a disproportionate negative effect on those participants that do not desire to fish in State waters in the Aleutian Islands, compared to those participants that have harvested and want to continue to harvest Pacific cod in the Aleutians and within State waters. In general, the fixed gear and jig gear sectors have reduced the AI share of their total BSAI Pacific cod harvest in recent years, while the trawl sectors have generally increased the AI share of their total BSAI Pacific cod harvest.

The press release announcing the AI State Pacific cod fishery states that bycatch limits that apply in the parallel fishery will apply in the State waters fishery (ADF&G news release, 3/1/06). Halibut mortality from a State waters groundfish fishery cannot be deducted from a Federal fishery category, thus, the PSC allowances for the Federal Pacific cod fisheries will not be modified as a result of this action. The State could choose to enforce Federal closures that result from reaching PSC limits in State waters, but that decision is at the Commissioner's discretion. Note that both trawl and longline gear are prohibited from participating in the State water AI fishery from May 1–September 15; these are the only gear sectors that are subject to PSC bycatch allowances in the Federal Pacific cod fishery. Pot and jig gear are exempt from PSC limits due to very low bycatch rates. However, the A season GHL was harvested in ten days, primarily by trawl vessels. The B season, which started on June 10 with a GHL of a little over 4 million pounds, closed on September 1. The State held back 0.5 million pounds for a possible reopening later in the year.

[2]See Table 5 (2006 and 2007 Gear Shares and Seasonal Allowances of the BSAI Pacific cod TAC) in 71 FR 10870, March 3, 2006.

Note that observer coverage is not required under a State water fishery. However, it is assumed that this fishery will operate similarly to the Gulf of Alaska State Pacific cod fishery, in that if the vessel in the State fishery has a Federal Fisheries Permit (FFP), then any time the vessel operates in the State fishery it is subject to observer coverage requirements, and any time an observer is onboard in the State fishery can be counted toward the Federal observer coverage requirements. One presumes that this is based on the premise that any time a vessel has an FFP, it is authorized to fish in the EEZ when the fishery is open. When the Federal GOA Pacific cod fishery closes, generally, the majority of the fleet surrenders the FFP in order to relieve itself of observer coverage requirements. A few vessels, however, sometimes choose to continue to keep their FFP and carry observers in the State water cod fishery, in order to satisfy their observer coverage requirements. In the fishery's first season, six vessels voluntarily carried a Federal observer.

V. Data used in discussion paper

The data in this analysis are retained harvests from 1995 through 2005 with and without meal. Retained harvest data for CPs are from NMFS Weekly Production Reports; retained harvest data for CVs are from Alaska Department of Fish and Game electronic fish tickets.

The Council's intent in Amendment 85 was to allocate Pacific cod based upon retained harvest, as its retention is required in both the directed fishery and up to the maximum retainable allowance when the directed cod fishery is closed. However, the 100% retention requirement did not begin until January 3, 1998, so that in the years 1995-1997 Pacific cod could be (and were) legally discarded.

What has occurred after the 100% retention standards for Pacific cod were in effect is less clear-cut. For example, some catcher vessel deliveries contained fish in poor condition which could not be processed for human consumption. Often, these fish were processed into fish meal, as the fish could not be discarded.

Among the CPs, the inclusion/exclusion of Pacific cod meal products affects the AFA trawl CP sector, as a large portion of the Pacific cod harvested by this sector is taken incidentally in the BSAI pollock fishery. There is some AFA CPs whose sole Pacific cod product has been meal, so that if meal were included, the number of eligible vessels in this sector would increase.

Only a portion of the AFA CP sector process meal, as the processing infrastructure (and space on board) required for this type of product is substantial. None of the non-AFA trawl CP sector, have meal plants onboard. Of the existing alternatives, only Alternative 4 would be impacted by the inclusion of fish meal in the catch data. To get an indication of the extent of Pacific cod destine for meal production, separate tables with and without meal have been included in the analysis where appropriate.

VI. Harvest distribution between BS and AI by sector

In considering the division of the BSAI Pacific cod sector allocations between BS and AI management areas upon a TAC split, it is useful to consider the historic harvests from those areas. This section provides a general description of historic harvests from 1995 to 2005. Table 2 shows the amount and division of retained catch between the BS and AI subareas during 1995–2005 without meal, and Table 3 shows that same information but with meal included. The data shows that retained catch from the Aleutian Islands fluctuated from 1995 through 1997, then stabilized from 1999 through 2004 at between 15% and 20% of the combined BSAI retained catch, and then in 2005 catch from the Aleutian Islands declined to 12.6%. From 2000 to 2005, approximately 16.4% of the BSAI retained harvests were from the Aleutian Islands area. The effect of including meal in the catch statistics increases the BS history one or two tenths of a percent while decreasing the AI history the same percent.

Table 2 **Pacific cod retained catch in the Aleutian Islands and Bering Sea from 1995 to 2005 without meal (in metric tons and percent of total)**

Area		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Aleutian Islands	Retained catch	9,782	21,603	13,169	25,187	24,441	29,793	30,410	27,442	29,384	34,027	26,365	271,601
	Percent of BSAI	5.5%	11.2%	6.2%	15.3%	17.0%	18.5%	19.9%	16.5%	16.2%	15.8%	12.6%	13.7%
Bering Sea	Retained catch	167,255	171,798	200,245	139,382	119,643	131,434	122,141	138,795	151,496	180,751	182,800	1,705,741
	Percent of BSAI	94.5%	88.8%	93.8%	84.7%	83.0%	81.5%	80.1%	83.5%	83.8%	84.2%	87.4%	86.3%
BSAI	Retained catch	177,037	193,402	213,414	164,569	144,084	161,228	152,551	166,236	180,880	214,778	209,165	1,977,343

Source: NPFMC database (Pcod data 95 thru 05 by sector Jan 2007.xls)

Table 3 **Pacific cod retained catch in the Aleutian Islands and Bering Sea from 1995 to 2005 with meal (in metric tons and percent of total)**

Area		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Total
Aleutian Islands	Retained catch	9,782	21,603	13,169	25,226	24,475	29,832	30,412	27,445	29,387	34,036	26,365	271,732
	Percent of BSAI	5.5%	11.1%	6.2%	15.1%	16.7%	18.3%	19.7%	16.2%	16.0%	15.6%	12.4%	13.6%
Bering Sea	Retained catch	167,632	172,324	200,365	141,330	121,913	133,517	123,930	141,903	153,739	183,587	186,444	1,726,684
	Percent of BSAI	94.5%	88.9%	93.8%	84.9%	83.3%	81.7%	80.3%	83.8%	84.0%	84.4%	87.6%	86.4%
BSAI	Retained catch	177,414	193,928	213,534	166,556	146,388	163,349	154,342	169,347	183,126	217,623	212,809	1,998,416

Source: NPFMC database (Pcod data 95 thru 05 by sector Jan 2007.xls)

Table 4 shows, for each sector, the average annual retained catch, without meal, in each subarea and the BSAI as a whole, the percent of the sector's catch from each subarea, and the number of unique vessels with Pacific cod catches in each subarea and in the BSAI as a whole for two time periods, 1995–1999 and 2000–2005. In general all sectors for which allocations are being considered under this action have some history in both the Aleutian Islands and Bering Sea Pacific management areas. For the non-AFA trawl CV sector, sub-area retained catch data is not shown for the period 1995–1999 because of confidentiality limitations.

A summary of Table 4 shows overall harvest by AFA trawl CP and AFA trawl CV sectors has decreased since 1999, but the AFA trawl CV sector has more than tripled its annual catch from the Aleutian Islands during the 2000 to 2005 period. The non-AFA trawl CP sector has increased its annual catch slightly in the Bering Sea from the first to the second period, but has more than doubled its Aleutian Islands catch. Annual Pacific cod harvest by the hook-and-line CP sector and the ≥60' pot CV sector are stable and largely from the BS in both time periods. Pacific cod harvest by the jig CV sector and ≥60' hook-and-line CV sector are relatively small in both areas. Catches in these sectors are heavily weighted toward the BS. Harvest by fixed gear vessels <60' has increased substantially across the two periods (likely due to the separate allocation established for this sector in 2000), but are predominantly from the Bering Sea in both periods.

Table 4 **Retained Pacific cod catch (without meal) in the Bering Sea and Aleutian Islands by sector and percent of each sector's catch by area, 1995–1999 and 2000–2005**

		1995-1999			2000-2005		
Sector	Area	Average annual catch (mt)	Percent of sector BSAI catch	Unique vessels	Average annual catch (mt)	Percent of sector BSAI catch	Unique vessels
Hook and Line and Pot CVs < 60'	AI	26	10.00%	19	40	2.15%	29
	BS	235	90.00%	70	1,803	97.85%	98
	BSAI	261		79	1,843		116
AFA Trawl CPs	AI	2,519	62.59%	9	1,620	68.83%	3
	BS	1,505	37.41%	18	734	31.17%	13
	BSAI	4,025		20	2,354		17

		1995-1999			2000-2005		
AFA Trawl CVs	AI	2,589	6.02%	40	9,643	30.41%	42
	BS	40,406	93.98%	108	22,062	69.59%	104
	BSAI	42,995		109	31,705		107
Jig CVs	AI	21	7.41%	6	14	10.13%	12
	BS	259	92.59%	67	125	89.87%	54
	BSAI	280		73	139		63
Longline CPs	AI	5,967	6.92%	33	5,446	6.02%	29
	BS	80,248	93.08%	55	85,016	93.98%	48
	BSAI	86,215		56	90,462		49
Longline CVs	AI	9	28.56%	12	38	3.23%	21
	BS	22	71.44%	25	1,144	96.77%	33
	BSAI	31		32	1,182		43
Non-AFA Trawl CPs	AI	3,676	18.86%	21	9,952	30.83%	15
	BS	15,814	81.14%	39	22,333	69.17%	25
	BSAI	19,491		40	32,285		25
Non-AFA Trawl CVs	AI	*	*	2	2,137	50.81%	21
	BS	*	*	31	2,068	49.19%	32
	BSAI	2,579		32	4,205		44
Pot CPs	AI	1,283	26.87%	12	250	8.95%	9
	BS	3,491	73.13%	22	2,543	91.05%	10
	BSAI	4,774		24	2,793		13
Pot CVs	AI	848	5.84%	42	431	3.11%	34
	BS	13,684	94.16%	183	13,409	96.89%	121
	BSAI	14,532		189	13,839		139

Source: NPFMC database ((tb4&5_95thru99.xls and tb4&5_00thru05.xls)
*Not shown due to restrictions on confidential data

Table 5 Retained Pacific cod catch (with meal) in the Bering Sea and Aleutian Islands by sector and percent of each sector's catch by area, 1995–1999 and 2000–2005

		1995-1999			2000-2005		
Sector	Area	Average annual catch (mt)	Percent of sector BSAI catch	Unique vessels	Average annual catch (mt)	Percent of sector BSAI catch	Unique vessels
Hook and Line and Pot CVs < 60'	AI	26	10.0%	19	41	2.2%	30
	BS	235	90.0%	70	1,822	97.8%	101
	BSAI	261		79	1,864		116
AFA Trawl CPs	AI	2,519	54.2%	9	1,620	48.6%	3
	BS	1,505	45.8%	18	1,714	51.4%	17
	BSAI	4,025		20	3,334		17
AFA Trawl CVs	AI	2,589	6.0%	40	9,650	29.1%	42
	BS	40,406	94.0%	108	23,499	70.9%	107
	BSAI	42,995		109	33,149		107
Jig CVs	AI	21	7.4%	6	14	10.0%	12
	BS	259	92.6%	67	127	90.0%	54
	BSAI	280		73	141		63
Longline CPs	AI	5,967	6.9%	33	5,446	6.0%	29
	BS	80,248	93.1%	55	85,017	94.0%	48
	BSAI	86,215		56	90,463		49

Sector	Area	1995-1999 Average annual catch (mt)	1995-1999 Percent of sector BSAI catch	1995-1999 Unique vessels	2000-2005 Average annual catch (mt)	2000-2005 Percent of sector BSAI catch	2000-2005 Unique vessels
Longline CVs	AI	9	28.6%	12	39	3.3%	22
	BS	22	71.4%	25	1,145	96.7%	35
	BSAI	31		32	1,184		43
Non-AFA Trawl CPs	AI	3,676	18.9%	21	9,952	30.8%	15
	BS	15,814	81.1%	39	22,333	69.2%	25
	BSAI	19,491		40	32,285		25
Non-AFA Trawl CVs	AI	*	*	2	2,137	50.4%	21
	BS	*	*	31	2,102	49.6%	33
	BSAI	2,579		32	4,238		44
Pot CPs	AI	1,283	26.9%	12	250	8.9%	9
	BS	3,491	73.1%	22	2,543	91.1%	10
	BSAI	4,774		24	2,793		13
Pot CVs	AI	848	5.8%	42	431	3.1%	34
	BS	13,684	94.2%	183	13,551	96.9%	122
	BSAI	14,532		189	13,982		139

Source: NPFMC database ((tb4&5_95thru99.xls and tb4&5_00thru05.xls)
*Not shown due to restrictions on confidential data

Although the existing alternatives and options developed do include harvest data beyond 2005, it is important to consider the most recent data available by sector. Table 6 and Table 7 below provide retained catch by sector with and without meal for 2004 and 2005. Note that confidential data for the AFA trawl CP sector, jig gear sector, longline CV sector, and pot CP sector are not provided.

Table 6 below indicates that about 15.8% and 12.6% of the total BSAI Pacific cod harvest was taken in the AI in 2004 and 2005, respectively. Note that **Table 2** from the previous section showed that from 1999 to 2005, approximately 16.4% of the BSAI retained harvests were from the AI. **Thus, it appears that the Pacific cod harvest in the AI is a slightly smaller share of the overall BSAI Pacific cod harvest than realized in 1999 - 2005. In addition, including fish meal, reduces the percent of the AI harvest relative to the BS.**

Table 6 Pacific cod retained catch by sector without meal in the BS, AI, and BSAI areas for 2004 and 2005

2004						
Sector	BS (mt)	BS (%)	AI (mt)	AI (%)	BSAI	% of total BSAI
<60 HAL/Pot CVs	3,133	98.3%	53	1.7%	3,186	1.5%
AFA Trawl CPs	*	*	*	*	*	*
AFA Trawl CVs	25,468	69.3%	11,304	30.7%	36,771	17.1%
Jig CVs	*	*	*	*	*	*
Longline CPs	101,648	96.7%	3,451	3.3%	105,099	48.9%
Longline CVs	*	*	*	*	*	*
Non-AFA Trawl CPs	32,094	68.6%	14,715	31.4%	46,808	21.8%
Non-AFA Trawl CVs	1,555	39.0%	2,433	61.0%	3,988	1.9%
Pot CPs	3,970	100.0%	0	0.0%	3,970	1.8%
Pot CVs	11,593	100.0%	0	0.0%	11,593	5.4%
Total	**180,751**	**84.2%**	**34,027**	**15.8%**	**214,778**	**100.0%**

2005						
Sector	BS (mt)	BS (%)	AI (mt)	AI (%)	BSAI	% of total BSAI
<60 HAL/Pot CVs	3,305	99.5%	16.99	0.5%	3,322	1.6%
AFA Trawl CPs	*	*	*	*	*	*
AFA Trawl CVs	23,992	76.6%	7317.34	23.4%	31,309	15.0%
Jig CVs	*	*	*	*	*	*
Longline CPs	105,052	98.0%	2152.576	2.0%	107,204	51.3%
Longline CVs	4,630	99.9%	6.63	0.1%	4,637	2.2%
Non-AFA Trawl CPs	26,811	67.8%	12721.64	32.2%	39,533	18.9%
Non-AFA Trawl CVs	1,500	71.7%	592.84	28.3%	2,093	1.0%
Pot CPs	*	*	*	*	*	*
Pot CVs	11,457	100.0%	0	0.0%	11,457	5.5%
Total	**182,800**	**87.4%**	**26364.8**	**12.6%**	**209,165**	**100.0%**

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data

Table 7 Pacific cod retained catch by sector with meal in the BS, AI, and BSAI areas for 2004 and 2005

2004						
Sector	BS (mt)	BS (%)	AI (mt)	AI (%)	BSAI	% of total BSAI
<60 HAL/Pot CVs	3,184	98.1%	62	1.9%	3,246	1.5%
AFA Trawl CPs	*	*	*	*	*	*
AFA Trawl CVs	27,279	70.7%	11,304	29.3%	38,584	18.1%
Jig CVs	*	*	*	*	*	*
Longline CPs	101,657	96.7%	3,451	3.3%	105,108	49.3%
Longline CVs	*	*	*	*	*	*
Non-AFA Trawl CPs	32,094	68.6%	14,715	31.4%	46,808	21.9%
Non-AFA Trawl CVs	1,563	39.1%	2,433	60.9%	3,996	1.9%
Pot CPs	3,970	100.0%	0	0.0%	3,970	1.9%
Pot CVs	11,687	100.0%	0	0.0%	11,687	5.5%
Total	**181,433**	**85.0%**	**31,965**	**15.0%**	**213,399**	**100.0%**
2005						
Sector	BS (mt)	BS (%)	AI (mt)	AI (%)	BSAI	% of total BSAI
<60 HAL/Pot CVs	3,329	99.5%	17	0.5%	3,346	1.7%
AFA Trawl CPs	*	*	*	*	*	*
AFA Trawl CVs	26,271	78.2%	7,317	21.8%	33,589	16.6%
Jig CVs	*	*	*	*	*	*
Longline CPs	105,052	98.0%	2,153	2.0%	107,204	53.1%
Longline CVs	4,634	99.9%	7	0.1%	4,641	2.3%
Non-AFA Trawl CPs	26,811	67.8%	12,722	32.2%	39,533	19.6%
Non-AFA Trawl CVs	1,520	71.9%	593	28.1%	2,113	1.0%
Pot CPs	*	*	*	*	*	*
Pot CVs	11,608	100.0%	0	0.0%	11,608	5.7%
Total	**179,225**	**88.7%**	**22,808**	**11.3%**	**202,034**	**100.0%**

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data

The data in Table 6 and Table 7 are important in determining whether the distribution of harvest by sector in the two subareas has changed in recent years. The overall trend discussed previously in this section is

that the trawl sectors have generally increased the percentage of their Pacific cod harvest in the AI compared to the BS over time, while the fixed gear sectors have generally decreased their share harvested in the AI. **The data provided for 2004 and 2005 follows this trend, as the trawl sectors appear to continue to take more of their total harvest in the AI than they did in 1995 – 1999.**

The data shows that the Non-AFA trawl CP sector harvested about 31% and 32% of their total BSAI Pacific cod harvest in the AI in 2004 and 2005, respectively. This can be roughly compared to about 32% of their total BSAI Pacific cod harvest taken in the AI during 2000 – 2003. The AFA trawl CV sector harvested about 31% and 23% of their total BSAI Pacific cod harvest in the AI in 2004 and 2005, respectively. This can be roughly compared to about 34% of their total BSAI Pacific cod harvest taken in the AI during 2000 – 2003.

While the fixed gear sectors have not harvested a significant amount of cod in the AI during any of the years considered, they continue to harvest less of their total cod share in the AI in the most recent years. The hook-and-line CP sector harvested about 3% and 2% of its total cod catch in the AI during 2004 and 2005, respectively. This compares to an estimated 8% in 2000 – 2003. Hook-and-line and pot catcher vessels of any length, as well as jig vessels, harvested little to none of their total BSAI Pacific cod harvest in the AI in 2004 and 2005, and less than was harvested on average in 2000 – 2003.

VII. Alternative 1: No action

Under Alternative 1, a methodology to apportion the BSAI Pacific cod allocations to the jig, trawl, and fixed gear sectors between the BS and AI subareas would not be selected. Note that selecting no action under Alternative 1 does not mean that the BSAI TAC will not be split into the BS and AI subareas in a future specifications process, however, the likelihood of the Council recommending this split without having a methodology to apportion the numerous industry sector allocations by subarea is uncertain. As noted above, the only approach that could be implemented without a new regulatory amendment is an equal percentage of both the BS and AI subarea TAC by sector. The implications of that potential action are described under Alternative 3.

Alternative 1 effectively means that the Council would explicitly not select a method of apportioning by subarea the numerous sector allocations determined under Amendment 85 that were established for the entire BSAI area. In the event the BSAI TAC is split by subarea in the future, it is likely that NMFS would implement equal percentages of each sector's BSAI allocation in each area (e.g., if a sector receives a 40% BSAI allocation, it would receive 40% in the BS and 40% in the AI upon a TAC split) under the current regulations. It is likely that this management system would not be satisfactory to most participants, as it would not reflect each sector's recent harvest history by subarea (see Table 4 above). In general, the trawl sectors have increased the percentage of their total harvest taken from the AI in recent years, and the fixed gear sectors have reduced their share in the AI.

Thus, Alternative 1 may effectively mean that a separate, new regulatory amendment would be initiated following the TAC split, in order to allocate each sector's BSAI allocation by subarea in a manner that reflects recent harvest patterns. The primary intent of the proposed action is provide direction in the regulations prior to separate TACs being issued in the annual specifications process, in order to avoid expediting an analysis to mitigate these circumstances. As the action would require notice and comment rulemaking under the current amendment process, it would likely require a minimum of six months to a year to implement new subarea sector allocations.

VIII. Alternative 2: Sector allocations remain BSAI

Under Alternative 2, sectors would not be allocated a specific percentage of the individual AI subarea TAC or BS subarea TAC. Instead, sectors would continue to be issued an overall amount of BSAI Pacific cod, as determined in Amendment 85, that could be harvested anywhere in the BSAI. In effect, a sector's allocation could be fished from either the BS or AI subarea, as long as TAC was available in that subarea and the area was open to directed Pacific cod fishing. Once the Pacific cod TAC for either the BS or AI was reached, NMFS would issue a closure notice and all sectors would be required to stop directed Pacific cod fishing in the closed subarea. The sectors would then only be permitted to continue directed fishing in the open subarea.

This alternative provides the greatest flexibility for sectors and may be the simplest alternative for inseason management to monitor. NMFS would not be required to manage two separate subarea allocations for each of the ten proposed sectors. They would instead be required only to monitor each sector's overall BSAI allocation and a single harvest limit for each subarea, using the existing tools to open and close fisheries. Alternative 2 would also provide maximum flexibility to the fleet since the sectors would be able to fish in either subarea if it was open. Thus, regardless of historical harvest patterns, sectors could move in and out of a subarea as desired on an inseason or annual basis, and focus their efforts in the area in which they can optimize their harvest at that point in time. Thus, while some sectors have not had substantial participation in the AI in the past, if this area became more advantageous due to shifts in the stock or a desire to deliver to a new port, these sectors would be able to shift more of their fishing to the AI. Note, however, that only vessels with an AI endorsement earned on their LLP would be eligible to fish in the AI under any of the alternatives.

Under Alternative 2, it is assumed that each sector would attempt to fish in its preferred area first, especially if that area is the most constrained by TAC, such as the Aleutian Islands. A possible disadvantage of this alternative is that it could cause sectors (both within sectors and among sectors) to race for Pacific cod in the subarea they expect to close first. This could affect a sector's ability to rationalize their harvest, especially if some members of the sector wanted to fish the subarea that is expected to close later in the year. The sectors that operate under a cooperative structure (e.g., the AFA sectors and in the future, the non-AFA trawl CP sector) will manage their sector's Pacific cod harvest through internal agreements and thus will be much better positioned to strategize and fish in the subarea they expect to close first.

The level of risk in creating a race for fish in the AI under Alternative 2 is difficult to characterize; it is speculative and dynamic, depending on each sector's participation in the AI each year. As stated previously, the best estimate of long-term average biomass distribution is 85% in the BS and 15% in the AI. During the past eleven years for which data is available (1995–2005), the AI share of BSAI Pacific cod retained harvest was 13.7%, and the BS share was 86.3%. Under this long-term average, it does not appear that a race for fish in the AI would be inevitable. However, if the time frame is shortened to the most recent years (2000–2005), the share percentages change to 16.4% in the AI and 83.6% in the BS. In addition, the annual share taken in the AI has ranged from a low of 5% (1995) to a high of 20% (2001) during 1995–2005 (see Table 2). Thus, while the long-term average share taken in the AI does not exceed the 15% projected, the average of a subset of the most recent harvest years slightly exceeds 15%. In addition, each individual year, except 2005, during the past five years (1999–2005) also exceeded 15%.

Generally, the trawl sectors have increased their share of AI harvest as a percentage of their overall BSAI harvest and the fixed gear sectors have decreased their share of AI harvest as a percentage of their overall BSAI harvest, in the past several years. As stated above, because three of the four trawl sectors (AFA and non-AFA CP sectors) operate, or will operate, under a cooperative structure, these sectors should be better positioned to manage their harvest between subareas within their respective sectors. If the AI subarea is

expected to close first, Alternative 2 may result in the trawl sectors fishing first in the AI, in order to ensure their historical level of harvest in the AI. Since the trawl sectors generally have been increasing their harvest in the AI, this may mean that the race for fish in the AI may be an issue among the trawl sectors more so than with or among the fixed gear sectors. At the same time, with the exception of the non-AFA trawl CV sector, the trawl sectors are better able to plan their fishing year and react to closures than the sectors operating under a limited access regime.

Additionally, NMFS has expressed some concern with this alternative relative to the 2001 Biological Opinion. Because Alternative 2 does not establish sector allocations in each subarea, there are thus no gear specific seasonal apportionments by subarea. While the overall guideline for the BSAI in the 2001 Biological Opinion is a 70%–30% seasonal split, the seasonal apportionments vary by gear type. Thus, absent specific sector allocations in the AI, if any gear type was allowed to fish in the AI until the TAC was taken, this approach risks harvesting all of the AI TAC in the first half of the year. No guidelines currently exist for establishing AI seasonal apportionments by gear type or overall. Thus, NMFS is concerned that this alternative deviates from what was consulted on in the 2001 Biological Opinion.

Note that NMFS is undertaking another ESA Section 7 consultation on the BSAI and GOA groundfish FMPs in 2006. The consultation team has initiated the preparation of a consultation package which will consist of a series of documents, one of which is a Biological Opinion that summarizes information on the proposed action (the groundfish FMPs). The process should provide additional information on guidelines for managing the BSAI fisheries in such a manner that does not adversely affect Steller sea lions or their habitat.

Overall, Alternative 2 is likely to be the least disruptive to the BSAI Pacific cod fleet compared to Alternatives 3 and 4. Alternative 2 provides maximum flexibility for the sectors to change their fishing patterns in reaction to a shifting stock, preferable fishing location, or market conditions. This alternative would also not apportion Pacific cod to the extent Alternatives 3 and 4. As sector allocations are apportioned into separate subareas and then further divided into seasons, flexibility declines and the potential for sector disruption increases.

IX. Alternative 3: Equal percentages in BS and AI subareas

Under Alternative 3, NMFS would be directed to allocate sectors the same percentage of the BS subarea and AI subarea TACs, as determined by the BSAI sector allocations determined in Amendment 85. For example, if the hook-and-line CP sector is allocated 48.7% of the BSAI Pacific cod ITAC under Amendment 85, this sector would be allocated 48.7% of the BS ITAC and 48.7% of the AI ITAC. Note that this alternative also reflects the default scenario under the current regulations, should the Council choose to take no action (Alternative 1).

Table 8 shows the range of BSAI allocations proposed under Amendment 85 for each sector, and the annual average of each sector's BSAI harvest that was taken in the BS and AI subareas during 2000–2005. **In effect, under Alternative 3, each sector would be allowed 85% of its BSAI Pacific cod allocation in the Bering Sea and 15% of its BSAI Pacific cod allocation in the AI, using the stock assessment projections of an 85%–15% split between areas.** Refer to the last two columns in Table 8 to compare the proposed split and each sector's historical split as a percentage of its annual average BSAI Pacific cod harvest.

Table 8 Percentage of BSAI Pacific cod harvest taken in BS and AI subareas by sector, average 2000–2005

Sector	BSAI allocations under AM 85 (% of P. cod ITAC)	% of sector's BSAI cod allocation allocated to BS	% of sector's BSAI cod allocation allocated to AI	% of sector's BSAI cod harvest in BS, Avg. 2000–2005	% of sector's BSAI cod harvest in AI, Avg. 2000–2005
AFA trawl CP	2.3%	85%	15%	31.2%	68.8%
Non-AFA trawl CP	13.4%	85%	15%	69.2%	30.8%
Hook-and-line CP	48.7%	85%	15%	94.0%	6.0%
Pot CP	1.5%	85%	15%	91.1%	9.0%
Trawl CV	22.1%	85%	15%	67.0%	33.0%
Hook-and-line CV ≥60'	0.2%	85%	15%	96.7%	3.20%
Pot CV ≥60'	8.4%	85%	15%	96.9%	3.1%
<60' fixed gear	2.0%	85%	15%	97.9%	2.2%
Jig CV	1.4%	85%	15%	89.9%	10.1%

Source: NPFMC Database (tb4&5_95thru99.xls and tb4&5_00thru05.xls)

Table 8 shows that most sectors' recent harvest patterns in the BS and AI do not exactly mirror an 85% (BS) and 15% (AI) split. The fixed gear sectors harvested 90% to 98% of their harvest in the BS during the past several years (2000–2005). However, the trawl sectors harvested noticeably less than 85% of their total harvest in the BS during this time period: AFA trawl CP sector – 30%; non-AFA trawl CP sector – 69%; trawl CV sector – 67%. In general, the individual trawl sectors have increased the percentage of their total retained BSAI cod catch harvested in the AI in recent years, and the fixed gear sectors have taken less of their total retained BSAI cod catch from the AI.

Table 9 provides the potential BS and AI allocations by sector, by converting percentage allocations to metric tons, based on the 2007 BSAI Pacific cod ITAC and the projected split of 85% (BS) and 15% (AI). The first data column provides the BSAI allocations to each sector from Amendment 85. These represent percentage shares of the BSAI Pacific cod ITAC. The next column provides the projected BS allocation to that sector under Alternative 3, followed by the average annual BS Pacific cod harvest by that sector in 2000–2005. Finally, the last two columns show the same information by sector for the AI.

Table 9 Projected BS and AI allocations by sector under Alternative 3, using the 2007 BSAI Pacific cod ITAC and the range of allocations from Amendment 85

Sector	Allocation under AM 85 (% of BSAI Pcod ITAC)	Estimation of BS allocation using 2007 ITAC (mt)	Average annual BS cod retained harvest (mt) 2000-2005	Estimation of AI allocation using 2007 ITAC (mt)	Average annual AI cod retained harvest (mt) 2000-2005
AFA trawl CP	2.3%	2,980	734	526	1,620
Non-AFA trawl CP	13.4%	17,364	22,333	3,064	9,952
Hook & line CP	48.7%	63,108	85,016	11,137	5,446
Pot CP	1.5%	1,944	2,543	343	250
Trawl CV	22.1%	28,638	24,130	5,054	11,780
Hook & line CV>60'	0.2%	259	1,144	46	38
Pot CV>60'	8.4%	10,885	13,409	1,921	431
<60' fixed gear	2.0%	2,592	1,803	457	40
Jig CV	1.4%	1,814	125	320	14

Source: NPFMC Database (tb4&5_95thru99.xls and tb4&5_00thru05.xls)
Note: The 2007 BSAI Pacific TAC = 170,720 mt. Applying a 10.7% CDQ allocation results in a BSAI ITAC = 152,453 mt. This does not account for the 3% State water AI fishery.
The BS/AI TAC split is projected to be 85% and 15% AI, which means the projected BS ITAC = 129,585 mt and

the AI ITAC = 22,868 mt.

Note that Table 9 uses the 2007 BSAI Pacific cod TAC of 170,720 mt[3], and assumes the 85% (BS) and 15% (AI) split occurs in the future to determine the projected BS and AI TACs. This table also assumes that the CDQ Pacific cod directed fishing allocation would be 10.7%. In effect, 10.7% is removed from the BS and AI TACs to determine the subarea ITACs allocated among the various (non-CDQ) sectors. Table 9 above uses a 10.7% CDQ allocation to simplify the illustration.

Table 9 compares the potential BS and AI allocations to each sector under Alternative 3 to each sector's average annual harvest in the BS and AI. With the exception of the Pot CP and hook and line CV > 60' sectors, the remaining fixed sectors, estimated allocation would be more than 50% higher than the annual average harvest by sector in the AI (2000–2005). In hook-and-line CP sector, for example, the AI allocation would be more than 200% higher, and in the pot CV sector the AI allocation would be more than 400% higher than the recent harvest. In the trawl sectors, the opposite is true; generally, the AI allocation to each sector is more than 50% lower than the annual average harvest by trawl sector in the AI (2000–2005). In the non-AFA trawl CP and trawl CV sectors in particular, the estimate of the AI allocation would be 69% and 57% lower than the recent harvest in that area.

The problem statement for the proposed action references the need to recognize differences in dependence among gear groups and sectors that harvest Pacific cod in the BS and AI management areas. While Alternative 3 would mitigate the problem of disproportionate impacts that result from TAC fluctuations, it may force vessels to fish in areas they have very limited historical participation and do not want to fish. This issue impacts all sectors, but would likely be most onerous on the sectors comprised of smaller vessels, as they would be required to travel greater distances to fish in conditions that may not be well suited for their vessels.

In general, Alternative 3 is likely to be the most disruptive to the BSAI Pacific cod fleet of the alternatives considered in this action. The alternative would apportion Pacific cod into subarea and seasonal bins thus reducing the flexibility of the fleet. In addition, Alternative 3 does not result in an allocation scheme between the two subareas that reflects current harvest patterns by sector. In general, Alternative 3 would allocate a lower share of the trawl sectors' BSAI allocations to the AI than has been harvested in the AI in the recent past. In contrast, Alternative 3 would allocate a higher share of the fixed gear sectors' BSAI allocations to the AI than has been harvested in the AI in recent years. In sum, Alternative 3 does not appear to meet the concerns described in the problem statement.

X. Alternative 4: AI allocation based on historic harvest

In February 2006, the Council identified Alternative 4 as the preliminary preferred alternative for how to apportion the various BSAI Pacific cod allocations from Amendment 85 between the BS and the AI. Alternative 4 would define the sector allocations for each area based on the relative percentages of Pacific cod that were harvested by the sectors during the identified series of years. Thus, the overall sector splits determined at the combined BSAI level in Amendment 85 remain in place, and the sector allocations are then calculated at the individual subarea level. Alternative 4 divides the Aleutian Islands ITAC among the sectors based upon each sector's relative historic harvest in the Aleutian Islands. The remainder of each sector's overall BSAI allocation is allocated in the Bering Sea, after accounting for the respective allocation for the Aleutian Islands.

[3] Excludes 3% deduction for State water AI Pacific cod fishery.

This alternative allows the BSAI sector allocations to be maintained, but sectors would be allocated different percentages of each area based on their historic harvest patterns in the AI. It also allows the overall BSAI allocations to each sector to be based on a different series of years than the years on which the AI allocations are based. This is because the Council may want to base the BSAI subarea sector allocations on a smaller subset of (recent) years than the overall BSAI sector allocations, in order to reflect the fact that sectors generally tended to fish more or less in the AI in recent years.

The general intent under Alternative 4 is thus to base the percentage AI allocations for each sector on recent harvest shares in the AI. **Thus, in the case that the Council chooses an option under Alternative 4 as its preferred alternative, and a BSAI TAC split between the BS and AI subareas does not occur for several years, it may be preferable at that time to consider whether the preferred alternative continues to reflect recent AI harvest shares by sector.** For instance, if the harvest distribution between the BS and AI changes dramatically for one or more sectors between now and when a TAC split occurs, the Council may want to consider initiating a new amendment to revise the sector AI allocations resulting from this part.

The original year combination options from Amendment 85 for determining each sector's allocation in the AI were as follows:

Option 1	1995–2002
Option 2	1997–2003
Option 3	2000–2003
Option 4	2002–2003

As stated in earlier sections, the trawl sectors have generally increased their share of AI harvest as a percentage of their overall BSAI harvest in the past several years. By contrast, the fixed gear sectors have generally decreased their share of AI harvest as a percentage of their overall BSAI harvest in the past several years. Because of this variation in AI harvest by sectors, the time period selected for the allocations largely determines whether certain fixed gear sectors, primarily the pot sectors and the hook-and-line CV sector, will be significant participants in the AI Pacific cod fishery in the future. Other sectors would also be impacted by the years selected as the historic base period, but in most cases would be less likely to be effectively excluded from the AI fishery.

The calculations for the AI harvest by sector under Alternative 4 are made using the four options above. In completing the allocation calculations, it was necessary to make several adjustments to overcome potential problems with confidential data. It was necessary to combine the <60' hook-and-line and pot catcher vessel sector with the jig catcher vessel sector. The estimates for all other sectors are unaffected, as this calculation was only undertaken for the AFA trawl catcher processor and non-AFA trawl catcher vessel sectors.

The first step in evaluating the Aleutian Islands and Bering Sea allocations resulting from the options under Alternative 4 was to calculate each sector's AI historic retained Pacific cod harvest share, as a percentage of the historical AI harvests for all CV and CP sectors, during the years identified. These estimates are show in Table 10. Table 11 shows the same data but includes fish meal destine for production. The first column for each option shows the retained catch of Pacific cod in the Aleutian Islands by each sector during the years specified in the options, while the second column shows the percent of the total Aleutians Islands retained catch by the sector during that period.

Table 10 Aleutian Islands Pacific cod catch (mt) and percent of the total Aleutian Islands allocation to each sector under Alternative 4, Options 1–4 (meal not included)

Sector	1995-2002		1997-2003		2000-2003		2002-2003	
	mt	percent	mt	percent	mt	percent	mt	percent
<60 HAL/Pot CVs and Jig CVs	456	0.26%	468	0.3%	237	0.2%	64	0.1%
AFA Trawl CPs	15,704	9.10%	12,063	6.9%	4,111	3.5%	1,856	3.3%
Trawl CVs	45,158	26.17%	60,986	35.1%	49,029	41.9%	32,122	56.5%
Longline CPs	56,230	32.59%	49,059	28.2%	27,072	23.1%	2,515	4.4%
Longline CVs	261	0.15%	245	0.1%	218	0.2%	5	0.0%
Non-AFA Trawl CPs	39,979	23.17%	41,956	24.1%	32,275	27.6%	20,253	35.6%
Pot CPs	7,912	4.59%	3,753	2.2%	1,500	1.3%	*	*
Pot CVs	6,825	3.96%	5,226	3.0%	2,585	2.2%	*	*
Denominator	172,526		173,757		117,028		56,825	

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data

Table 11 Aleutian Islands Pacific cod catch (mt) and percent of the total Aleutian Islands allocation to each sector under Alternative 4, Options 1–4 (meal included)

Sector	1995-2002		1997-2003		2000-2003		2002-2003	
	mt	percent	mt	percent	mt	percent	mt	percent
<60 HAL/Pot CVs and Jig CVs	456	0.26%	471	0.3%	240	0.2%	66	0.1%
AFA Trawl CPs	15,756	9.13%	12,115	7.0%	4,111	3.5%	1,856	3.3%
Trawl CVs	42,221	24.46%	61,051	35.1%	49,072	41.9%	32,126	56.5%
Longline CPs	56,230	32.57%	49,059	28.2%	27,072	23.1%	2,515	4.4%
Longline CVs	264	0.15%	247	0.1%	221	0.2%	5	0.0%
Non-AFA Trawl CPs	39,979	23.16%	41,956	24.1%	32,275	27.6%	20,253	35.6%
Pot CPs	7,912	4.58%	3,753	2.2%	1,500	1.3%	*	*
Pot CVs	6,825	3.95%	5,226	3.0%	2,585	2.2%	*	*
Denominator	172,643		173,878		117,076		56,832	

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data

Recall that each sector's overall BSAI allocation is maintained under Alternative 4. Thus, to represent the AI percentage estimates above as a potential allocation to each sector requires the use of an allocation option from Amendment 85 as this part determines each sector's allocation of the overall BSAI ITAC.

Table 12, Table 13, Table 14, and Table 15 show estimated allocations with and without meal using Option 1 and 2 together with Amendment 85 allocation percentages. The first column of Table 12 shows the BSAI allocation to each sector, as a percent of the BSAI ITAC. The second column shows the estimated allocation to each sector in metric tons, based on a 2007 BSAI ITAC of 152,453 mt. The third column shows the Aleutian Islands allocation to each sector, as a percent of the Aleutian Islands ITAC, based on Option 1. The third column shows each sector's Aleutian Islands allocation in metric tons, based on a projected Aleutian Islands ITAC of 22,868 mt. The fourth column shows each sector's remaining Bering Sea allocation in metric tons (i.e., each sector's overall BSAI allocation minus its AI allocation). The last two columns show the respective percentages of each sector's total BSAI allocation that is from the BS subarea and the AI subarea, based on the previous estimates. In reviewing this table, it is important to bear in mind that the division of a sector's allocation between the BS and AI will vary annually with the respective ITACs.

Table 12 Example of BSAI, AI, and BS allocations by sector without meal using 1995–2002 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC -1995-2002)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.3%	60	4,345	98.6%	1.37%
AFA Trawl CPs	2.3%	2,980	9.1%	2,082	899	30.2%	69.84%
Trawl CVs	22.1%	28,638	26.2%	5,986	22,653	79.1%	20.90%
Longline CPs	48.7%	63,108	32.6%	7,453	55,655	88.2%	11.81%
Longline CVs	0.2%	259	0.2%	35	225	86.6%	13.36%
Non-AFA Trawl CPs	13.4%	17,364	23.2%	5,299	12,065	69.5%	30.52%
Pot CPs	1.5%	1,944	4.6%	1,049	895	46.0%	53.95%
Pot CVs	8.4%	10,885	4.0%	905	9,980	91.7%	8.31%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 13 Example of BSAI, AI, and BS allocations by sector with meal using 1995–2002 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 1995-2002)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.3%	60	4,345	98.6%	1.37%
AFA Trawl CPs	2.3%	2,980	9.1%	2,087	893	30.0%	70.02%
Trawl CVs	22.1%	28,638	24.5%	5,593	23,046	80.5%	19.53%
Longline CPs	48.7%	63,108	32.6%	7,448	55,660	88.2%	11.80%
Longline CVs	0.2%	259	0.2%	35	224	86.5%	13.47%
Non-AFA Trawl CPs	13.4%	17,364	23.2%	5,296	12,069	69.5%	30.50%
Pot CPs	1.5%	1,944	4.6%	1,048	896	46.1%	53.92%
Pot CVs	8.4%	10,885	4.0%	904	9,981	91.7%	8.31%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 14 Example of BSAI, AI, and BS allocations by sector without meal using 1997–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC -1997-2003)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.3%	62	4,344	98.6%	1.40%
AFA Trawl CPs	2.3%	2,980	6.9%	1,588	1,393	46.7%	53.27%
Trawl CVs	22.1%	28,638	35.1%	8,026	20,612	72.0%	28.03%
Longline CPs	48.7%	63,108	28.2%	6,457	56,651	89.8%	10.23%
Longline CVs	0.2%	259	0.1%	32	227	87.6%	12.44%
Non-AFA Trawl CPs	13.4%	17,364	24.1%	5,522	11,843	68.2%	31.80%
Pot CPs	1.5%	1,944	2.2%	494	1,450	74.6%	25.41%
Pot CVs	8.4%	10,885	3.0%	688	10,197	93.7%	6.32%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 15 Example of BSAI, AI, and BS allocations by sector with meal using 1997–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 1997-2003)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.3%	62	4,344	98.6%	1.41%
AFA Trawl CPs	2.3%	2,980	7.0%	1,593	1,387	46.5%	53.46%
Trawl CVs	22.1%	28,638	35.1%	8,029	20,609	72.0%	28.04%
Longline CPs	48.7%	63,108	28.2%	6,452	56,656	89.8%	10.22%
Longline CVs	0.2%	259	0.1%	33	227	87.4%	12.55%
Non-AFA Trawl CPs	13.4%	17,364	24.1%	5,518	11,846	68.2%	31.78%
Pot CPs	1.5%	1,944	2.2%	494	1,450	74.6%	25.39%
Pot CVs	8.4%	10,885	3.0%	687	10,198	93.7%	6.31%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 16, Table 17, Table 18, and Table 19 below show estimated allocations with and without meal under Options 3 and 4, respectively, using the same allocation example as shown in the above tables. Again, the selection of this example allocation option is for illustrative purposes only.

Table 16 Example of BSAI, AI, and BS allocations by sector without meal using 2000–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 2000-2002)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.2%	46	4,360	98.9%	1.05%
AFA Trawl CPs	2.3%	2,980	3.5%	803	2,177	73.0%	26.95%
Trawl CVs	22.1%	28,638	41.9%	9,581	19,058	66.5%	33.45%
Longline CPs	48.7%	63,108	23.1%	5,290	57,818	91.6%	8.38%
Longline CVs	0.2%	259	0.2%	43	217	83.5%	16.46%
Non-AFA Trawl CPs	13.4%	17,364	27.6%	6,307	11,058	63.7%	36.32%
Pot CPs	1.5%	1,944	1.3%	293	1,651	84.9%	15.08%
Pot CVs	8.4%	10,885	2.2%	505	10,380	95.4%	4.64%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 17 Example of BSAI, AI, and BS allocations by sector with meal using 2000–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 2000-2003)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.2%	47	4,359	98.9%	1.06%
AFA Trawl CPs	2.3%	2,980	3.5%	803	2,177	73.1%	26.94%
Trawl CVs	22.1%	28,638	41.9%	9,585	19,053	66.5%	33.47%
Longline CPs	48.7%	63,108	23.1%	5,288	57,820	91.6%	8.38%
Longline CVs	0.2%	259	0.2%	43	216	83.4%	16.63%
Non-AFA Trawl CPs	13.4%	17,364	27.6%	6,304	11,060	63.7%	36.31%
Pot CPs	1.5%	1,944	1.3%	293	1,651	84.9%	15.07%
Pot CVs	8.4%	10,885	2.2%	505	10,380	95.4%	4.64%

Source: NPFMC database (Pcod tables Jan 07.xls)
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 18 Example of BSAI, AI, and BS allocations by sector without meal using 2002–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 2002-2003)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.1%	26	4,380	99.4%	0.58%
AFA Trawl CPs	2.3%	2,980	3.3%	747	2,234	74.9%	25.06%
Trawl CVs	22.1%	28,638	56.5%	12,927	15,711	54.9%	45.14%
Longline CPs	48.7%	63,108	4.4%	1,012	62,096	98.4%	1.60%
Longline CVs	0.2%	259	0.0%	2	257	99.3%	0.70%
Non-AFA Trawl CPs	13.4%	17,364	35.6%	8,150	9,214	53.1%	46.94%
Pot CPs	1.5%	1,944	*	*	*	*	*
Pot CVs	8.4%	10,885	*	*	*	*	*

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Table 19 Example of BSAI, AI, and BS allocations by sector with meal using 2002–2003 catch history

Sector	BSAI allocation (as percent of ITAC)	BSAI allocation (mt)	AI allocation (as percent of ITAC - 2002-2003)	AI allocation (mt)	BS allocation (mt) (remaining portion of sector's allocation)	BS allocation (as percent of sector BSAI allocation)	AI allocation (as percent of sector BSAI allocation)
<60 HAL/Pot CVs and Jig CVs	3.4%	4,406	0.1%	26	4,379	99.4%	0.60%
AFA Trawl CPs	2.3%	2,980	3.3%	747	2,234	74.9%	25.05%
Trawl CVs	22.1%	28,638	56.5%	12,927	15,711	54.9%	45.14%
Longline CPs	48.7%	63,108	4.4%	1,012	62,096	98.4%	1.60%
Longline CVs	0.2%	259	0.0%	2	257	99.3%	0.71%
Non-AFA Trawl CPs	13.4%	17,364	35.6%	8,149	9,215	53.1%	46.93%
Pot CPs	1.5%	1,944	*	*	*	*	*
Pot CVs	8.4%	10,885	*	*	*	*	*

Source: NPFMC database (Pcod tables Jan 07.xls)
*Not shown due to restrictions on confidential data
Example assumes a projected 2007 BS ITAC of 129,585 mt and AI ITAC of 22,868 mt. This does not account for the 3% State water AI fishery.

Because the fixed gear sectors have been taking less of their total Pacific cod harvest in the AI in the most recent years, and because all of the fixed gear sectors except for the hook-and-line CP sector receive a relatively small percentage of the overall BSAI ITAC, using 2002–2003 to determine the AI allocations will result in relatively small allocations to these sectors under every allocation scenario. This result may not represent a concern to these sectors, unless and until they desire to increase their Pacific cod share in the AI in the future.

In summary, if the Council wants to mirror the most recent sector shares of the AI Pacific cod harvest, it may want to simply choose percentages that fall within the range provided under Options 1–4. Selecting AI percentage allocations to each sector that fall within the range analyzed would allow the Council to choose percentages that do not result in a negative BS allocation to each sector under the current projected TAC levels, but could also provide for an AI allocation that mirrors the most recent harvest levels by sector in that area. However, as pointed out at the April 2006 Council meeting, because 1) the BSAI TAC split has not yet occurred, 2) it is uncertain how TACs in the BS and AI would fluctuate relative to one another in the future, and 3) the subarea allocations under Alternative 4 are dependent first on maintaining the overall BSAI allocation to each sector, **it is possible that Alternative 4 could result in negative allocations in the BS subarea for one or more sectors.** This is because the BSAI allocation

by sector is established at final action and implemented through rulemaking, and would not vary by year. Each sector's percentage share of the AI ITAC also would be established in regulation. The actual allocation (in metric tons) would vary depending on the AI ITAC. **Thus, it is possible, depending on TAC fluctuations, that a sector could have an AI allocation that is greater (in mt) than its overall BSAI allocation.** If the Council wants to provide for this concern, the following language could potentially be added under Alternative 4:

> ***If, in a particular year, the AI allocation to a sector is greater than the BSAI allocation to that sector, set the sector's AI allocation equal to the sector's BSAI allocation and set the BS allocation equal to zero. All other sector AI allocations would be adjusted (increased) proportionately to allocate the full AI ITAC.***

Also noted at the April 2006 Council meeting, Alternative 4 could result in sectors having no allocation in the Bering Sea, and all of the allocation in the Aleutian Islands. Recall from Table 1 that in many sectors, including the non-AFA trawl CV sector, the majority of the LLPs are endorsed only for the Bering Sea area. In the case of the non-AFA trawl CV sector, there are 50 valid LLPs, and only 6 have AI endorsements. Thus, selecting an allocation option that would result in no allocation in the Bering Sea could severely affect the ability of eligible vessels to continue participating in this sector for Pacific cod. While the tables indicate that other sectors, such as the smaller fixed gear sectors, could receive a relatively small BSAI allocation, there is less likely the possibility for a negative or zero BS allocation as a result of Alternative 4 since these sectors have taken very little of their overall harvest in the AI in 2002 and 2003.

In addition, the AI allocations would also be seasonally apportioned, resulting in extremely small AI seasonal allocations to some sectors. Thus, implementing BS and AI allocations for each of ten sectors of the Pacific cod fishery may be more difficult to manage than it appears on an aggregate gear level. However, in such case that (1) allocations are refined to four trawl sectors as opposed to the current two; (2) there exist relatively small allocations to most of the fixed gear sectors with the exception of the hook-and-line CP sector; and (3) seasonal apportionments of the AI allocations are implemented, the result is very small allocations to particular sectors (e.g., non-AFA trawl CV, <60' fixed gear, hook-and-line CV, and pot CP sectors). This effect is exacerbated as the overall BSAI TAC declines. **It is thus possible that some sector AI allocations will be so small that inseason management could not open a directed fishery.**

Overall, Alternative 4 is likely to be the more disruption to the BSAI Pacific cod fleet compared to Alternatives 2, but less disruptive than Alternative 3. This alternative, much like Alternative 3, would apportion Pacific cod into subarea and seasonal bins thus reducing the flexibility of the fleet. However, all options under Alternative 4 are based on a sector's AI harvest, so would be less disruptive to the fleet.

XI. Other Alternative Approaches

In April 2006, the Council received extensive public testimony recommending that additional alternatives be developed for allocation of BSAI Pacific cod if TAC area split. The alternatives described above are the original alternatives from Amendment 85 prior to April 2006. These alternatives are the most obvious, but they are not the only alternatives. For example, an alternative approach could be some variation of Alternatives 2 thru 4. One simple approach would be to combine Alternatives 3 and 4 in equal proportions. Half of the allocation would be based on the sector's catch history in the Aleutian Islands and the other half would be based on equal percentages of BS and AI subareas TACs. The results of this alternative approach are shown in Table 12. With the exception of the hook and line CV >60' sector, sector allocations under this alternative would be at the mid-point between Alternative 3 and

Alternative 4. The effects of this alternative would be to dampen any disproportional allocation a sector would receive under either Alternatives 3 or 4.

Table 20 AI and BS allocations for 50% of Alternatives 3 and 4

	AI Allocation			BI Allocation		
	Alt 3	Alt 4	50% Alt 3/ 50% Alt 4	Alt 3	Alt 4	50% Alt 3/ 50% Alt 4
<60 HAL/Pot CVs and Jig CVs	778	46	412	4,406	4,360	4,383
AFA Trawl CPs	526	803	665	2,980	2,177	2,579
Trawl CVs	5,054	9,581	7,317	28,638	19,058	23,848
Longline CPs	11,137	5,290	8,213	63,108	57,818	60,463
Longline CVs	46	43	44	259	217	238
Non-AFA Trawl CPs	3,064	6,307	4,686	17,364	11,058	14,211
Pot CPs	343	293	318	1,944	1,651	1,797
Pot CVs	1,921	505	1,213	10,885	10,380	10,633

Source: NPFMC database (Pcod tables Jan 07.xls)

Other alternatives could be some variation of the above approach or some entirely new approach. For example, it might be possible to design an alternative that would allocate Pacific cod for a sector or a group of sectors using one approach, while using another approach for the remaining sectors as long as the overall BSAI allocations were maintained and the percent allocated in each area summed to 100%. If changing TACs for one subarea or both are a factor, it might be possible to design an alternative approach that shifts subarea allocations based on changing subarea TACs. In the end, there are likely a myriad of different alternative approaches the Council could consider for apportioning BSAI Pacific cod sector allocations to the BS and AI subareas, so the Council might want to request public input on alternative approaches.

XII. Summary

In April 2006, the Council removed the action addressing the apportionment of BSAI Pacific cod sector allocations between BS and AI from Amendment 85 and initiated a new, separate analysis that examines alternative approaches to apportion the BSAI Pacific cod sector allocations between the BS and AI subareas. Each of the existing alternatives triggered concerns such that the Council agreed that additional analysis is warranted. This discussion paper provides information on the existing alternatives for apportionment of BSAI Pacific cod sector allocations between BS and AI, the historical background on this issue, and a summary of the impacts of each of the alternatives. At the October 2006 meeting, the Council could adopt additional alternatives for analysis and/or give notice to the public that additional alternatives should be developed.

In summary, none of the existing alternatives were a good solution to the problem. The concern with Alternative 1 is that it does not reflect recent historical catch by sector in the Aleutian Islands subarea. Although Alternative 2 provides the greatest flexibility for sectors and may be the easiest for NMFS in season management to monitor, the alternative risks creating a race for fish. Additionally, there is no gear specific seasonal apportionment by subarea, which is an area of concern for NMFS. Similar concerns exist for Alternative 3 since it is virtually the same as Alternative 1. Finally, Alternative 4, identified as the preliminary preferred alternative in February 2006, also has a couple areas of concern. One concern is that TAC fluctuations will have disproportionate impacts on sectors that are allocated the greatest percentage of the subarea with the declining TAC. A related concern is that some of the resulting AI sector allocations may not be large enough to open a directed fishery in the AI.

Other alternatives or options could be developed to apportion BSAI Pacific cod sector allocations between the BS and AI. If more flexibility for the sectors is needed, an approach similar to Alternative 2 would be more in order. An alternative that is more dynamic in relation to changing TAC for the BS and AI could be developed by including an apportionment methodology that shifts sector allocations between subareas depending on the relative TAC in each subarea. Alternatives or options based on catch history in one or both subareas could be developed to fit with any of the above alternative approaches similar to the alternative in Table 20.

BSAI Pacific cod: information supporting a regional management split into EBS and AI Pacific cod
Prepared by Sarah Gaichas and Kerim Aydin

In this paper, we summarize information relevant to the management of Pacific cod in the Eastern Bering Sea (EBS) and Aleutian Islands (AI) regions of the Bering Sea Aleutian Islands (BSAI) fishery management area. We present evidence of differences in exploitation rates between the EBS and AI, as well as recent work suggesting different population trajectories in the two areas. Finally, we provide analyses suggesting different ecological impacts of cod mortality in each ecosystem, which have been published in the 2007 BSAI SAFE.

Unequal exploitation rates (new information)
An unintentional effect of the BSAI wide Pacific cod TAC was a difference in exploitation rates for EBS and AI cod in 2007. Catches reported in the SAFE (Thompson et al. 2007) were 136,430 t in the EBS and 33,724 t in the AI and were complete through early October 2007. The assessment-estimated exploitable biomass of cod was 806,400 t in the EBS, and the AI estimate of exploitable biomass of 153,600 t was estimated in the assessment based on the assumption that the AI exploitable biomass should reflect the ratio of AI survey biomass to EBS survey biomass; 0.16. If this is correct, then the exploitation rate in the AI was 33,724 t / 153,600 t or 22% in 2007, while the EBS exploitation rate was 136,430 t / 806,400 t or 17% in 2007. The overall exploitation rate for the BSAI was 18% based on these numbers; therefore, statistics based on the BSAI are more representative of exploitation rates in the EBS than in the AI.

Different population trajectories (new information)
The BSAI Pacific cod SAFE models the EBS portion of the population only, and until recently, there was no separate population model for the AI portion of the population. Kinzey and Punt (in review) have developed an AI cod population model using AI data and an assessment framework developed at the AFSC (AMAK, developed by J. Ianelli). There are differences in the population trajectories estimated for each area. For example, the EBS cod stock was estimated to have been at a historic low in 1976, to have increased rapidly to a historic high in 1983-1985, and to have declined to an intermediate biomass and fluctuated within that range between the 1990s and 2000s (Figure 1; Thompson et al. 2007). In contrast, the AI cod stock was estimated to have been near a historic high in 1976, and has undergone a general decline since then with the exception of a small peak in the early 1990's (Figure 2; Kinzey and Punt in review). All AI model structures (both standard single species and experimental models including predation) suggest a decline in AI cod spawning biomass from the mid-1990's to the present, while the EBS model suggests a slight increase in spawning biomass from 1998-2003 with a decline since then.

Different ecosystem effects (summarized from 2007 SAFE)
The food web relationships of cod are different between the EBS and AI ecosystems, both due to spatial distribution and diet differences. Because the AI has a much smaller area of shelf relative to the EBS, the smaller survey biomass estimate of cod in this area translates into a higher density in tons per square kilometer relative to the density in the EBS (Figure 3, left panel). Cod have diverse diets in both ecosystems, but with important differences (Figure 4). Pollock account for 25% of cod diet in the EBS, and commercially important crab species such as snow crab (C. opilio) and tanner crab (C. bairdi) make up 9% of cod diets in the EBS, but less than 3% in the AI, reflecting the stronger benthic energy flow in the EBS. In contrast, pollock comprise less than 5% of AI cod diet, while Atka mackerel account for 15%. Squids make up over 6% of cod diets in the AI, but are very small proportions of diets in the EBS, reflecting the stronger pelagic energy flow in the AI. Myctophids are also found in cod diets only in the AI, reflecting the oceanic nature of the food web there. Fisheries are the most important predators of Pacific cod in both the AI and EBS (Figure 5). Simulated impacts of changing cod fishing mortality differ by ecosystem as well, with the impacts felt most strongly and with highest certainty in the AI ecosystem according to this analysis (Figure 6). In particular, limited diet data suggest an interaction between cod and (juvenile) sablefish in the AI that was not present in the EBS. The larger impact of cod mortality in the AI observed in these simulations is a combined result of different diet relationships and the higher biomass per unit area in the AI relative to the EBS; the

difference in fishery exploitation rates observed above was not included in the ecosystem simulation analysis. Therefore, it seems that the cod fishery in the AI should be managed separately from that in the EBS to ensure that any potential ecosystem effects of changing fishing mortality might be monitored at the appropriate scale.

References

Aydin, K., S. Gaichas, I. Ortiz, D. Kinzey, and N. Friday, 2007. A Comparison of the Bering Sea, Gulf of Alaska, and Aleutian Islands Large Marine Ecosystems Through Food Web Modeling. NOAA Tech Memo NMFS-AFSC-178. In press.

Kinzey, D., and A. Punt, in review. Multispecies and single species models of fish population dynamics: comparing parameter estimates. Submitted to Natural Resources Modeling.

Thompson, G., J. Ianelli, M. Dorn, D. Nichol, S. Gaichas, and K. Aydin, 2007. Chapter 2: Assessment of the Pacific Cod Stock in the Eastern Bering Sea and Aleutian Islands Area.

Figures

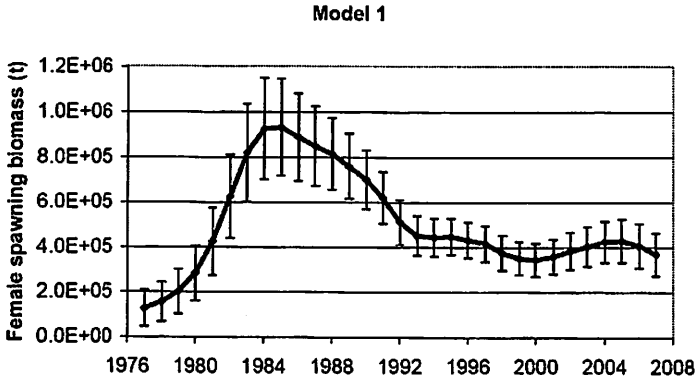


Figure 1. Model-estimated female spawning biomass (t) of Pacific cod in the EBS, reprinted from Thompson et al., 2007, Figure 2.3.

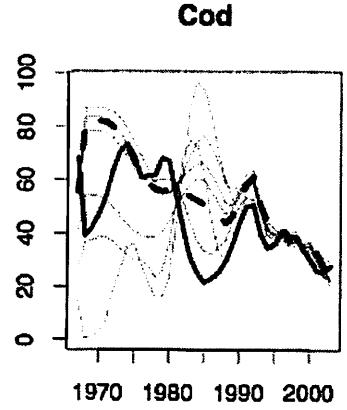


Figure 2. Model-estimated total spawning biomass (1000 t) of Pacific cod in the AI, reprinted from Kinzey and Punt, in review, Figure 4. The dashed bold line indicates the standard single species model run. The solid lines indicate multispecies model runs with predation included, with the bold line indicating the best fit of the multispecies models.

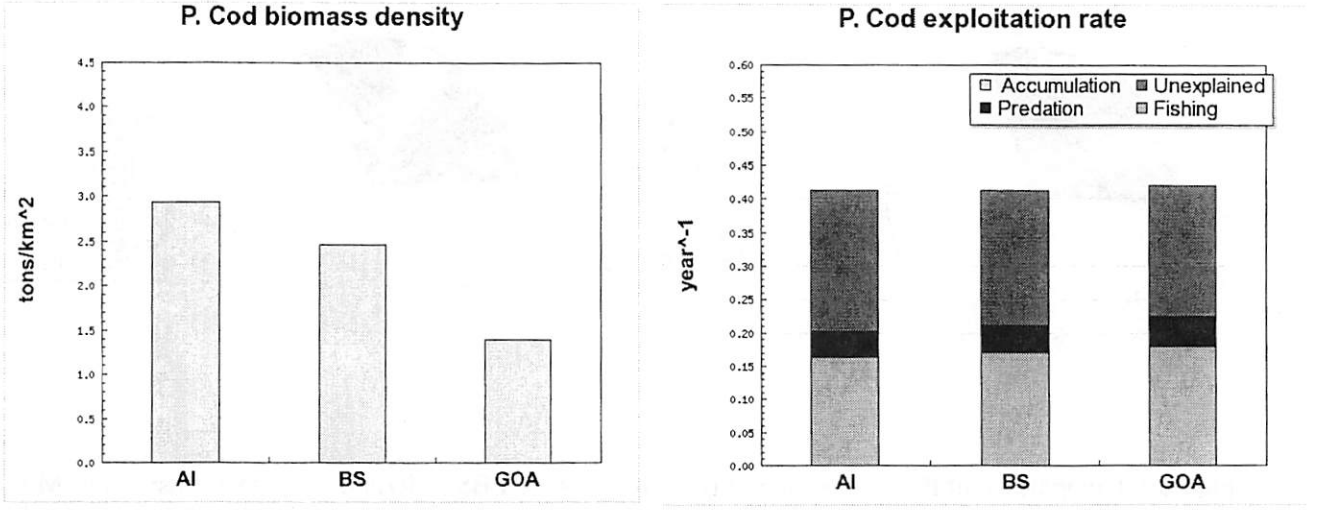


Figure 3. Comparative biomass density (left) and mortality sources (right) for Pacific cod in the AI, EBS, and GOA ecosystems. For the AI and GOA, biomass density (left) is the average biomass from early 1990s NMFS bottom trawl surveys divided by the total area surveyed. For the EBS, biomass density is the stock assessment estimated adult (age 3+) biomass for 1991 (Thompson and Dorn 2005) divided by the total area covered by the EBS bottom trawl survey. Total cod production (right) is derived from cod stock assessments for the early 1990's, and partitioned according to fishery catch data and predation mortality estimated from cod predator diet data (Aydin et al. 2007).

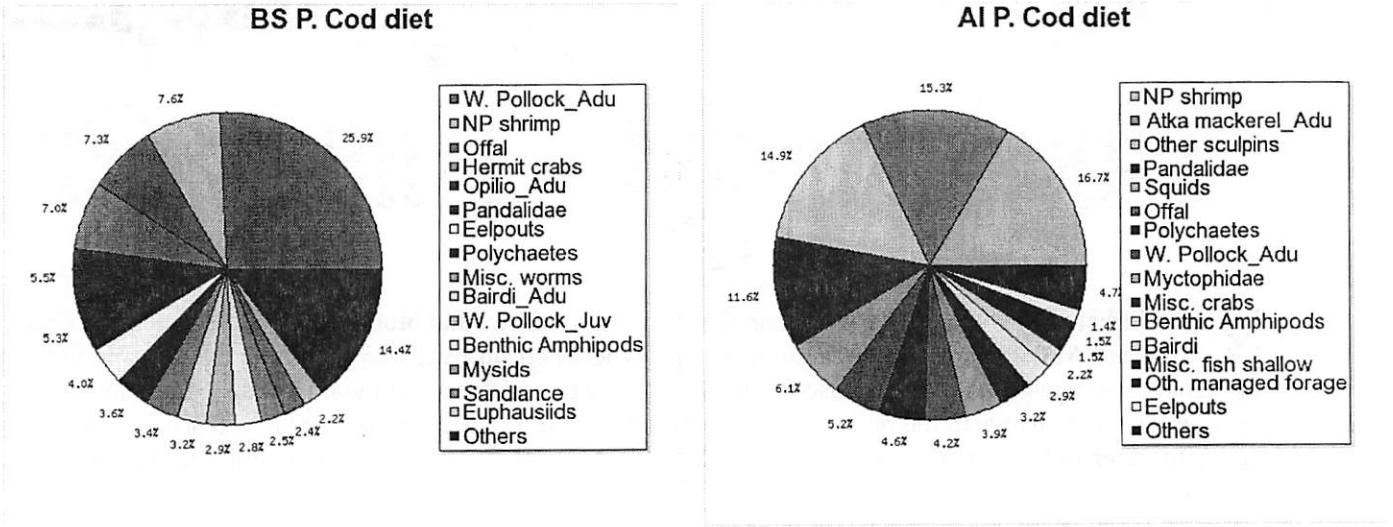


Figure 4. Comparison of Pacific cod diet compositions for the EBS (left) and AI (right) ecosystems. Diets are estimated from stomach collections taken aboard NMFS bottom trawl surveys in 1991 (EBS) and in 1991-1994 (AI).

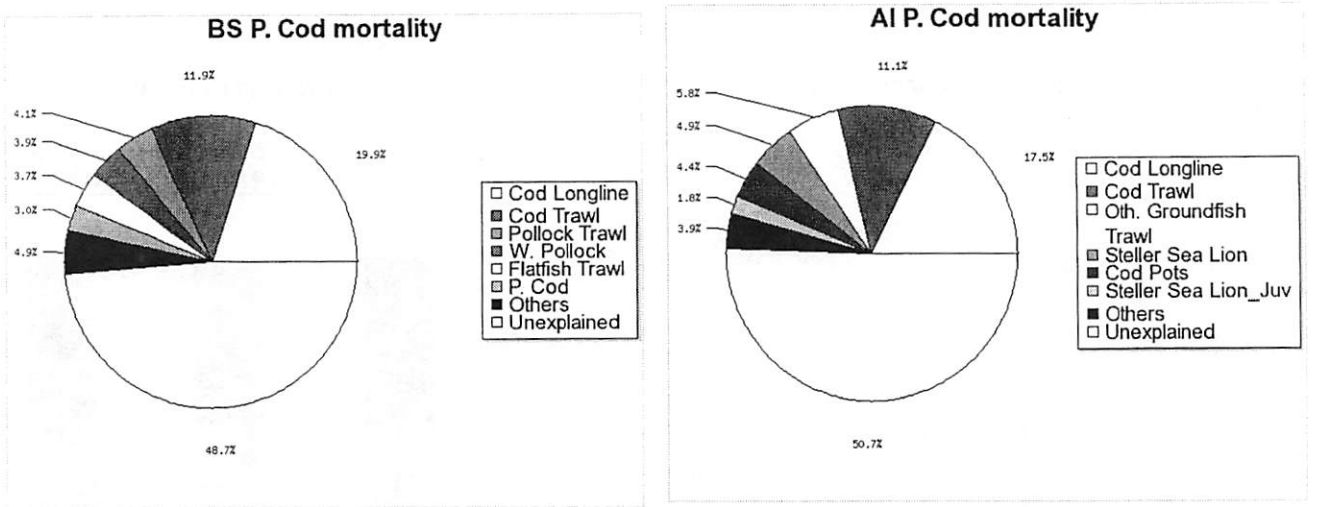


Figure 5. Comparison of Pacific cod mortality sources for the EBS (left) and AI (right) ecosystems. Mortality sources reflect cod predator diets estimated from stomach collections taken aboard NMFS bottom trawl surveys in 1991 (EBS) and in 1991-1994 (AI), cod predator consumption rates estimated from stock assessments and other studies, and catch of cod by all fisheries in the same time periods (Aydin et al. 2007).

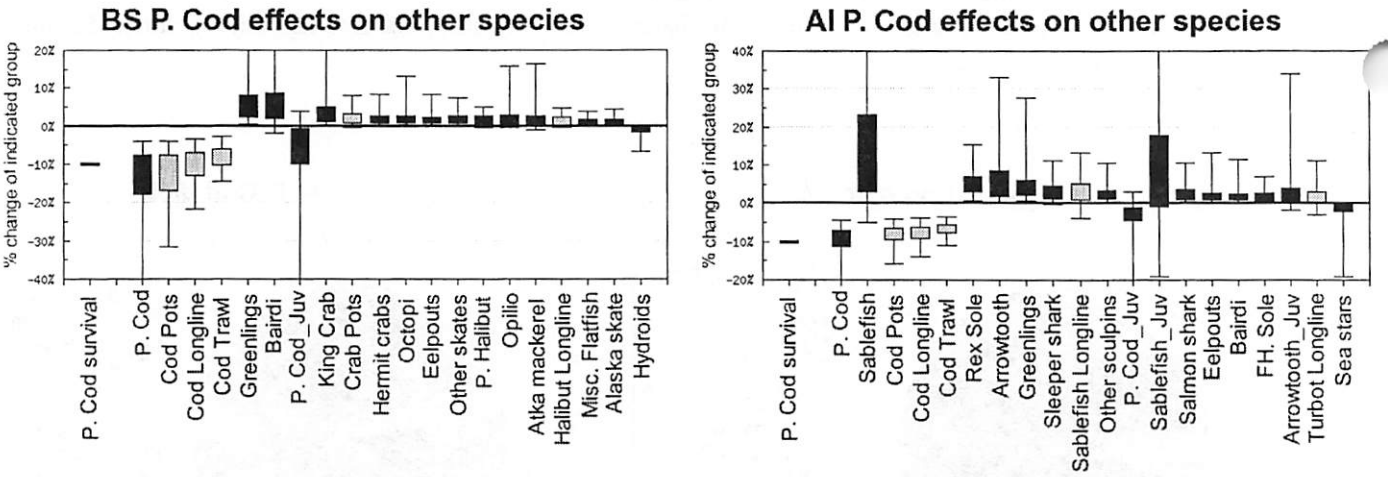


Figure 6. Effect of changing cod survival on fishery catch (yellow) and biomass of other species (dark red): EBS (left) and AI (right), from a simulation analysis where cod survival was decreased by 10% and the rest of the ecosystem adjusted to this decrease for 30 years. Note the differences in y-axis scale. Boxes show resulting percent change in the biomass of each species on the x axis after 30 years for 50% of feasible ecosystems, error bars show results for 95% of feasible ecosystems (see Aydin et al. 2007 for detailed methods).

Genetic survey of Pacific cod – Cunningham et al. (in preparation)

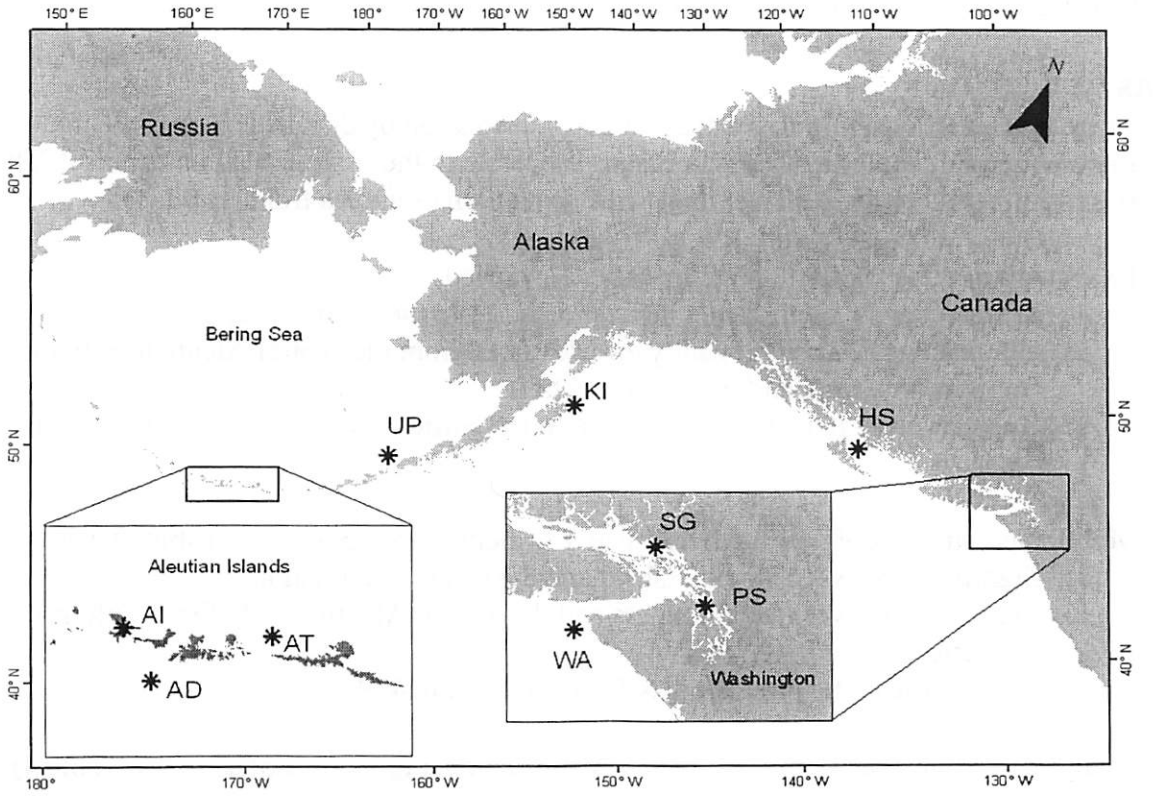


Figure 1. Adult cod sampled during spawning period at three locations in Alaska: Kodiak Island, Unimak Pass, and central Aleutian Islands

Table 1. Sample locations, abbreviations, numbers, and collection dates.

Sample Locations in Alaska	Abbreviation	Date	n
Adak Island	AD	3/2006	45
Central Aleutian Islands,	AI	2/2005	92
Atka Island	AT	4/2006	45
Unimak Pass	UP05	1/2005	87
Unimak Pass	UP03	1/2003	95
Kodiak Island	KI05	3/2005	106
Kodiak Island	KI03	3/2003	94

Methods

Genetic variation was screened at 11 microsatellite loci.

Results

- There was a highly significant pattern of genetic isolation by distance among coastal samples across the North American range (WA State to the central Aleutian Islands). The regression relationship is similar and significant among samples from Alaska (Fig. 2).

- Exact tests of genetic differentiation (Table 2) showed:
    1. Kodiak Is. was significantly differentiated from the central Aleutian Is.
    2. Unimak Pass was significantly differentiated from the central Aleutian Is. before Bonferroni correction for multiple tests.
    3. Kodiak Island and Unimak Pass were not significantly differentiated from each other.

- Multilocus estimates of genetic divergence, F_{ST}, between sample pairs (Table 3) were:
    1. Significant between Kodiak Island and the central Aleutian Is.
    2. Significant between Unimak Pass and the central Aleutian Is. before Bonferroni correction for multiple tests.
    3. Not significant between Kodiak Island and Unimak Pass

- Analysis of Molecular Variance (AMOVA) for regional groupings of samples (Table 4) showed:
    1. Pooling Unimak Pass and central Aleutian Is. samples as a group resulted in a significant between-sample variance component for that group and an insignificant between-group variance when compared with Kodiak Is.
    2. Pooling Unimak Pass and Kodiak Is. samples as a group resulted in the highest overall F_{ST} value, no significant between-sample variance component for the group, and a significant between-group variance when compared with the central Aleutian Is.

Conclusions

Spatial genetic heterogeneity indicative of restricted gene flow was observed in a limited number of samples from Alaska. The analyses infer that sampled populations along the (nearly) continguous Alaska Peninsula (Kodiak Is. and Unimak Pass) are not genetically distinct from each other but are differentiated from those in the Aleutian Is.. The Aleutian archipelago, particularly deep-water passes, may present barriers to adult movements, restricting gene flow with the relatively homogeneous environments of the eastern Bering Sea. Additional sampling across these passes would be required to address this hypothesis and some are available (Table 5).

Supplementary materials

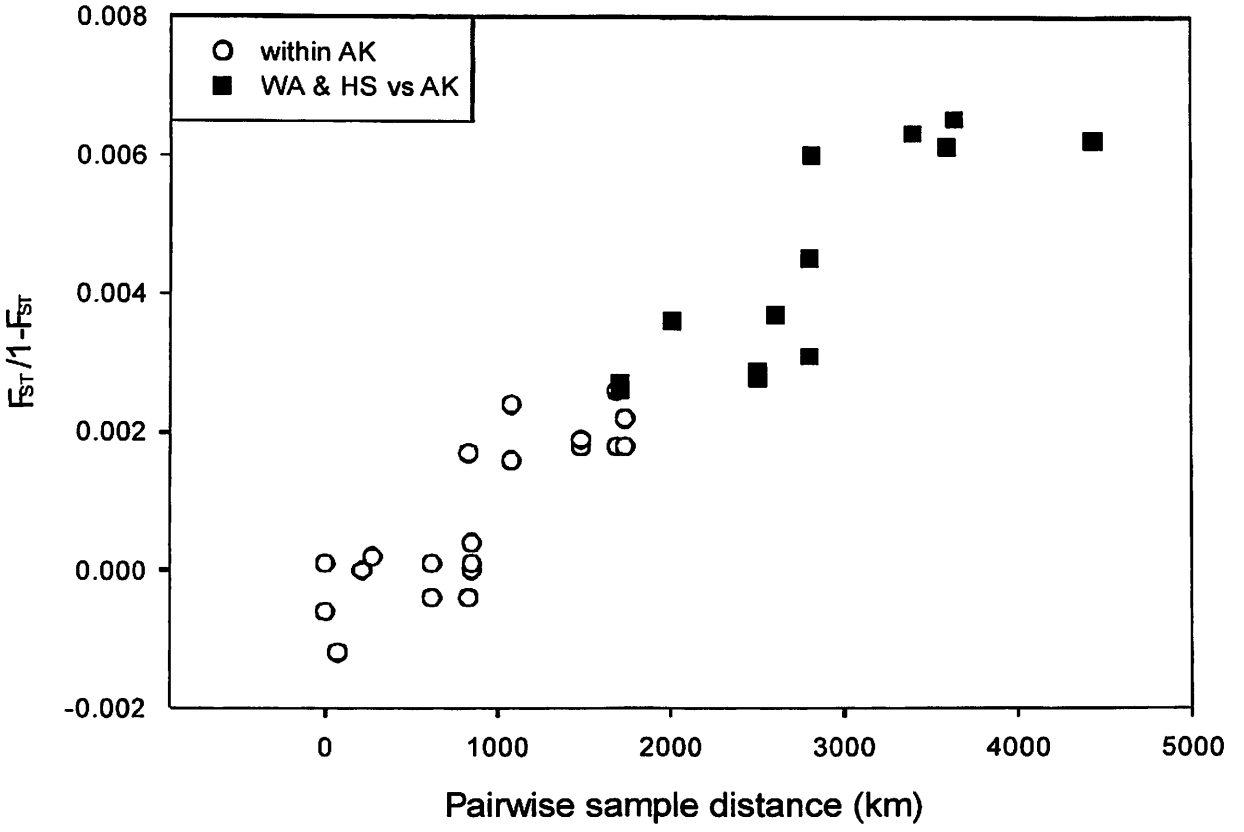


Figure 2. Genetic distance versus geographic distance between sample pairs from coastal North America. Abbreviations WA, HS, and AK refer to samples from coastal Washington State, Hecate Strait, BC, and Alaska, respectively.

Table 2. Probability (*P*) values for exact tests of allelic (above diagonal) and genotypic (below diagonal) tests of samples pooled over years within locations. Bolded values are significant at $\alpha = 0.05$ after sequential Bonferroni correction for multiple tests. * significant prior to correction for multiple tests. AI, central Aleutian Islands; UP, Unimak Pass, KI, Kodiak Island

	AI	UP	KI
AI	---	**0.0050**	**0.0000**
UP	0.0138*	---	0.3402
KI	**<0.0001**	0.5213	---

Table 3. Estimates of F_{ST} between sample pairs in Alaska. Bolded values are significant after sequential Bonferroni correction for multiple tests. * significant prior to correction for multiple tests. Abbreviations as in Table 2.

	AI	UP	KI
AI		0.0012*	**0.0023**
UP			0.0004

Table 4. Variance components and associated probability (*P*) values from Analysis of Molecular Variance (AMOVA) for hypothesized population groupings of Pacific cod. F_{SC} – variance of samples between groups; F_{CT} – variance of samples within group. Bolded estimates are significant.

Grouping Scheme	n groups	F_{SC}	*P*	F_{CT}	*P*
AI&UP vs. KI	2	**0.0011**	0.00456	0.0002	0.3379
AI vs UP&KI	2	0.0003	0.20238	**0.0014**	< 0.0001

Table 5. Unprocessed Pacific cod samples available for genetic analysis.

Location	Sampling dates	Lat	Long	n
Central Aleutian Islands	3/20/2007	52°00'N	176° 00' W	96
Central Aleutian Islands	3/8/2007	51° 97'N	174° 38' W	96
Central Aleutian Islands	2/26/2007	52° 28'N	173° 69' W	81
Central Aleutian Islands	2/27/2006	52° 42'N	173° 80' W	96
Central Aleutian Islands	3/30/2007	51° 87'N	175° 67' W	96
Near Islands	2/23/2005-3/7/2005	52° 50'N	174 ° 00'E	200+
Kiska Island	3/8/05-3/10/05	51°8N	177°.7E	100
Amchitka Island	2/22/2005	52°.3N	179°.8W	25
Tanaga Island	3/12/2005	51°.7N	178°.2W	100
Great Siskin Island	3/13/2005	52°.7N	175°.9W	100
Amchitka Island	summer 2003	51°.3N	178°.6W	200

Reproductive potential and egg fatty acid composition of Pacific cod from the western Aleutian Islands and the eastern Bering Sea

Report to the Science and Statistical Committee, North Pacific Fishery Management Council

Olav A. Ormseth, Alaska Fisheries Science Center
January 14, 2008

This report contains a brief summary of recent findings regarding the reproductive biology of female Pacific cod in the western Aleutian Islands (AI) and the eastern Bering Sea (EBS; Figure 1). Two aspects of reproduction were investigated: 1) maternal size effects on reproductive potential and 2) maternal size and geographic area effects on the fatty acid composition of eggs.

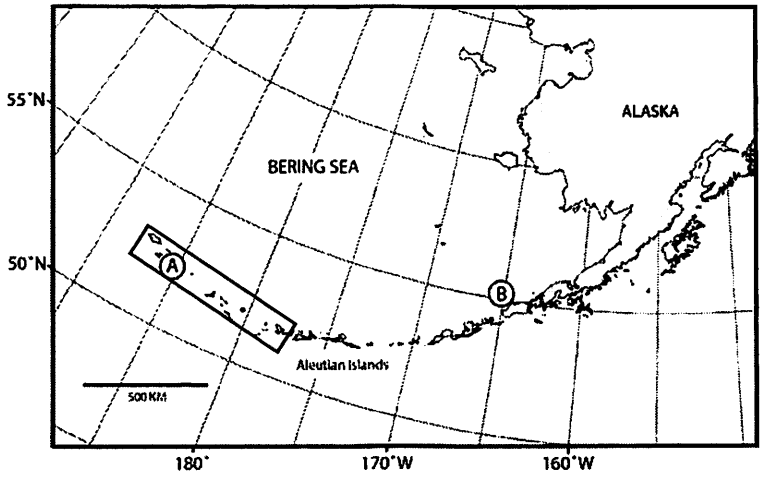


Figure 1. Sampling locations for studies of Pacific reproductive biology. Samples for egg fatty acid analysis were collected from the western AI in the Near Islands (A) and from the eastern Bering Sea north of Unimak Island (B). Samples for determining reproductive potential were collected throughout the western AI (box surrounding A) and from the eastern Bering Sea north of Unimak Island (B).

Reproductive potential

Total gonad (ovary) weight was used as a proxy for reproductive potential, which comprises fecundity and egg size, for samples collected from the AI (N = 137) and EBS (N = 44) in 2005. Reproductive potential increased approximately with the cube of the length, and this relationship did not differ between the AI and EBS (Figure 2A; $F = 0.71$, $p = 0.4918$). However, females from the two areas achieved equivalent reproductive potential through different means. Fecundity at length was slightly greater in the EBS (Figure 2B; $F = 8.50$, $p = 0.0003$), while average egg size (as measured by dry weight) was slightly greater in the AI (AI = 0.103 ± 0.001 mg, EBS = 0.097 ± 0.002 mg; $F = 10.87$, $p = 0.0012$). While differences in fecundity and egg size were significant, they were quite small and may not be biologically relevant.

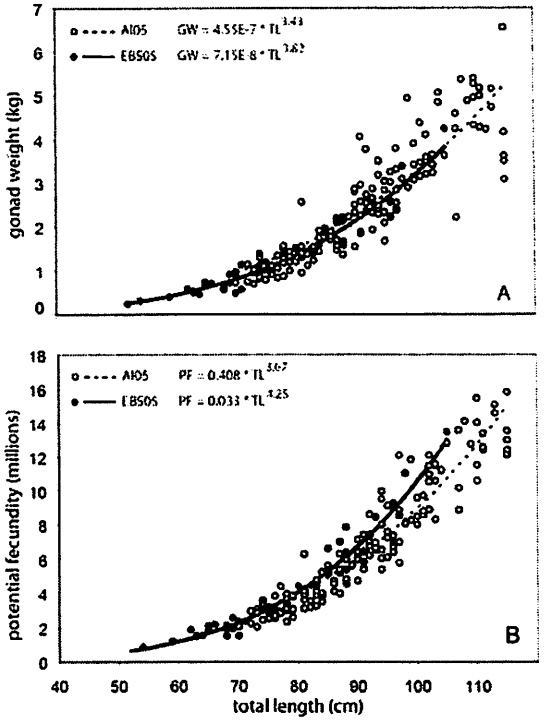


Figure 2. Effect of maternal total length on (A) gonad weight and (B) potential fecundity of female Pacific cod from the AI and EBS. Sample size: AI = 137, EBS = 44.

Fatty acid composition

The composition of fatty acids in fish egg lipids may affect hatching success and larval survival. In addition, fatty acid composition has been used to discriminate among genetically distinct stocks of several marine fish species as well as lobsters (Castell et al. 1994, Joensen and Grahl-Nielsen 2004, Joensen et al. 2000, Pickova et al. 1997). While fatty acid composition of lipids is influenced by diet, this appears to occur mainly in the neutral lipids, which are used as a source of energy. The fatty acid composition of polar lipids, which are used primarily as structural components and hormone precursors, is thought to be highly regulated and less influenced by diet (Pickova et al. 1997). As a result, differences in polar-lipid fatty acid composition may reflect local adaptation and genetic differentiation among stocks.

I compared the fatty acid composition of eggs collected from the EBS in 2004 (N = 7) and the AI in 2005 (N= 21). All eggs were collected from females in spawning condition. Fatty acid analysis of the polar lipids was performed by a commercial laboratory. Principal component analysis (PCA) was used to separate individual females according to 1) a full set of 23 fatty acids and 2) a subset of 8 fatty acids that have been shown to affect egg quality. In both cases, there was a clear separation between the eggs of females from the AI and EBS, with the exception of one sample that was intermediate to the two main groups (Figure 3).

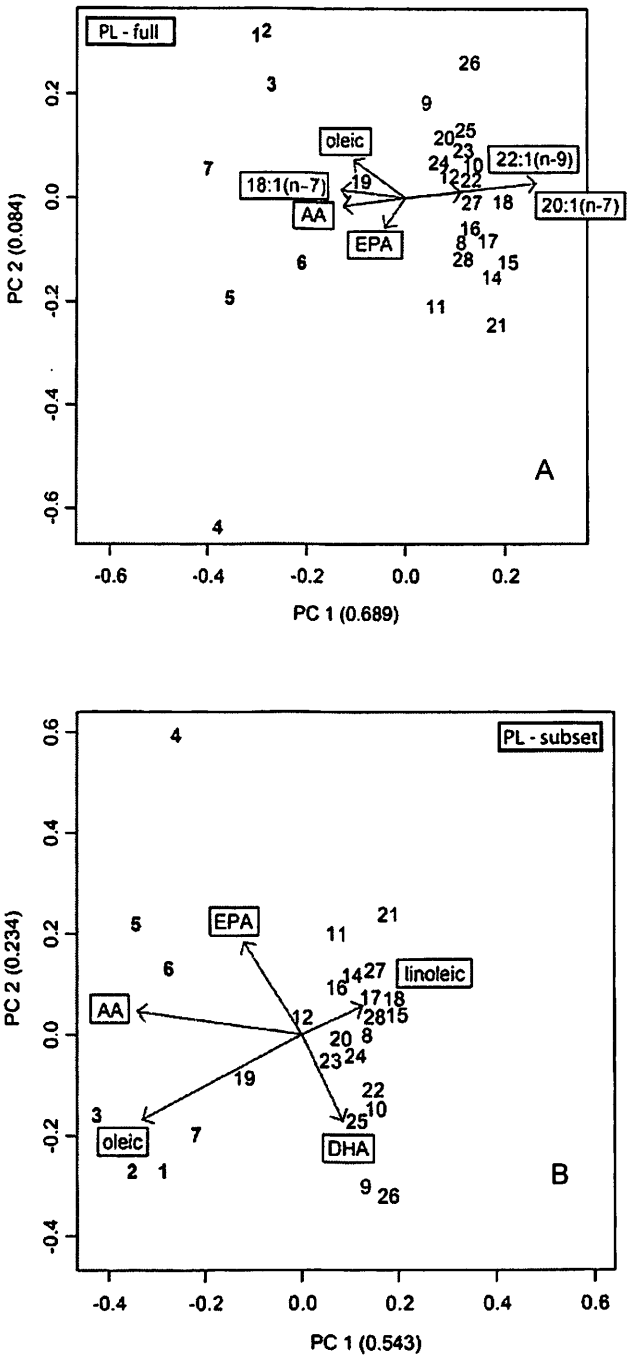


Figure 3. Principal component (PC) analysis for fatty acid (FA) composition in the polar lipids (PL) of Pacific cod eggs, using (A) all polyunsaturated FAs (PUFAs) and any FA contributing more than 1% of the total FA pool and (B) only the subset of FAs of potential importance to egg quality. Values following each axis label are the proportions of variability in the dataset explained by each of the first 2 two PCs. Numbers 1-7 (bold) are EBS samples; numbers 8–28 are AI samples. Text boxes indicate the four most important FAs in the first PC and the two most important FAs in the second PC. Length of arrows indicates the relative contribution of that FA in forming the PCs. Direction of arrows indicates the relative contribution of that FA to each of the two PCs. AA = arachidonic acid, EPA = eicosapentaenoic acid, DHA = docosahexaenoic acid .

This analysis of area effects on FA composition is complicated by maternal length effects on several fatty acids and size differences of sampled females from the AI and EBS. The fractions of three fatty acids in the polar lipids were related to maternal total length: linoleic acid (R^2 = 0.63, p = 0.0001), α-linolenic acid (R^2 = 0.38, p = 0.0051), and arachidonic acid (AA; R^2 = 0.26, p = 0.0242). Regression analysis was conducted for only the eggs from the AI (Figure 4; only the results for AA are shown). Because the female cod from the EBS were smaller than those in the AI, maternal length effects could confound the analysis of area effects. For example, EBS eggs have higher AA content, smaller females have higher AA content, and the EBS females we collected were on average smaller, so it is possible that area-related variability in AA is the result of area-related size differences. In addition, neither the AI or the EBS sample sets includes the full size spectrum of female cod in each area.

Despite age and size differences between the EBS and AI and the incomplete representation of EBS and AI cod populations, there are several reasons why I believe that area differences in FA composition are due to either diet or adaptation and not maternal size. The best evidence for this conclusion is the separation of samples by the various PCAs. Separation into area groups is very distinct, and despite overlap in female size between the two areas (Figure 4) there is no overlap between the two areas in the PCA. The range of size-related variability in AA within the AI samples is also much smaller than the difference in AA between areas. Finally, several of the FAs that differed between areas (e.g. oleic acid) were not related to maternal length.

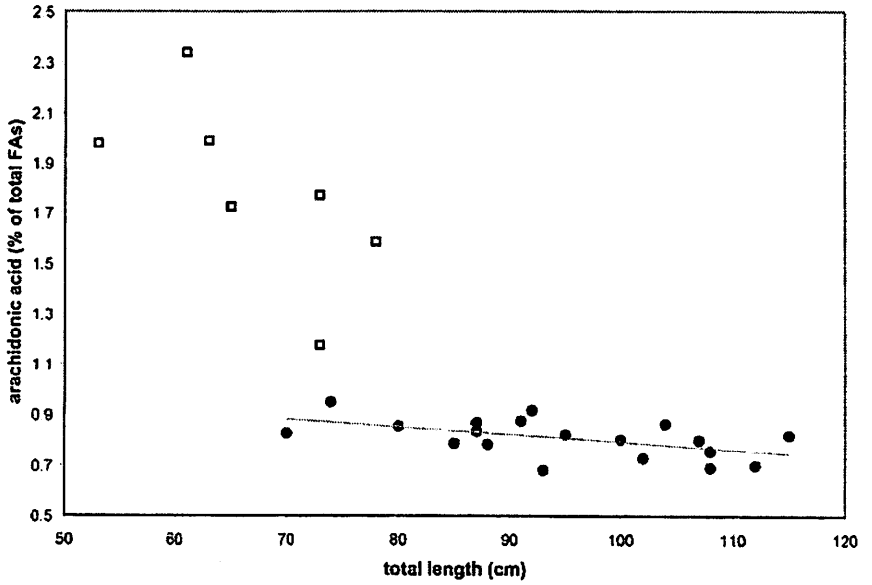


Figure 4. Maternal total length versus arachidonic acid (AA), 20:4(n-6), content of polar lipids from Pacific cod eggs. Data are shown as % of total fatty acid pool in that lipid class. Open squares, EBS; solid circles, AI. Line is the result of least-squares linear regression.

References

Castell, J. D., L. D. Boston, R. J. Miller, and T. Kenchington. 1994. The potential identification of the geographic origin of lobster eggs from various wild stocks based on fatty acid composition. Canadian Journal of Fisheries and Aquatic Sciences 52:1135-1140.

Joenson, H., and O. Grahl-Nielsen. 2004. Stock structure of Sebastes mentella in the North Atlantic revealed by chemometry of the fatty acid profile in the heart tissue. ICES Journal of Marine Science 61:113-126.

Joenson, H., P. Steingrund, I. Fjallstein, and O. Grahl-Nielsen. 2000. Discrimination between two reared stocks of cod (Gadus morhua) from the Faroe Islands by chemometry of the fatty acid composition in the heart tissue. Marine Biology 136:573-580.

Pickova, J., P. C. Dutta, P.-O. Larsson, and A. Kiessling. 1997. Early embryonic cleavage pattern, hatching success, and egg-lipid fatty acid composition: comparison between two cod (Gadus morhua) stocks. Canadian Journal of Fisheries and Aquatic Sciences 54:2410-2416.

Excerpt from July 2007 CIE review of AFSC flatfish stock assessments

Executive summary of findings

The Alaska Fisheries Science Center (AFSC) requested a peer review of the Gulf of Alaska and Bering Sea/Aleutian Islands flatfish stock assessments by the Center for Independent Experts (CIE). The review covered the assessments of arrowtooth flounder (Atheresthes stomias) and rex sole (Errex zachirus) in the Gulf of Alaska, and Greenland turbot (Reinhardtius hippoglossoides), northern rock sole (Lepidopsetta polyxystra) and yellowfin sole (Limanda aspera) as examples of the types of approaches and methodologies that are conducted by the BSAI and GOA Groundfish Plan Teams. These stock assessments have never undergone outside review and such review is timely given that the North Pacific Fisheries Management Council is likely to pass new amendments for the flatfish fisheries. Three reviewers, Drs. Din Chen, Paul Medley and Graham Pilling, constituted the Review Panel which was convened during June 11-14th 2007 in Seattle, Washington, at the NMFS Alaska Fisheries Science Center. The reviewers were given three Terms of Reference that included:

TOR1 1. Modeling efforts for Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) flatfish assessments and harvest recommendations. Specifically, the review shall evaluate: a) The analysts' use of fishery dependent and fishery independent data sources in the assessments; b) Gaps or inconsistencies in the population dynamics modeling methodology or logic; c) If uncertainties in assessment model results are appropriately applied to management advice; and d) Whether the assessments provide the best available science.

TOR 2. The effort to incorporate ecosystem indicators and shifts in states of nature in the assessments. These include modeling survey catchability with annual bottom water temperature and using the Ocean Surface Current Simulation Models (OSCURS) to define putative oceanic productivity regimes.

TOR 3. The harvest control rules adopted for Bering Sea yellowfin sole and northern rock sole (where a stock-recruitment model and FMSY quantities are estimated) compared to other flatfish stocks where proxy values are used. Specifically, comments on the trade-offs between the different approaches are required.

There was consensus that the modeling for BSAI and GOA flatfish assessments and harvest recommendations were appropriate given the available data and provided the best scientific advice.

Under TOR 1, the reviewers all felt that the fisheries-independent trawl survey provided reasonable estimates of abundance, given that it was not designed for that purpose, and also that the sablefish longline survey also provided a reasonable index for Greenland turbot. They were concerned that budget constraints might imperil data collection, specifically on the Bering Sea slope.

For fishery-dependent data, they noted that there was a long time series which is supplemented well by observer coverage. All three reviewers noted that catch data was reliable for flatfish, with the exception of Greenland turbot. Because of the observer program, they felt that discards and by-catch were also well recorded. Their concern with the fishery-dependent data was based on the migration of Greenland turbot between U.S. and Russian waters and the potential for evaluating only a portion of the stock, which would lead to a miss-estimation of stock biomass.

[1] TOR =Terms of Reference

There was also consensus among the reviewers that the models being used were appropriate. These models include AD Model Builder and SS2. However, the spatial extent and potential migration of Greenland turbot made these models less reliable for that species. The reviewers also were concerned with the use of a single sex model for yellowfin sole. Because there are considerable sexual differences in size that can result in mortality differences, the reviewers thought that a two-sex model would be more appropriate. The reviewers agreed that uncertainty was handled appropriately in the models because assessment scientists are using AD Model Builder with MCMC bootstrapping. However, the reviewers also thought that there need to be further work in this area and more formal procedures to include uncertainty in recommendations.

Altogether, the reviewers stated that the assessments generally provided the best available science and Dr Pilling noted that "the work performed is impressive."

Under TOR 2, the reviewers discussed the various modeling approaches that could support ecosystem-based management for BSAI and GOA flatfish. They specifically addressed the application of Ecopath with Ecosim (EwE); modeling of bottom temperature effects on selectivity, distribution, growth, and fecundity; Ocean Surface Current Simulation Models (OSCURS). There was consensus among the reviewers that the use of EwE was worthwhile because it pointed out the importance of the flatfish community in the ecosystem. However, they also noted that they expected that there would be limitations with EwE because flatfish are data poor and that other models should be developed, e.g. "Atlantis".

The reviewers did have more comments on the models that related temperature to factors such as selectivity, but generally agreed that this modeling was worthwhile. They suggested various approaches to improve these models, including 1) examining the indirect effects of temperature on the distribution of fishing fleets as relates to stock abundance, and 2) developing formulations that were related to metabolic theory.

All three reviewers commented on the value of using OSCURS to model productivity. The liked the fact that the model had been validated and saw the larval dispersal model as an interesting scientific study. However, they also noted the inherent difficulties in predicting the abundance of adults from early life stages, and thought
that modeling post-settlement stages would provide greater predictive value. The reviewers comments were rich in detail and their reports are attached as appendices.

For TOR3, the reviewers were again largely in agreement that the tier system should be simplified. The North Pacific Fisheries Management Council uses a 6-tier system where a stock is assigned to a tier based on the extent and quality of its data. The tier system was designed to allow greater exploitation as data on the stocks improves, and is a precautionary approach to management. Several reviewers commented on a lack of documentation defining the system clearly (but see Goodman et al 2002) and also thought that and that there was no substantive research to support the use of the definitions of F_{OLF} or F_{ABC} within each tier. The reviewers also agreed that BSAI yellowfin and rock soles had very reliable data and should be moved to tier 1. The other concern was the use of 0.2 as the value for natural mortality (M), The reviewers found evidence from other flatfish stocks that M could be lower than this and that species that used this assumed value should actually be classified as tier 6 not tier 4 or 5.

The review resulted in 32 recommendations. Of these two were endorsed by all three reviewers and include 1) that more research and effort should be made in the development of multispecies/ecosystem modeling and management, and 2) the 6-tier system for harvest controls should be simplified for flatfish. Besides these, there were 9 more recommendations endorsed by two of the reviewers. Care should be taken in interpreting the level of endorsement, given that each reviewer has their own writing style and if they were presented with the final list, they could all agree.

Excerpt from September 2007 Joint Groundfish Plan Team meeting *(revised)*:

Flatfish CIE review Tom Wilderbuer summarized the reviewer's comments from the flatfish CIE review that were released a week ago. The review covered the assessments of arrowtooth flounder and rex sole in the Gulf of Alaska and flathead sole, Greenland turbot, northern rock sole, and yellowfin sole in the BSAI. There was consensus that the modeling for BSAI and GOA flatfish assessments and harvest recommendations was appropriate given the available data and provided the best scientific advice. The reviewers provided 32 specific recommendations for the three terms of reference which encompassed the review. There has not been sufficient time for the AFSC to respond to the reviews. Plans were already underway to develop a split sex model for BSAI yellowfin sole in 2008, include more uncertainty in the projections (for many assessments), and multi-species modeling.

Wilderbuer asked if the teams had recommendations to prioritize the CIE recommendations for changes to the models. The teams felt that they did not have sufficient time to review the CIE recommendations so as to prioritize the recommendations, however, the teams did address some of the CIE recommendations. The teams discussed whether the lack of trawl survey coverage and the corresponding expansion of the trawlable area to the untrawlable area came up during the CIE review as it was an issue in the rockfish CIE reviews that is generic to other groundfish stocks. Wilderbuer responded that it did not come up. In response to a CIE recommendation, a team member discussed that there was no directed fishery on rex sole, so a fishery selectivity estimate could not be determined. One would not want to set TAC on a selectivity based on bycatch harvests. And while it is important to get correct age data, this is not key to the rex sole assessment. The team wondered if the CIE reviewers noted something specific to flatfishes in the recommendation for multi-species modeling for flatfish. Wilderbuer could not report on any specific CIE discussion on this issue. An industry representative questioned a recommendation that suggested using the fishery CPUE as an index of abundance in the face of potential survey budget reductions. He asked how one could tease out market effects on annual harvests. The teams concurred with Wilderbuer's response that he would not want to use CPUE to estimate abundance.

Some of the recommendations are equally applicable to all groundfish assessments, but without an AFSC response to guide the team members, no specific recommendations were made. The teams will keep them in mind during reviews of flatfish assessments in November 2007. The teams recommended that the Council request that the AFSC provide a written response to the CIE reviews and report to the Council at a future SSC meeting (possibly February 2008 in Seattle).

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