


Public Testimony Sign-Up Sheet

Agenda Item C4 (a)(b) crab overfishing

	NAME (PLEASE PRINT)	AFFILIATION
1	Tom Casey	Justice / (cont)
2	Frank Kelly	UNA Alaska
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NOTE to persons providing oral or written testimony to the Council: Section 307(1)(I) of the Magnuson-Stevens Fishery Conservation and Management Act prohibits any person "to knowingly and willfully submit to a Council, the Secretary, or the Governor of a State false information (including, but not limited to, false information regarding the capacity and extent to which a United State fish processor, on an annual basis, will process a portion of the optimum yield of a fishery that will be harvested by fishing vessels of the United States) regarding any matter that the Council, Secretary, or Governor is considering in the course of carrying out this Act.

MEMORANDUM

TO: Council, SSC and AP Members
FROM: Chris Oliver 
Executive Director
DATE: May 30, 2007
SUBJECT: BSAI Crab Management

ESTIMATED TIME 8 HOURS (all C-4 items)
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ACTION REQUIRED

- a) Receive reports from Crab Plan Team and PNCIAC
- b) Initial review of crab overfishing definitions analysis

BACKGROUND

a) Crab Plan Team and PNCIAC Reports.

The Crab Plan Team met at the Alaska Fisheries Science Center in Seattle, WA from May 22-24, 2007. The majority of the meeting involved a technical review of the initial review draft of the crab overfishing definitions analysis (proposed Amendment 24 to the BSAI Crab FMP). The report from the Crab Plan Team is attached as Item C-4(a)(1).

The Pacific Northwest Crab Industry Advisory Committee held a meeting on April 17th in Seattle, WA. The focus of this meeting was to discuss the analysis of the revised crab overfishing definitions. The report from PNCIAC is attached as Item C-4(a)(2). The chair of PNCIAC will be available to give this report.

b) Initial review of crab overfishing definitions analysis.

At this meeting, the Council will make an initial review of an analysis which evaluates proposed changes to the current overfishing definitions for BSAI crab stocks. The proposed action is to establish a set of overfishing levels (OFLs) that provide objective and measurable criteria for identifying when a BSAI crab fishery is overfished or when overfishing is occurring, in compliance with the Magnuson-Stevens Act. The BSAI crab FMP establishes a State/Federal cooperative management regime that defers crab fisheries management to the State of Alaska with Federal oversight. The Magnuson-Stevens Act requires that FMPs specify objective and measurable criteria for identifying when the fishery is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stock). The OFLs are a Category 1 measure in the FMP, and as such revisions to the OFLs require an FMP amendment.

Determinations of total allowable catches (TACs) and guideline harvest levels (GHLs) are a Category 2 management measure and are deferred to the State following the criteria in the FMP. Catch levels established by the State must be in compliance with OFLs established in the FMP to prevent overfishing. NMFS annually determines if catch levels exceed OFLs or if stocks are overfished or are undergoing overfishing. If either of these occurs, NMFS notifies the North Pacific Fishery Management Council (Council) and the Council has one year to develop an FMP amendment to end overfishing and the rebuild the stock.

The purpose of the proposed action is to establish status determination criteria in compliance with the Magnuson-Stevens Act and the national standard guidelines. The Council first took initial review of this analysis in February 2007. At that time, given extensive comments by the SSC, the Council requested that the analysis be revised for another initial review June 2007. Accordingly, the analysts have substantially revised the analysis. The structure of the alternatives has also been modified in response to comments and clarifications requested in February. There are now three alternatives with two different sets of options.

The three alternatives are summarized as follows:

- Alternative 1: (Status Quo)** Amendment 7 provided fixed values in the FMP for the status determination criteria: minimum stock size threshold (MSST), maximum sustainable yield (MSY), optimum yield (OY), and maximum fishing mortality threshold (MFMT) for the BSAI king and Tanner crab stocks.
- Alternative 2:** Tier system with five Tiers. The FMP amendment would specify the Tier system and a framework for annually assigning each crab stock to a Tier and for setting the OFLs (see Options 1 and 2). The Tier system with five Tiers would provide an OFL for all FMP stocks (see Options A and B).
- Alternative 3:** Tier system with six Tiers. The FMP amendment would specify the Tier system and a framework for annually assigning each crab stock to a Tier and for setting the OFLs (see Options 1 and 2). The Tier system with six Tiers would provide an OFL for stocks with sufficient catch history and, in Tier 6, set a default OFL of zero for those stocks with insufficient information from which to set an OFL, unless the SSC establishes an OFL based on the best available scientific information

The two sets of options are summarized as follows:

Options 1 and 2 provide options for the OFL setting and review process by which stocks would be annually assigned to Tier levels, the OFLs would be set, and the timing of the annual review process by the Crab Plan Team, Scientific and Statistical Committee, and Council.

- Option 1:** Council annually adopts OFLs. In June, the Council would adopt the final Tier level assignments and OFLs for each stock. OFLs would be determined based upon model estimates prior to the summer survey because the Council would adopt the OFLs before the survey.
- Option 2:** Council annually reviews OFLs. OFLs would be calculated after the survey data are available in late August. The Council would review the status of the stocks, the OFLs, and the TACs in the Fall.

Options A and B provide options for the stocks managed under the FMP, and therefore, determine the stocks for which OFLs are required.

- Option A:** This option would remove eleven stocks from the FMP for which the State is interested in the conservation of management of the stock and there is no need for additional Federal management.
- Option B:** Status quo FMP species.

The analysis reviews the impacts on crab stocks, groundfish incidental catch limits for crab species, seabirds, marine mammals, threatened and endangered species and the economic impacts on participants in the crab fisheries. The executive summary of the EA is attached as Item C-4(b)(1). The full analysis was mailed to you on May 4th. An errata sheet for the analysis is attached as Item C-4(b)(2). This analysis is scheduled for initial review at this meeting.

Crab Plan Team Report

The Crab Plan Team convened their May meeting from May 22-24, 2007 at the Alaska Fisheries Science Center in Seattle, WA.

Members present included the following:

Forrest Bowers (ADF&G-Dutch Harbor), Chair
Ginny Eckert (UAF/UAS), Vice-Chair
Diana Stram (NPFMC)
Doug Pengilly (ADF&G-Kodiak)
Gretchen Harrington (NMFS-Juneau)
Wayne Donaldson(ADF&G-Kodiak)
Jack Turnock (NMFS/AFSC-Seattle)
Shareef Siddeek (ADF&G-Juneau)
Herman Savikko (ADF&G-Juneau)by phone
Lou Rugolo (NMFS/AFSC-Kodiak)
André Punt (Univ. Of Washington)
Bill Bechtol (UAF)

CPT member Josh Greenberg (UAF) was absent.

Members of the public (and state and agency staff) present for all or part of the meeting included: Tom Casey, Dick Powell, Linda Kozak, Florence Colburn, Rob Rogers, Doug Wells, Heather McCarty, Jack Tagart, Arni Thomson, Anne Hollowed (AFSC), Tony Allison, Einar Sorvik, Doug Woodby (ADF&G), David Barnard (ADF&G), Jie Zheng (ADF&G), Pat Livingston (AFSC), Margo Posten, Keith Colburn, Phil Hanson, Kevin Kaldestad, Steve Hughes, Lance Farr, John Boggs, Tom Suryan, Gordon Kristjanson.

The attached agenda was agreed upon for the meeting. However, due to the fact that the review of the crab overfishing definitions analysis took the majority of the allotted time for the three day meeting, the team was unable to address many of the items on this agenda. The agenda, which is attached as Appendix A, shows in strike-out format those items that the team was unable to address due to time constraints. To the extent possible these items will be included in the September 2007 CPT meeting agenda.

Discussions in this report have been reorganized from the order in which they were addressed in order to highlight those agenda items that the team was able to discuss. The remainder of the report (from page 3 on) contains the technical review comments by chapter of the crab overfishing definitions analysis.

New Membership

The team welcomed the participation of two new members: Dr. André Punt of the University of Washington and Ph.D. candidate Bill Bechtol of the University of Alaska-Juneau. These two members were solicited given their expertise in stock assessment and modeling (Punt) and crab biology (Bechtol). The team had previously noted that it would benefit from additional expertise in these two areas. The team also noted that the Lab Director position in Kodiak (NMFS RACE Division) previously held by Dr. Bob Otto has now been filled and the team looks forward to the participation of the new director, Dr. Bob Foy as a member of the CPT to fill the vacancy left by

Dr. Otto. The team anticipates that Dr. Foy will be available to participate beginning in the Fall of 2007.

Scheduling

The team tentatively scheduled their next two meetings for:

- (a) September 12-14, 2007.
- (b) May 6-8, 2008

The team also notes its intention per previous discussion to have all plan team meetings take place at the AFSC in Seattle, to the extent possible, noting that the cost for team member travel is similar to other areas while the ability to have additional staff and public participation by holding the meetings in Seattle is improved.

Annual Catch Limits and Accountability Measures

The team discussed the new MSRA requirements for all FMPs to include Annual Catch Limits (ACLs) and Accountability Measures (AMs) by 2010 (for overfished stocks) and 2011 (for all other stocks). The agency is compiling guidelines to be released regarding how ACLs are to be defined. This could have an impact on current crab management if the ACL is defined as a limit ($TAC < ACL < OFL$) rather than a target. How this is to be defined and what buffer may be necessary is still being determined. Other aspects for MSRA that could have an impact on crab management include how data-poor stocks are to be dealt with, as well as a mandated peer review process.

External review of stock assessment guidelines

At the request of the SSC, the team revised the external guidelines for stock assessment review in accordance with the timing and specific needs for crab management. The team suggests further revision of these guidelines if necessary following the results of the already-requested snow crab review. The adopted guidelines are attached as Appendix B.

Research Priorities

The research priorities approved by the SSC in 2006 were reviewed by the team. Understanding that the SSC will again review and modify this list at the June 2007 meeting, the team suggests the following changes to the approved list of crab research priorities:

Additions to the existing list:

- Index of abundance for Tier 5 and 6 stocks (methods for creating indices for unsurveyed stocks)
- Handling mortality estimates to provide accuracy to assessment models

Edits to existing list (numbered according to original list):

#1-Delete parenthetical referring to "(except BBRKC)"

#4- Reiterate priority for fertilized egg production index. Add to first sentence: "... contribution by males as a function of size, time post molt, and their distribution during the survey and fishery. The outcome of this exercise is to obtain a spawning index that could be utilized to estimate spawner recruit relationships."

Bering Sea Crab EFH measures considered by Council

The team was informed of measures under consideration by the Council in conjunction with Bering Sea Habitat Conservation. Understanding that the Council intends to take final action at the June 2007 meeting, the team took the following motion (unanimous):

The CPT recommends that the NPMFC carefully consider all available information on king and opilio crab abundance and location when developing the Bering Sea Habitat Conservation plan. The CPT supports studying this northern area to evaluate to what extent this area represents important crab habitat and the CPT supports studies on the impact of bottom trawling on crab habitat and stocks. Further, should the Council move forward with development of a Northern Research Area management plan, the CPT requests participation and consultation in the development of this plan as it relates to protection measures for crab habitat and an analysis of this in conjunction with existing crab bycatch limitation zones.

Review of Crab Overfishing Definitions analysis (Proposed amendment 24)

The team spent substantial time reviewing each chapter of the Initial Review draft of the Amendment 24 Environmental Assessment to revise the crab overfishing definitions. Comments below are organized according to chapter, with general comments on organization, revision across the Chapter (or document) listed first followed by page-specific revisions. Understanding that staff have already compiled an errata sheet to be distributed to the SSC at this meeting these corrections are not repeated here. Following a thorough review of the entire document, the team discussed the necessity of further CPT review and discussion of the analysis prior to Council final action. Accordingly, the CPT requests that the team have a chance to review the analysis in September prior to being released for the Public Review Draft.

Chapter 1 (Introduction):

Incorporate MSRA requirements as necessary into the purpose and need section of this chapter.

Chapter 2 (Description of alternatives)

In general and across the description of all of the alternatives, there is a need to be explicitly clear regarding what is being adopted specifically and what is being frameworked in this analysis. Eventually there should be a single summary table included in this chapter of stock, tier level, MMB, OFL.

The team clarified that for Tiers 1-3 the OFL will be for all removals (crab and non-directed fisheries). Previously it had been discussed that only the directed fishery F would be utilized as a benchmark for comparison with an annual review of landed catch for the determination of overfishing in conjunction with an annual review of whether the assumptions in the model with respect to discards and catch in other fisheries are still correctly specified. The application of the OFL has now been clarified to involve comparing the total catch (total for all crab fisheries, directed and non-directed as well as groundfish fisheries) annually with the OFL (from model simulations that include estimates of all losses) where the latter will include all removals for the stock. The ideal OFL for all Tiers will be all removals (crab and non-directed fisheries). However, for Tiers where a total catch OFL is not possible, a retained catch OFL will be used. Two notations are suggested for use in the analysis: C(OFL) to indicate total catch OFL and R(OFL) to indicate retained catch OFL.

General comment that needs to be clarified in the OFLs: how to address research takes within the OFL?

The team also discussed the potential risk of overfishing females as an unintended result of using MMB as the benchmark for determining overfishing. There is no current feedback to the relative catch of females.

Team members noted the potential difficulty in using separate models for OFL determination and TAC determination. There is an inherent need for consistency in parameterization and formulation between these models.

The document uses several units (millions of crabs, millions of lbs and thousands of tonnes), which can be confusing. Consistency in unit usage will make the document easier to follow.

Section 2.2.1:

Tiers 1-3:

The first paragraph should clarify that F_X is not based on the entire (e.g. male and female) spawning biomass, but rather on the proxy for fertilized egg production (for the analysis MMB).

Alpha and beta:

Explicit language should be added to the description of the alternatives and that of the control rule, with respect to how α and beta β are defined (what values, with what analytical basis). The analysis would benefit from additional justification for the values used in the analysis, as well as criteria for how these values are to be chosen. The sensitivity analysis does not indicate why the particular values used in the bulk of the analyses were chosen, but rather what happens when other values are used. The analysis cannot indicate why the values used in the analysis are more justifiable than other values as different values for α and β primarily lead to different trade-offs between the rate of recovery of overfished stocks and the catch during the rebuilding period. The choice of values for α and β will be primarily a policy call (with precedent in other NPFMC fisheries for this). Given that these values should ideally not change annually, some consideration should be given to hardwiring these into FMP or at the least indicate that they should not be annually modified. A figure should be included (perhaps in the methodology section) which demonstrates the different α and β scenarios that were evaluated in the analysis.

Tier 4 description:

The language describing Tier 4 should be clear that these are stocks for which there is no information on recruitment or ability to estimate spawner-recruit relationship.

Page 11: Revise first sentence to read: Tier 4 is for stocks where essential life-history information and understanding is lacking.”. Strike third sentence (“The most important parameter for Tier 4 is γ ”).

Page 12: Revise the wording at the top of the page re “gamma should never be set...”. This statement should not have such a strong language regarding “never” as this could be legally indefensible. This statement should be modified accordingly.

Table 2-3:

Note in table that in Tier 4, the value of M is a proxy.

Note in table (footnote) that $F_{35\%}$ is the default value “unless the SSC determines...”, i.e. this value is frameworked, but with an automatic default.

Tier 5 description:

Add description to the Tier 5 alternative that the ideal is that the OFL should be calculated based on total removals (i.e. all sources of non-natural mortality), and that the OFL shall apply to both

directed and non-directed fisheries. If there is no additional information available except for retained catch for OFL determination then this OFL will only apply to the directed fishery (i.e. the OFL under Tier 5 is only calculated based on retained catch and thus only applies to retained catch). Reliable discard data needs to exist over the time period for which the average catch OFL is calculated.

Section 2.2.2 Status Determination Criteria:

This section needs to be reorganized and clarified and needs to be very clear (but concise) how overfishing will be determined (specific steps) by Tier level. It needs subsections for SDC for each Tier, as the current description is for Tiers 2-3 only. There is also a need to include a sentence at the beginning of the section that F_{OFL} applies to a stock and not a fishery) and explain how this is determined. The CPT notes that there is difficulty in estimating non-directed fishery (crab) discards and the potential impact assuming (rather than estimating) these might have on the OFL. Additional consideration should be given to the timing of acquiring catch data in conjunction with the timing of overfishing determinations. This may not be possible within one year of fishing.

OFL is related to the total catch (i.e. all anthropogenic losses "count"). However, the analysis currently lacks clarity on the distinction between the retained catch and the overall total catch comprising the OFL. The analysis does not make it clear how overfishing is specifically determined and what the result of an overfishing determination would be.

Page 15: Second to last paragraph of section 2.2.2: Revise to ensure that non-directed fishery losses are also included in the listing here.

Tier 6 overfishing determination:

Tier 6 overfishing determination remains a major problem. The intention is not that in the absence of information $F_{OFL} = 0$ for all catch (and therefore any catch, including research catch and bycatch is overfishing). The description here needs to clarify that the determination of overfishing only applies to landed catch, including landed incidental catch. Scarlet king crab, which is retained as incidental catch in the AI golden king crab fishery, is an example where any retention would be overfishing unless a non-zero OFL is specified in advance of the season. Non-zero OFLs would be established for Tier 6 stocks in the annual OFL setting and review process according to Option 1 or Option 2. More information is necessary to highlight that a determination should be made regarding which stocks may have some retained catch so as to initiate the process of defining a non-zero OFL for those stocks within the annual review process. The team also had a prolonged discussion on the arbitrary nature of a Tier 6 determination and the potential for confusion between establishment of a meaningful OFL and that of setting a TAC (= 0). The CPT indicated a possible preliminary recommendation that Alt 2 and Option A may be preferable given the implications and problems with Tier 6 formulation. The CPT intends to revisit this discussion after technical review of the full analysis to indicate a preferred alternative.

This section must distinguish between "directed" as defined under Tier 6 as opposed to "directed" as used in discussions in all other sections. In most other sections of the document "directed fishery" is used to indicate "target fishery"

Timing of overfishing determination (2 considerations):

1. Retrospective to previous year's fishery: total catches (all losses) compared to OFL;
2. Hindcast: looking at whether or not the catch for year y exceeded the OFL defined for year y given the information for year y (which will include data for year y).

Additional problems were noted with establishing an OFL as a biomass when the information to implement a biomass-based OFL is not available (i.e. a reliable average-weight relationship to apply for a meaningful catch biomass-estimate for data poor stocks).

André presented a figure characterizing the process of analysis and application of the overfishing determination. A figure along the lines of that below should be included in the revised Chapter 2 to help clarify the simulation process and how (and when) this process interfaces with the stock status determination as well as at what stage (analytically) we move from MMB to total catch. This figure would need to be further modified to include the process of status determination for “overfished” status ($1/2 B_{MSY}$) as well in Year 0.

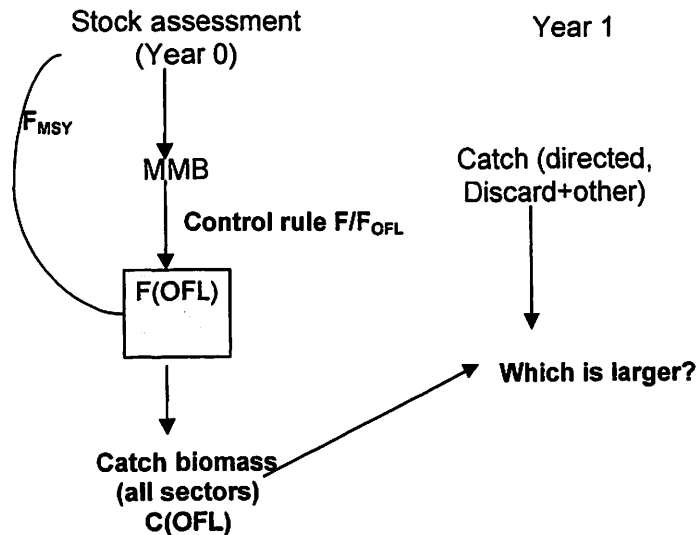


Table 2-8:

Add total removals to clarify that 06/07 F is for the directed fishery only, but that the OFL should include removals from other fisheries. Rearrange this table so it is clear what aspects are related to OFL determinations under alternative 1 (through $OFL(06)=SY$) and what is a separate cataloguing of “what happened” which includes TAC column and 06/07 F rate column. This table should be revised by analysts for presentation to the SSC in June for clarity. This table is intended to compare results across the six surveyed stocks only.

Section 2.7 Comparison of Options:

This section should be revised to include additional information currently contained in Chapter 12. It also needs clarification regarding the mechanics of how an OFL determination under option 1 vs option 2 would occur. It should be clarified that under option 1 CPUE data could also be used and that the situation exists for a potentially high OFL to be established June based on previous year’s data, but for the TAC to be much lower than the OFL if the survey result is much lower than anticipated from the model on which the OFL was based. A potential difficulty with Option 2 is that there is limited time for thorough review of model parameterization.

The analysis needs to clarify that under option 2, the SSC and Council are deciding upon Tier levels only, not that aspect of Tier determination that is dependant upon the stock biomass in comparison to its B_{msy} (or B_{msy} proxy). (e.g. Tier level 3 not Tier level 3a, 3b, 3c). The choice among “a”, “b” and “c” will depend on the outcome of the assessment. All tables and figures in section need CVs associated with them.

Table 2-7

add similar footnoting from this table to other tables as necessary to clarify what is frameworked in the alternatives.

Table 2-8

Make it clear that $\alpha = 0.1$ and $\beta = 0.25$

Page 23: Text needs to be extensively rewritten and revised for use in explaining specifics of Table 2-8.

Table 2-9

Add survey CVs. Also perhaps also include the survey estimates of total mature male biomass by year for comparison.

Tables 2-10 and 2-11:

It that not very clear in the text what information this imparts for deciding upon option 1 vs. option 2. There needs to be additional information to clarify this section and to explain how it relates to the choice of option. For example, the first column in Table 2-10 "estimated in terminal year" relates to option 2 while the second column relates to option 1. The remaining columns should be moved to a separate table as they relate to relative model precision rather than an analysis to determine the impact of choosing to use one year old data or awaiting the current year's data. This whole section should be rewritten to make it clear how this analysis (model-based estimates in terminal year vs. one year projection) related to the choice of options.

Options A and B:

This should be revised so that Option A can also apply to Alternative 3. While most stocks fall under Tier 6 (with default OFL for directed fishing =0), EAI is on the list of stocks for removal, and under alternative 3 (in the absence of option A) an OFL must be determined for this stock (Tier 4)

Chapter 3: Methodology

This chapter needs reorganization. The model description (Appendix A) should be checked to ensure that it is complete (and that all of the parameters in the remaining appendices are defined in Appendix A). Whether values for parameters (e.g. the extent of observation error) are assumed, appropriate justification must be provided. There needs to be additional information regarding how TMB is calculated. This methodology should be explicitly included.

Table 3.1

The listing of stocks by Tiers needs to be revised according to recommended changes for some stocks. The names of the stocks which are candidates for removals under option A should be shaded or highlighted in some other way.

Section 3.1:

The section needs reorganization. This section current addresses two issues: 1) why MMB was utilized and 2) how MMB is defined for simulations. The latter should be moved to a separate section related to the specifications of the simulation model. The MMB section needs to clearly specify why MMB is utilized rather than other measure of spawning biomass. Some of the discussion in this section is currently related primarily to specific Tier levels and is not general for all Tiers and alternatives. Additional information should be included in the appendices (B, C, D) regarding the parameters used to estimate MMB and the male component of biomass under TMB. The methodology section should specifically clarify what size classes and above are included in TMB to explain how it is estimated and the estimation of MMB for different stocks (one model, one survey) including the need for an estimated assumed maturity schedule. Note

that it may be necessary to go back to the amendment 7 analysis (or supporting analyses or clunker program output) for TMB information.

Section 3.2:

This section should be reorganized so its first section reviews the general simulation procedure (what the model simulates) while the next section clarifies how each Tier level is applied. Currently there is confusion between discussion of generic simulation procedure with implementation details for each Tier. It is difficult to ascertain which specification is applied to which model and Tier. Again it is necessary to cross check that the methodology section accurately represents the methodology employed in the simulation itself.

The results for the simulations for species with models should be expressed as a percentage of those for a "reference" management strategy (e.g. the Tier 2 management strategy) to the extent that this is meaningful as this will focus the interpretation of the results on differences among strategies rather than the outcomes in absolute terms.

Table 3.2:

Express the results in terms of the quantities in Table 3-4 (steepness and R_{max}).

Sections 3.2.6/4.3.2:

Sections discussing α and β need to be reorganized as outlined above. More detail is necessary here on what Fs were utilized.

Tier 4 methodology:

Some additional information should be added here regarding the general approach of excluding specific years for biomass estimation. The current approach seems somewhat arbitrary and it is desirable that there be consistent criteria. The rationale for the specific years to be excluded should be documented and the consequences of excluding these years should be evaluated. Note that the use of these γ values for species other than the ones for which they were calculated is an assumption thus text should be caveated accordingly. Subscript B_{msy} as $B_{msy\ prox}$ for improved clarity.

Table 3-6:

Delete this table as it is uninformative.

Page 38: AI golden king crab: Recommend to change wording to indicate that this species is likely move out of Tier 5, but the likely final Tier level is unknown at present.

Section 3.4: Tiers 5 and 6

This section should also be revised to split out methodology for simulation versus the specific application procedures implemented (as outlined above).

Tier 5 methodology:

Some team members expressed concern with the inconsistent approach used in selecting applicable years for the average catch estimate. Additional explanation should be added to indicate that this has been done to try to avoid biases of management actions (e.g. years fishery closed).

Tier 6 methodology:

Need to clarify information in text for all Tier 6 stocks for which a commissioners permit is established and exploratory fishing is likely to continue in the future. A Table should be included

in the Tier 6 impacts section for all stocks which would include fishery history (landings if not confidential) and years, to provide background information to ascertain what information is available for these stocks.

Page 39: Strike sentence "Since OFLs are set..." and replace with a clear explanation that no incidental harvest will be allowed for any species without an OFL under this alternative.

General comments for all species specific chapters and analysis

CVs should be added to all figures (and tables) with survey biomass estimates. There should be separate plots for biomass-related quantities (TMB, MMB, B_{MSY} , MSST, etc) and catch-related quantities (SY, OFL, etc.) and the current plots are too cluttered. When possible, survey TMB and estimated MMB should be included on the same plot for comparative purposes. In general, figures and tables (e.g. Table 4-1 and Figure 4-3) should have equivalent units for comparative purposes.

For impact analysis of model simulations, additional information is necessary to ascertain how trawl bycatch is included in the model and how the model-estimates compare with the historical data. For example, using tables of model-predicted bycatch of females, trawl etc in conjunction with the actual amounts of each. This information could be included in an Appendix. This information should be reviewed annually to assess to determine that model assumptions are appropriate. Additional information should also be added to the discussion of the $F = 0$ scenarios to clarify that the focus of these scenarios should be to evaluate relative rebuilding times not to characterize the allowable amount of trawl bycatch.

For sections where reference is made to a 75% target catch level, these statements should be revised. For Tier 5 species impact discussions where this target level was utilized to compare against the OFL, statements in the analysis need to be removed and revised such that each says "the current GHF is X% of the proposed OFL"

OFLs in terms of catch (either C(OFL) or R(OFL)) must be included explicitly for all stocks.

Chapter 4: Bristol Bay red king crab

Table 4-1:

Revise the label so it is clear that TMB is the area swept estimate at the time of the survey while the February 15 MMB is the model-derived estimate (discounted for natural mortality from the time of the survey). Revise to include both retained catch (R(OFL)) and total catch (C(OFL))

Table 4-1 should be reorganized so that it is clear that columns 1-4 relate to alternative 1 while the remaining columns relate to alternatives 2-3 and retained and total catch OFL values included. This table (and similar ones for Snow crab) should look like the following:

Year	Alternative 1					Alternative 2-3					
	Catch Retained	Catch Total	TMB	%BMSY	C(OFL) Retained	MMB (Feb 15)	MMB / Ref period	%B35	FOFL	C(OFL) Retained	C(OFL) Total

Other notes for inclusion on reorganized Table 4-1:

- Column currently labeled "TAC" should indicate catch
- Clarify that TMB is calculated directly from the survey results, but MMB is computed from the model.

Tables 4-4 through 4-7:

These Tables are difficult to interpret and should be revised to be more focused on pertinent policy level issues. All columns should be scaled to the Tier 2 column for relative impact clarity.

Section 4.3.1:

Paragraph beginning with "Annual determination.." need to be revised according to discussion under Chapter 2 regarding overfishing determination.

Page 45: The paragraph beginning "The change in currency.." needs to be extensively revised for clarity.

Figure 4-3:

The caption needs to be revised to indicate that Fofl in the figure is expressed as legal harvest rates. There is a need to have consistency between Table 4-1 and Figure 4-3 (different units on Figure 4-3 and Table 4-1).

Page 48: The sentence regarding trawl bycatch (over 100 years starting at B_{msy}) is misleading and should be deleted.

Tables 4-2, 4-3:

Need to re-label row indicating "Years fishery closed" as it relates to the $\beta=0$ scenarios (because with $\beta=0$ is no formal fishery closure). This row should be revised to indicate when catch = 0. A plot should be included which shows the control rules (α , β) evaluated in Tables 4-2, 4-3.

Table 4-8:

This table should include the uncertainty about the projection (e.g. similar to Table 5-9 for snow which includes 95% confidence intervals).

Norton Sound red king crab:

Need clarification in Norton Sound description as to data available: should note that trawl survey and pot survey data are available. Additional explanation should be added as to why the pot survey data is not reliable enough to use.

Pribilof red king crab:

The team noted that there is a shift in the perception of stock status from the previous draft as a result of the translation from number of crabs to MMB. This is due to number of large crabs observed (low in number but makes up larger proportion of biomass). This results in an improved stock status from the previous draft (albeit still below B_{msy}). Here stock status differs in alternatives 2 and 3 from alternative 1 and further explanation should be added to the document to clarify this. Including CVs of survey biomass estimates (as recommended previously in the report) will also help in interpreting the difference in stock status under the alternatives.

Page 57: Last sentence should be modified so that it does not mandate that γ will always be set based on Bristol Bay red king crab.

Page 58: Delete last sentence of second to last paragraph.

Dutch Harbor red king crab:

This stock should be included in the list of stocks under Option A for removal to state management based on meeting the listed criteria for inclusion in this option. This fishery has a survey conducted in state waters only; if opened in the future it would be likely to only be a fishery in state waters. Previous harvests have occurred in both state and federal waters, but the relative percentages are unknown. While this is a surveyed stock, the results from the survey are insufficient to estimate stock biomass. The CPT recommend that this stock be moved to Tier 5 under alternative 2 and that under alternative 3 this stock should fall into Tier 6 rather than Tier 4. Additional information should be included to explain why survey biomass estimates are insufficient to characterize this stock.

Adak red king crab:

Page 62: Remove last sentence.

Chapter 5: Snow Crab*Table 5-1*

needs to be updated (as the values given are wrong) and C(OFL) added. Additional table revisions are also necessary here as numbers are incorrect as shown. See comments regarding Table 4-1 revisions and suggestions for new format.

Page 68: The rationale for basing the selection of $F_{x\%}$ and the simulations on a range of steepness values that does not include the "best estimate" (Table 3-4) needs to be provided. Alternatively, Table 3-4 should be deleted if the "best estimate" is not considered reliable. The preference of the CPT is to include the "best estimate" in range as this estimate is lower than the lowest value considered in the analyses. The estimates SR curves for snow crab should be included in the document.

Section 5.2.3.1

Table 5-2 through 5-11 should be in 1000s of tons not just tons.

Tables 5-4 through 5-8:

These Tables are difficult to interpret and should be revised to be more focused on pertinent policy level issues. All columns should be scaled to the Tier 2 column for relative impact clarity.

Figure 5-3:

Showing the time-trajectories of catch and biomass would provide complementary information to that in the Tables.

Table 5-10/5-11:

These tables explore how the management strategies perform if handling mortality differs from that assumed in the other tables and that this is known. However, this analysis only explores where, given perfect information on handling mortality rates, an F_{MSY} control rule that is appropriate for the hypothetically known handling mortality rate can be determined. The problem is that handling mortality is not known and past discussions have highlighted a high degree of uncertainty in the true handling mortality rate. It does not explore how robust the control rule is to errors in estimating handling mortality when managing using, for example, an $F_{35\%}$ strategy. This could be explored by using $F_{35\%}$ defined for the reference value for handling mortality when handling mortality actually differs from the reference value. The simulations for the sensitivity analysis should provide an assessment of how a suite of possible true handling mortality rates can affect recruitment, total yield, retained yield, mature male biomass, mature female biomass, rebuilding time, percent of years below 50% of B_{MSY} and below 25% of B_{MSY} , etc when a control rule that assumes the base-value handling mortality rate is used.

Chapter 6 Tanner crab:

Some specific comments are made on the analysis as it currently stands. However after significant discussion of the model configuration, the fact that the model is for Bristol Bay only, and other information available for Tanner crab, it is the recommendation of the CPT that this section be substantially revised. The species should be evaluated under Tier 4. This would mean that the following additional stock status analyses be included and reviewed in the subsequent draft:

1. recalculate MMB for the whole area (survey based);
2. define γ for Tanner crab from assessment from the Tanner crab assessment for Bristol Bay;
3. calculate B_{MSY} from a defined range of years; and
4. calculate R(OFL) for the whole stock.

The current simulation results (Tables 6-5 though 6-8), although tailored for Bristol Bay, are useful in that they provide information relative to the performance of the Tier rules for a species with a biology similar to that of Tanner crab. However, the text needs to be much clearer that the analyses relate to Bristol Bay only.

The following specific comments should be addressed if the simulation analyses are to be retained

- Section 6.2.2 - strike this sentence as the steepness parameter fit refers back to chapter 3 but no information is available here to support this.
- Figure 6-3 - Given the data, neither of these curves are measurably better than the other.
- Table 6-4 needs to be revised to be similar to suggestions for Tables 4-1 and 5-1.
- Tables 6-5 to 6-8 descriptions need to be revised such that it is clear that assumptions of biological parameters for the Bristol Bay portion of the stock are applied to the whole stock.

The team further discussed the potential for a split OFL for Tanner crab, however, given the fact that the stock is considered to be one single stock at this time, a single OFL is specified. The team notes that further discussion of the potential stock split is contained in minutes of previous CPT meetings.

EAI Tanner crab:

The CPT was concerned with calculating B_{MSY} using the time period 1990-2006 which assumes that population was at B_{MSY} (roughly 40% of unfished state) over this period. Statements must be included in the analysis that indicates that some catch occurred before 1990 and that the biomass in recent years can reasonably be assumed to be close to B_{MSY} .

WAI Tanner:

The team discussed the rationale for the years (1985 – 1992) chosen for defined B_{MSY} for WAI Tanner crab. The CPT recommends that additional information be provide in support of these years (e.g. because these are the years when a fishery occurred).

Option A:

Discussion section focuses upon EAI as a state waters fishery. Need to add Eastern to description so it is clear that these statistics relate to EAI only. The CPT suggested that the text in this section also refer to WAI Tanner crab.

Chapter 7 Blue King Crab

St. Lawrence blue king crab:

Need to add some statements to effect that there is now some interest by CDQ groups to do some exploratory fishing on this stock. An OFL would need to be established in the OFL setting and review process for this to be possible. Some pot surveys have been conducted recently but reports have not yet been published.

Pribilof Blue king crab and St. Matthew blue king crab:

This section needs R(OFL) values for these stocks. Having a retained catch-only OFL could be a potentially difficult issue with stocks under rebuilding plans. The rebuilding plans will likely need to be revised with this information under consideration (for a retained catch OFL only).

Page 107: The description in the overfished section need to be edited to indicate where TMB<MSST historically and where MMB<proposed MSST(MMB) historically for comparative purposes (rather than current text indicating what years the stock was overfished under each currency).

Chapter 8 Golden King Crab

AI golden king crab:

There is a need to add additional information here that the fishery is evaluated on more than just CPUE; it is managed using a combination of fishery-dependant data (observer data and commercial CPUE as well as size composition, shell condition, fecundity, catch rates by size and sex). The TAC has been established as a constant value since 1999.

Additional information should be added to indicate that no formal harvest strategy exists for this stock. It is possible that a formal harvest strategy could be developed for this stock in the future if a model is developed and utilized for biomass estimation and Siddeek indicated that the AI golden king crab model could be evaluated by the CPT in the spring of 2008.

Figure 8-1: A table similar to Table 6-4 should be included in this section to show how often the catch would have been constrained by the OFL in previous years.

Page 112: Recommend that wording is modified here to indicate that this stock is likely to move out of Tier 5 but the final Tier level is unknown at present. The sections on pages 112-113 should be revised so that it is clear what information (e.g. at least proxy M value, a biomass trajectory and means of determining a γ for golden king crab) would be necessary to move up a Tier (e.g. "for Tier 4 the following information would be necessary..."). Note that this would mean that a would all be necessary.

Pribilof golden king crab:

Page 113: Remove sentence on 75% target statement.

St. Matthew golden king crab:

Page 114: Revise sentence beginning "The OFL may not be accurate..." To: "However use of the average catch may not be an appropriate measure for this stock due to the sporadic nature of this fishery." Note this stock would need an OFL established to remain open.

Chapter 9: Other crab stocks

Table 9-1:

Delete 75% column

Page 117: Revise text (second sentence, 4th paragraph) for clarity that “Tier 5 OFLs were calculated for purposes of this analysis ...”

Chapter 10: Incidental Catch Limits

Discussion of scallop rate-based approach description:

Page 122-123: strike the sentences relating to rate-based approach.

Section 10.5

Per previous discussions, a total OFL for Tier 3 stocks means that all catch in the groundfish trawl and scallop fisheries will accrue towards this catch limit. There is a need to include this in the description in the effects analysis for incidental catch limits.

Chapter 12 Economic and Social Effects:

General comments on this section:

1. It would be more useful if the background information were cross checked and updated to the extent possible.
2. Species names (e.g use Snow crab not opilio) should be consistent with those in the rest of document (use common names).
3. All references cited should be included in reference section (and correctly cited).
4. Either summarize and reference pertinent crab-related aspects in the sections on Existing Community Conditions (12.6) accordingly (preferred) or if it is necessary to excerpt information directly from an existing report it should be indented as a quote and referenced accordingly to make it clear that this is specifically quoted.
5. The headers and organization in chapter 12 should be reorganized so that the section headers and numbering (levels of organization) are correct.
6. Statements such as “recommended for management” should say “for purposes of this analysis...”
7. Reorganize so that impacts of alternative 3 only indicate where it differs from impacts under alternative 2.
8. Tables from previous sections of the document should only be repeated in this chapter if absolutely necessary in characterizing impacts.

Tables 12-4 and 12-5:

Tanner crab data as presented here are incorrect as they appear to include Westward region total data (i.e., including the GOA) and should be refined to ensure that only BSAI data are presented.

Section 12.7 Alternative 1:

The text leads to an inaccurate representation of the simulation results under alternative 1.

Recommend to add:

“The current OFL does not constrain the current *status quo* harvest strategy. In the absence of the *status quo* harvest strategy whereby fishing could occur at the level of the current OFL then simulation results would indicate...” for (BBRKC and Tanner)...reference back to those specific sections by species (add section references by species here)

Alt 2/3 economic impact analysis:

F₄₀ should be deleted from the tables and discussion as this is not an alternative proxy OFL.

There is a need to repeat the short-term projections in this section so that for each future year the catch is equal to that from the State harvest control unless this is greater than the yield under the $F_{35\%}$ control rule when the catch would be set to that corresponding to the $F_{35\%}$ control rule. This would better approximate the impact of a $F_{35\%}$ OFL rule than a comparison of the trajectories of catch based on setting State harvest rule and the $F_{35\%}$ control rule. All tables in this section need to be updated, ideally before the June Council meeting.

A table should be included that lists the OFLs for each stock for 2006 (only). Such a table would be similar to Table 2-1, but would include the OFL, the information used to compute it (Tier level, average catch, value of α , etc.) as well as the 2006 TAC (or GHY), and OFL.

12.8.6.1 Option 1 or Option 2:

This section should be moved to Chapter 2 so that all discussion of options 1 and 2 impacts are included in a single section. This section should also be revised so that the economic impact is the focus and additional information on economic impacts are included. For example, under option 1, market and pricing speculation could occur and lead to adverse economic impacts if the eventual TAC/GHY differed substantially from the OFL (e.g. if the assessment is revised downwards based on new information). This should be discussed further here regarding the market risks of setting an incorrect OFL. In situations where the stock may be increasing, establishing an OFL on the previous year's data could constrain yield. The industry would have some advance warning of a potential OFL increase under option 1. Under option 2 the time for forewarning of OFL is very short.

Section 12.8.6.2

There should be one section that compares the economic impacts of all of the alternatives. Care needs to be taken to avoid words (such as "significant") that have well-established policy meanings.

Section 12.9

The section will need to be rewritten in accordance with the earlier comments for Tier 6 impacts and the necessity of non-zero OFLs for some stocks where there is retained incidental catch in other fisheries.

Chapter 13

The CPT recommends that Section 13.2 (Bristol Bay Drilling) be deleted as its current inclusion under "reasonably foreseeable future actions" implies a potential impact on an equivalent basis to actions such as Amendment 80.

The meeting adjourned at 5:25pm

Appendix A

NPFMC Crab Plan Team meeting

May 22-24, 2007

AFSC Traynor Room, Seattle, WA

Draft Agenda

May 22

9:00 am -12:00 pm:

Administration

- Introductions,
- Additions to agenda and approval of agenda,
- Membership
- September meeting scheduling and location (Seattle or Anchorage)

Discussion of new Magnuson Stevens Reauthorization Act (MSRA) requirements

- Annual Catch Limits (ACLs) and Accountability Measures (AMs):
Implications for the Crab FMP (Stram/Harrington)

Review of draft Crab Overfishing Definitions Assessment

- CPT review new alternatives and options,
- CPT approval of draft document,
- Considerations for June council meeting,
- Public comments/questions

12:00 pm – 1:00 pm

Lunch break

1:00 pm - 5:00 pm:

Continue review of draft Crab Overfishing Definitions Assessment

May 23

9:00 am -12:00 pm:

Continue review of draft Crab Overfishing Definitions Assessment

12:00 – 1:00

Lunch break

1:00 pm - 5:00 pm:

~~Review of 2006/07 BSAI Crab Fisheries:~~

- ~~• Brief presentation on 2006/07 fisheries — ADF&G (Bowers),~~
- ~~• Review 2006/07 crab bycatch data — ADF&G (Pengilly/Bernard)~~

Trawl Surveys

- ~~NMFS Trawl survey overview from 2006 (Rugolo)~~
- ~~2007 BSFRF Bristol Bay RKC survey~~
 - ~~CPT discussion of reviewing and receiving survey results, data access, and any forthcoming NRC report (purpose and intent)~~

~~Summer research plans/schedule~~

- ~~NOAA,~~
- ~~ADF&G,~~
- ~~BSFRF.~~

~~**Aleutian Islands Fishery Ecosystem Plan**~~

- ~~Brief presentation on draft plan (Bowers),~~
- ~~CPT comments on draft plan,~~
- ~~Public comments on draft plan.~~

May 24

9:00 am -12:00 pm:

~~**Review of stock assessment models**~~

- ~~CPT input on models prior to start of assessment cycle in August~~
- ~~Public input to assessment authors~~
- ~~Stock status projections~~

Review and approve guidelines for external stock assessment reviews

12:00 pm – 1:00 pm

Lunch break

1:00 pm - 5:00 pm:

Bering Sea Crab EFH Measures considered by Council

- Presentation on EBS snow crab motion for June Council meeting (Savikko),
- CPT comments on motion,
- Public comments on motion.

~~**Discussion of SAFE and other reporting issues**~~

Review of Crab Research Priorities

Other issues/new business

Adjourn - (5:00 pm)

Appendix B

Draft Guideline for Crab Assessments

Notification:

The appropriate time period for notification of intent to solicit an external stock assessment review would be in October. This would give the public the entire time period between May (when stock assessments are first reviewed by the CPT) and October (when TACs are announced) to determine if they had an issue with the stock assessment that they wished to have reviewed externally

Timing:

In order to alleviate possible complications with staff workloads, the appropriate time period for an external review (inclusive of any interactions with the stock assessment authors as well as any follow up workshop) would be from October-March. This would allow for the normal stock assessment, data analysis and TAC setting process to occur between April and October.

Ideally, the reviewer will work with Assessment Authors in a collegial setting where reviewers would make suggestions to the framework or information used in the assessment. If this procedure is adopted, the Assessment Author would work with the reviewer(s) to find a mutually acceptable time for a pre-assessment workshop.

Responsibilities of External Reviewers and Assessment Authors:

The pre-assessment workshop will allow the reviewer to discuss the stock assessment with the Assessment Author and make requests for model modifications or alternative use of information in the assessment. The External Reviewer should produce a written report of their recommendations. To the extent practicable, the Assessment Author will address the comments and suggestions documented in the External Reviewer's report in their SAFE document. In general it is assumed that the Assessment Author will be able to determine whether any changes in the stock assessment recommended by the External Reviewer are substantial enough to require review by the Plan Teams and SSC. Assessment Authors will have the professional discretion to decide when the External Reviewer's recommendations will be incorporated into the SAFE document. When the External Reviewer's recommendation involves a matter of professional discretion, such as the choice of statistical or computational methods, Assessment Authors will have the ability to decline to implement the recommendation. In addition, Assessment Authors may defer action on an External Reviewer's recommendation when complying with the recommendation would compromise the SAFE schedule. For example, if an External Reviewer made a request that would require extensive re-analysis of existing data that could not be accomplished prior to the Plan Team meeting, that request could be deferred to a subsequent year.

Anticipated results of an external review:

The CPT will receive both comments from the external reviewer (to the extent these are made available) as well as a report from the assessment author at the subsequent May CPT meeting indicating how comments by the external reviewer were addressed in the assessment.

**PACIFIC NORTHWEST CRAB INDUSTRY ADVISORY
COMMITTEE (PNCIAC)**

c/o 4209 21st Avenue West, Ste. 403
Seattle, Washington 98199
Cell 360 440 4737
steve@wafro.com

May 7, 2007

PNCIAC Meeting Minutes from April 17, 2007 (Note change of address above)

Committee Area and Species: Bering Sea and Aleutian Islands king and tanner crab

Committee present: Steve Minor, Chair, North Pacific Crab Assn.; Rob Rogers, Icicle Sfds., Vice Chair; Tom Suryan, President, Skippers for Equitable Access; Lance Farr, F/V Kevleen K; Kevin Kaldestad, Kaldestad Fisheries LLC and ICE Group; Phil Hanson, V.P. UniSea Sfds.; Gary Stewart, F/V Polar Lady; Bering Sea Arbitration Organization; Gary Painter, F/V Trailblazer, BSFRF and ICE Group; Vic Scheibert, Trident Sfds.; Keith Colburn, F/V Wizard; Arni Thomson, Alaska Crab Coalition, Secretary, non-voting. Absent, Garry Loncon, Royal Aleutian Sfds.

Agency representatives present: Diana Stram, NPFMC Crab Plan Team Coordinator; Bill Tweit, WDFW and NPFMC; Dave Benson, NPFMC; Jack Turnock, Pat Livingston, NMFS, AKFSC; via teleconference: Shareef Shideek, Jie Zheng, Doug Woodby, Herman Savikko, Doug Pengilly, Forrest Bowers, ADFG; Gretchen Harrington, NMFS.

Industry present: Clyde Sterling, PPSF Inc.; Walt Casto, FV Pinnacle; Ron Lloyd, FV Pacific Mariner; Leif Mannes, FV Ocean Harvester; Jack Tagart, Tagart Consulting; Margo Posten, MSDH; Oystein Lone, skipper, crab boats; Thomas Parks, FV Katie K; Larry Hendricks, FV Sea Star; Gordon Kristjanson, FV Aleutian Mariner; Tim Kennedy, FV Mystery Bay; Svein Nyhammer, FV Rollo; David Wilson, FV Destination; Steve Hughes, Natural Resource Consultants, BSFRF; Dale Schwarzmiller, PPSF Inc.; Florence Colburn, Crab Group; Ron Brill, FV Cascade Mariner; David Harris, FV Arctic Mariner; Edward Poulsen, FV Artic Sea; Staale Brekkaa, FV Silver Dolphin; Dennis Thompson, FV Mystery Bay; Jim McManus, FV Royal Viking; Jim Stone, Ocean Fisheries LLC; Margaret Hall, Rondys Inc.; **(sign-up list attachment)**

Meeting called to order at 9:20 am.

1. Presentation by Diana Stram, approximately one hour. (powerpoint attachment)

Diana reviewed the 2006 MSFCMA revised requirements to prevent overfishing by requiring that FMPs "establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure

accountability.” Amendment 7 of the Crab FMP which established the current definitions of overfishing, implemented by the NMFS in March 1999 called for a revision in five years or in the case of a change in environmental conditions.

Diana also noted further purpose and need for the new amendments to overfishing definitions to reflect current scientific information and to accomplish the following:

- Provide and FMP framework for definition values to facilitate use of the best available scientific information as it evolves.
- Provide a new tier system that accommodates varying levels of uncertainty of information and takes advantage of alternative biological reference points.
- Define the status determination of criteria and their application to the appropriate component of the population.

A major problem with the current overfishing definition components (Alternative 1 in the Environmental Assessment) is that it is based on total survey mature biomass----however the fishery targets on large males only. Crab scientists have determined that this can lead to overfishing under certain conditions. Alternatives 2 and 3 will correct this as it will use mature male biomass in the control rules. The model is only intended to be used in the short term as the Plan Team is planning to develop an “egg production index” incorporating female mature biomass modified by changes in male mature biomass.

2. Presentations by Gary Stauffer, Steve Hughes and Jack Tagart relating to the Bering Sea Fisheries Research Foundation concerns about the development of the snow crab model and the revision of the overfishing definitions, a review of the material and issues identified in Tagart Consulting correspondence of November 13, 2006; and February 6, 2007; and correspondence from BSFRF of March 21, 2007 to Doug Demaster requesting BSFRF permission to gain access to the “Turnock Model” (snow crab population dynamics) to conduct a series of sensitivity analyses that are listed; and DeMaster response of March 21, 2007 which only provides for BSFRF peer review in the winter of 2008, following proposed NPFMC action in the fall of 2007. (**Attachments**)

3. Concerns raised by committee members during presentations:

Annual Catch Limits and Accountability Measures have not been defined by the Agency yet ... how can the Council adopt a new assessment model without defined parameters?

Alternative 1, which could be combined with Alternative 2 or 3 under final action, could give the State exclusive management of several smaller crab fisheries by removing them from the FMP. This is a huge policy issue that needs further discussion.

The plan to use an "Egg Production Index" in modeling raises a lot of questions. Has this been used before in any fishery, anywhere?

Handling Mortality and Natural Mortality are not specified. There are not only significant variables, there is also concern that the CPT is relying on pre-rationalization data for these variables, and we know that handling mortality is changing (for the better) under the new rationalization system.

The preliminary analysis indicates that the new assessment models may further increase fleet consolidation. This is an already controversial issue that needs further discussion.

It appears that the Aleutian Islands Golden King Crab (AIGKC) fishery TAC may be permanently constrained at the current level, even in the face of rising CPUE,s.

It appears that Pribilof Red Crab may be closed indefinitely, even though there is a harvestable surplus under the current model. This poses potential major economic disruptions to St. Paul island's recovery plan.

4. PNCIAC Motion

The Pacific Northwest Crab Industry Advisory Committee provides the following comments and recommendations concerning the new stock assessment models and overfishing definitions under development in response to MSA requirements.

1. The potential impacts to industry and crab-dependent communities are not well known or understood by these shareholders.
2. CPUE's in the major crab fisheries are improving significantly, indicating there is no immediate crisis.
3. There is a general concern that the stock assessment models are largely based on recent derby-style management and fleet behavior, which has changed significantly under the crab rationalization program.
4. There is no immediate legal deadline for implementation of the new OFL definitions.

Now therefore PNCIAC requests:

- A. The new assessment models be provided to the Bering Sea Fisheries Research Foundation, as requested in their letter of March 21, 2007; for public peer review and greater understanding of the potential impacts.
- B. That the BSFRF be afforded the opportunity to test the models and report back to industry and the Council as part of the public comment process.
- C. That the Council defer final action on this issue until that peer review process is complete.

Motion by: Kevin Kaldestad; second, Rob Rogers.
Motion passed unanimous.

All the PNCIAC Committee members made positive comments on the motion during discussion period, some of those comments are noted below.

Keith Coburn, Tom Suryan and Lance Farr all related experience-based comments as vessel captains generally noting that catch per unit of effort has improved dramatically in both the king and snow crab fisheries signaling an upswing in the mature biomass of the stocks. In addition they feel strongly that fishing mortality impacts have been greatly reduced under the new system, however, the proposed new fishing mortality estimates do not reflect this, but they should reflect these changes. They also noted that since there was no immediate time constraint to implement the revisions to the overfishing definitions, that final approval by the NPFMC should be delayed one season until the BSFRF has time to conduct a peer review.

Phil Hanson:

In the brief time since crab rationalization came into being we have seen dramatic changes in the fishery, the number of pots hauled, soak times, discard mentality changes, and a much lengthened season.

Vic Scheibert:

Trident is involved in both processing and catching. Regarding potential mortality we have seen a big change in the amount of pot pulls, sharing of gear, etc. from our recent Olympic style fishing history.

Arni Thomson: ACC generally concurs with the comments and supports the work that the BSFRF is doing and we support requesting a delay on final action to allow for peer review of the new models.

5. PNCIAC elections:

Steve Minor reelected to Chair; Gary Stewart elected Vic Chair.

Chair appoints Overfishing Definitions subcommittee; Rob Rogers and Tom Suryan are co chairs.

Adjourn at 12:00 pm.

Steve Minor, Chair, PNCIAC

Attachments: 7

Pacific Northwest Crab Industry Advisory Committee

Leif Erikson Hall, Ballard, WA

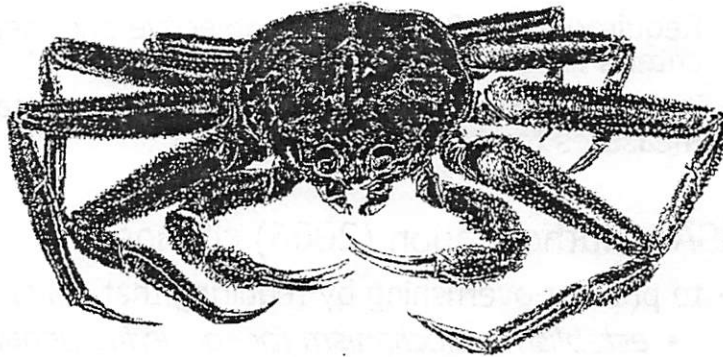
Tuesday, April 17, 2007

9:00 am - 12:00 noon

NAME	VESSEL/COMPANY
PAUL HANSON	UNISEA
Clyde Sterling	Peter Pan
WALF CASTO	PINNACLE
Pat Livingston	NOAA/NMFS
RON LOYO	Pacific Marmel
LEIF MANNIS	OCEAN HARVEST
Kevin Valderon	MCHC
Jack Taggart	Taggart Consulting
MARGO PRISTON	MSDH
Oystein Lore	S/R
THOMAS PARSONS	KATTLE
LAURENCE HENDRICKS	SEA STAR
GORDON KRISTJANSON	ALEUTIAN MARINE
TIM KENNEDY	MYSTERY BAY
Lance Farr	Heiken
TIM KING	MARK I
Pat Norman	TRIDENT
STEVE NYHAMMER	Tollo
David Wilson	Destination

NAME	VESSEL/COMPANY
Steve Hughes	NRC/BSFRF
Jack Tarnock	AFSC
Gary Painter	F/V Trailblazer
Date Schwarzmiller	Peter Pan Sfts.
KEITH Cabuen	F/V WIZARD.
Florence Colburn	Crab Group
Ron Bin	CASCADE MARINER
David Harris	Arctic Mariner
Edward Paulsen	Arctic Sea
John Suryan	Bristol Mariner
Stuart Brekhus	Silver Dolphin
Dennis Thompson	mystery Box
Alma Thomson	AGC
Jim McManus	RUE
Jim Stone	Ocean Fisheries, LLC
Bill Weitz	NPFMC
Dave Benson	NPFMC
Margaret Hall	Rndys, Inc.
Steve Minor	PNCLARC/NACA
Vic Scheibert	Trident
Gary Stewart	Polar Lady
Rob Rogers	Trickle Sfts.

Revised overfishing definitions Amendment 24 BSAI Crab FMP



Diana L. Stram
PNCIAC meeting
April 17, 2007



North Pacific Fishery Management Council

Fishery Management Plan (FMP) for the BSAI King and Tanner Crabs

- FMP establishes State/Federal cooperative management regime
 - Crab management deferred to State with Federal oversight
 - 3 categories of management measures defined under the FMP
 - Category 1: Fixed. FMP amendment to change.
 - Category 2: Frameworked. State has flexibility within the criteria specified for frameworked measures.
 - Category 3: Discretionary. State can change through own process.



North Pacific Fishery Management Council

MSA requirements

- MSA revisions in 1996 (SFA):
 - Defined 'overfished' and 'overfishing'
 - Required all FMPs to specify objective and measurable criteria for ID when fishery is overfished
 - if overfished or approaching overfishing, contain mgt measures to prevent and rebuild
- MSA reauthorization (2006) changes:
 - to prevent overfishing by requiring that FMPs
 - *establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations, or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.*
 - Timing (2 years to prepare and instead of 1)



North Pacific Fishery Management Council

Amendment 7 to Crab FMP

- Amendment 7 revised definitions of overfishing, MSY and OY (work by members of Crab Plan Team)
- Adopted by NPFMC in June 1998
- Effective date March 3, 1999
- CPT note that intent to revise after 5 years or in the case of a change in environmental conditions



North Pacific Fishery Management Council

NPFMC's overfished stocks since implementation of Amendment 7

- **BS Tanner** (1998 declaration, 2000 RBP adopted, amd 11). Currently under rebuilding plan. Small harvests in 2005/06(W), 2006/07 (E and W)
- **Snow crab** (1999 declaration, 2001 RBP adopted, amd 14). Currently under rebuilding plan. Some harvest under rebuilding plan.
- **St. Matthew BKC** (1999 declaration, 2000 RBP adopted, amd 15). Currently under rebuilding plan. Fishery closed.
- **Pribilof Island BKC** (2002 declaration, 2003 RBP adopted, amd 17). Currently under rebuilding plan. Fishery closed.



North Pacific Fishery Management Council

Purpose and Need for amendment

New overfishing definitions are necessary to reflect current scientific information and accomplish the following:

- *Provide an FMP framework for definition values to facilitate use of the best available scientific information as it evolves.*
- *Provide a new tier system that accommodates varying levels of uncertainty of information and takes advantage of alternative biological reference points.*
- *Define the status determination criteria and their application to the appropriate component of the population.*



North Pacific Fishery Management Council

Development of alternatives/analysis

- CPT designated workgroup (2003): ADF&G and NMFS scientists
- Workgroup progress reports to CPT and SSC 2003-2006
- Crab expert workshop convened to review and provide input on alternatives and analytical framework (February 2006)
- CIE review of draft Tier system and analytical framework (April 2006)
- Problem statement and range of alternatives adopted by the CPT for analysis (May 2006)
- CPT meeting to review draft analysis (Nov. 2006)
- Initial Review by SSC, AP, Council February 2007
- CPT meeting to review revised analysis: May 22-24, AFSC Seattle
- Initial Review revised analysis: June 2007
- Final Action: October 2007
- Implementation 08/09 Fishing year



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Response to SSC Comments

- Revisions currently in progress to respond to lengthy SSC February 07 comments
- Reorganized alternatives in response to commentary:
 - Additional options added
- Revised draft to be made available week of May 7th
- CPT meeting May 22-24, AFSC Seattle
 - 1 ½ days to be devoted to extensive technical review of revised initial review analysis



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Revised alternatives (draft description avail to PNCFIAC)

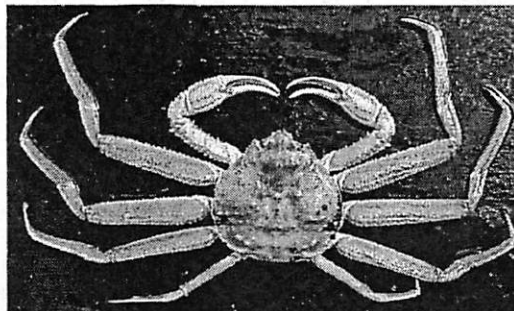
Alternatives	Options
Alternative 1: Status quo	Option A Remove Specific Stocks from FMP or Option B Status quo - no removal of stocks
Alternative 2: tier system five tiers	Option 1 Council annually adopts OFLs in June or Option 2 Council annually reviews OFLs
	Option A Remove Specific Stocks from FMP or Option B Status quo – no removal of stocks
Alternative 3: tier system six tiers	Option 1 Council annually adopts OFLs in June or Option 2 Council annually reviews OFLs



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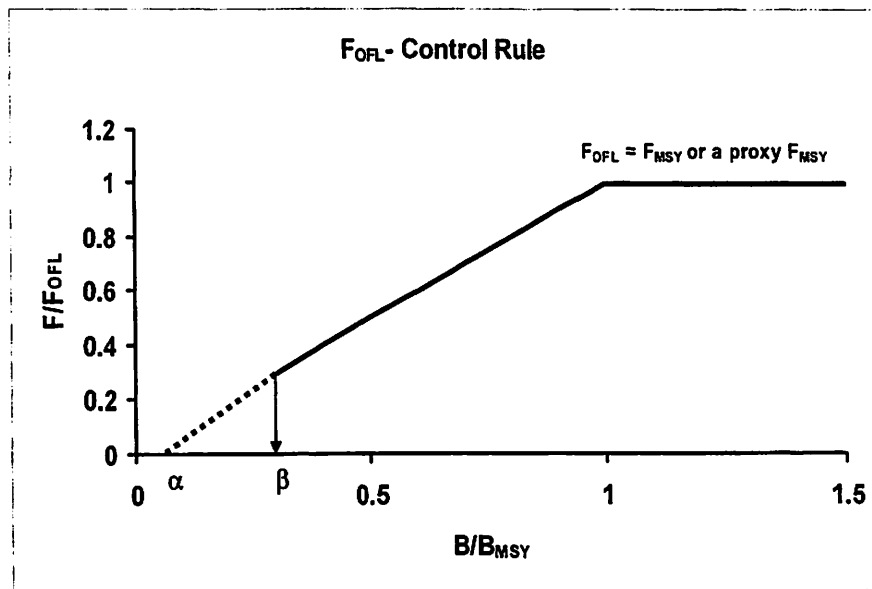
Status determination for crab stocks under new alternatives

- Overfished status:
 - Annual estimate of stock biomass below MSST
- Overfishing:
 - Comparison of estimated F rate from fishery with estimated F_{OFL} for same time period
 - If the harvest rate utilized is in excess of F_{OFL} = overfishing



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F_{OFL} control rule, Tiers 1-4



Measure of mature biomass for B_{MSY} and control rules

- Status quo (Alt 1) uses total survey mature biomass (males and females)
- Fishery targets on large males only
- Alt 2 and 3 - Short term use mature male biomass in control rules
- Long term – develop an egg production index incorporating female mature biomass modified by changes in male mature biomass

Comparison of Alternatives: biological reference points used in the alternatives

Biological Reference Points	Alternative 1 (Status quo)	Alternatives 2 and 3
Maximum Sustainable Yield (MSY) or MSY proxy	average of the annually computed sustained yield over the 15-year period, 1983-1997 (total mature biomass * natural mortality)	Tiers 1 and 2 (MSY) Tiers 3 and 4 (MSY proxy)
MSY Biomass (B_{MSY})	average annual estimated total mature biomass for the 15-year period, 1983-1997	Mature male biomass at MSY level
Minimum stock size threshold (MSST)	$\frac{1}{2} B_{MSY}$	$\frac{1}{2} B_{MSY}$
Maximum fishing mortality threshold (MFMT)	MSY control rule applied to the current total mature biomass	OFL fishing rate (F_{OFL}) calculated by applying tier system
MSY control rule	Natural mortality	F_{OFL} control rule
Natural mortality (M)	0.2 for all species of king crab 0.3 for all <i>Chionoecetes</i> species	0.18 for all species of king crab (default value) 0.23 for male and 0.29 for female <i>Chionoecetes</i> species (default values)
Sustainable yield (SY)	Total mature biomass * M	N/A
Optimum yield (OY)	OY range 0 - MSY	OY range 0 - MSY or MSY proxy

Comparison of alternatives for the major six stocks

Stocks	Alt. 1						Alt. 2&3			
	B_{MSY} TMB	MSST TMB	B (06) TMB	TAC 06/07	OFL SY=M*TMB	F 06/07	OFL F	B_{MSY} MMB	MSST MMB	B (06) MMB
Bristol Bay RKC	89.6	44.8	157.2	15.5	31.44	0.296	0.29	76.57	38.28	65.54
Pribilof Is. RKC	6.6	3.3	19	0	3.8	0	gM=0.32			15.9
Pribilof Is. BKC	13.2	6.6	1.6	0	0.32	0	gM=0.32			0.46
St Matthew BKC	22	11	11.2	0	2.24	0	gM=0.32			7.34
EBS Tanner	189.6	94.8	253.3	2.969	75.99	0.303	0.612	67.44	33.72	62.8
EBS snow	921.6	460.8	547.6	36.6	164.28	0.8	0.511	413.4	206.68	211

NOTE: all biomass values in millions of pounds

TMB – total mature biomass

MMB – mature male biomass

SY – sustainable yield

MSST – minimum stock size threshold



Projection models: Tier 3 stocks

- Stochastic simulation models used to project populations forward in time using parameters from the stock assessment models
- Recruitment was estimated from a spawner recruit curve
- 30 yr and 100 yr simulations to evaluate various control rules and model assumptions
 - Initial biomass values of 10%, 50%, 100% B_{MSY} were used to evaluate rebuilding times
- 5 yr projections starting at the current biomass were used to compare potential constraints of new control rules on current harvest strategy

Projection modeling for Tier 3 stocks: Bristol Bay red king crab, EBS snow crab, EBS Tanner crab

- **For all three stocks:**
 - **Alternative 1:**
 - **fishing at the status quo OFL**
 - **Result: stock depletion and no rebuilding**
 - **fishing at the status quo harvest strategy**
 - **Result: similar to Tier 3 $F_{35\%}$ control rule**
 - **Alternatives 2 and 3:**
 - **fishing at a range of control rules under Tiers 2-5**
 - **Result: higher retained yield and lower rebuilding time periods as compared to fishing at status quo OFL**

Economic impacts

- Current impact estimate limited to 5 year catch projections (for Tier 3 stocks)
 - Bristol Bay red king crab:
 - $F_{35\%}$ control rule constrains current harvest strategy in 2008
 - EBS snow crab:
 - $F_{35\%}$ control rule constrains current harvest strategy in 2010-2012
 - EBS Tanner crab:
 - $F_{35\%}$ control rule constrains current harvest strategy in 2008, 2010-2012 (all years but 2009)
 - For all stocks:
 - Any short-term decline in TAC could result in reduced gross revenues
 - Possible fleet consolidation
 - Long-term yields increase under proposed control rules compared to status quo (OFL and harvest strategy)



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Other impacts (cont.)

- Aleutian Islands golden king crab
 - Currently Tier 5 status with no OFL constraint on current harvest but could limit harvest increase (suggested by CPUE mgt)
 - Likely to move up to Tier 4 based on stock assessment model formulation
- Pribilof Island red king crab (Tier 4)
 - Revised stock status indicates possibly approaching an overfished condition
 - Therefore unlikely to open under a separate harvest strategy in near future



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Potential future actions

- BOF may need to revise existing harvest strategies to provide a buffer between OFL and TAC to ensure overfishing will not occur
- Rebuilding plans may need to be revised in accordance with new estimates of stock recovery and biological parameters



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November 13, 2006

Terry Cosgrove, President
Bering Sea Fisheries Research Foundation
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Kirkland, WA 98033

and,

Steven E. Hughes, NRC
Representing BSFRF
1900 W. Nickerson Street, Suite 207
Seattle, WA 98119

Re: NPFMC Crab Plan Team Meeting, November 8, 2006

Dear Terry and Steve:

As requested I attended the November 8, 2006 NPFMC Crab Plan Team (CPT) meeting held in Seattle at the NMFS/AFSC. This special meeting of the CPT was called to review the draft Environmental Assessment for Amendment 24 to the Fishery Management Plan for Bering Sea and Aleutian Islands King and Tanner Crabs to Revise Overfishing Definitions. Attached is a brief report on significant issues discussed during the meeting.

If you have any questions regarding my report, please don't hesitate to contact me.

Sincerely,



Jack V. Tagart, Ph.D.

Attachments: 1. Summary Report

**SUMMARY of the NOVEMBER 8, 2006
NPFMC CRAB PLAN TEAM MEETING**

Prepared by,
Jack V. Tagart, Ph.D.
Tagart Consulting

For,
Bering Sea Fisheries Research Foundation

November 13, 2006

The NPFMC Crab Plan Team (CPT) met in special session on November 8, 2006 to review the draft Environmental Assessment (EA) for Amendment 24 to the BSAI King and Tanner Crab FMP. Amendment 24 proposes to revise and replace existing crab overfishing definitions. The amendment contains three alternatives:

1. Retain the status quo overfishing definitions.
2. Implement a new tier system have the NPFMC annual adopt the estimated Overfishing Levels (OFLs)
3. Implement a new tier system and the NPFMC annually reviews the OFLs

Any federally managed species under jurisdiction of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) requires a determination of overfishing levels to satisfy National Standard 1. The current overfishing level is based on three tiers arrayed hierarchically from the least available to most available information:

Tier 1. Crab stock is not surveyed. Some catch data available.

$F_{msy} = M = 0.2$ (King), 0.3 (Tanner and snow).

B_{MSY} not estimable.

MSY is estimated from a proxy of mature biomass and stock utilization rate.

Tier 2. Sporadic or limited years of survey data. Catch and effort data on each crab stock is well documented.

$F_{msy} = M = 0.2$ (King), 0.3 (Tanner and snow).

B_{MSY} not estimable.

MSY is estimated from a proxy of mature biomass and stock utilization rate.

Tier 3. Data Available: historical catch, continuous in-season catch and effort data, stock assessment, growth, maturity, limited natural mortality and stock recruitment relationship information.

$F_{msy} = M = 0.2$ (King), 0.3 (Tanner and snow).

B_{MSY} is the average survey biomass of mature males and females from 1983 to 1997.

$MSY = B_{MSY} * F_{msy}$.

Among the problems with the existing definition is the fact that the biological reference points (B_{MSY} , MSST, MSY, OY and MFMT) are hard-wired into the FMP; any change requires a plan amendment (see Table 2-1, p 7 of the draft EA¹).

The proposed replacement for the current system of overfishing definitions adopts a 5-tier hierarchical system arrayed from most available to least available information (see Table 2-2, p 12 of the draft EA). The new tier system emulates that used for NPFMC managed groundfish stocks. The system adopts a sliding scale harvest control rule (HCR). OFL therefore changes with changes in estimated mature male biomass (MMB). When the current MMB is greater than B_{MSY} OFL is set equal to F_{msy} . When current MMB is $< B_{MSY}$, F_{msy} is reduced along a linear scale that reaches zero at a fraction of the unfished spawning stock biomass equivalent to the value $\alpha = 0.05$. However, the crab HCR also imposes a specific threshold spawning biomass level $\beta = 0.20$ below which F_{OFL} is set equal to zero. So, α dictates the rate at which the HCR reduces the allowable overfishing level and β sets an absolute spawning biomass limit at which allowable fishing mortality for the directed fishery goes to zero.

B_{MSY} and F_{msy} can only be estimated for stocks with a “known spawner-recruit (S-R)¹ relationship” (tier 1 stocks). This means that there exists a statistically significant functional relationship between spawning stock biomass (measured as mature male biomass for crab) and the estimated number of recruits in the population. It is seldom the case that a reliable S-R relationship exists. Consequently, the analysts must rely on proxy values to approximate these quantities.

Because crabs have a substantially different life history compared with groundfish it has required more than two years of analysis to develop the proposed overfishing definitions. The predominant effort over those two years has been the determination of suitable and defensible proxy maximum sustainable yield biomass and fishing mortality rates for the affected crab species.

Proxy B_{MSY} and F_{msy} values proposed in the draft EA are based on simulation analyses that utilize king and snow crab statistical population dynamics models. There has been extensive stochastic (i.e., incorporates random fluctuations in parameter values) simulations completed to evaluate the likely sensitivity of the proxy biomass and fishing mortality rates. As a result, the analysts have determined that $B_{35\%}$ and $F_{35\%}$ are suitable proxies for B_{MSY} and F_{msy} for king, tanner and snow crab. These rates imply that maximum sustainable yield is achievable when the current spawning stock biomass per recruit is reduced to a level of 35% of the unfished ($F=0$) spawning stock biomass per recruit. Spawning stock biomass is measured as the abundance of mature males in the stock.

The analysts have done their homework. They have debated the population models used to simulate crab abundance. Their interpretation of available data and their analytical approach to estimating crab abundance and overfishing levels was reviewed by Federal and State

¹ http://www.fakr.noaa.gov/npfmc/membership/plan_teams/CPT/KTCOFD_CPT_1106.pdf (118 p, 3.15 MB pdf file. This is an incomplete draft with many missing values and sections yet to be inserted in the document.)

scientists during an in-house workshop last February and then subsequently by a 3 person team of independent reviewers (CIE review) last spring. In July of this year, the analytical team met to iron out the last of their differences before completing the simulation analyses required to derive the proxy B_{MSY} and F_{msy} values. The king crab models are reasonably well established although the analysts utilized the "research model" for their simulation efforts. The snow crab model is new and remains somewhat controversial. Parameter values in the snow crab model have not stabilized, with large differences apparent between the 2005 version of the model and the 2006 version. Regardless, the models are adapted for the simulation analyses and those analyses have been thorough. Whereas the absolute estimates of population abundance appear to be sensitive to the parameter ranges used in the model, the proxy fishing mortality rates are not. $B_{35\%}$ and $F_{35\%}$ have been shown to be a fairly stable outcomes (i.e., proxy MSY values) for a range of parameter inputs.

Evaluating EA Alternatives:

I don't believe that Alternative 1 (Status Quo) is a viable alternative under the current interpretation of the MSFCMA and NS1. The F_{msy} and B_{MSY} values for this alternative are not particularly responsible or defensible estimates of either quantity. The difference between Alternative 2 and Alternative 3 is largely in the manner in which the 5-tier HCR is allowed to use recent trawl survey information. Under Alternative 2, the NPFMC would adopt as hard numbers the annually updated proposed F_{OFL} during their June Council meeting. This implies that the most recent trawl survey information that could inform the OFL decision would be the prior year's survey data. By contrast, Alternative 3 would have the Council adopt the process for setting OFLs at their June Council meeting, but they would not set the absolute level of OFL at that time. The OFL would be set as it is now, immediately prior to or coincident with the setting of the annual GHLS. Thus, Alternative 3 would allow the most recent survey data (that collected from the June-August annual trawl survey) to be utilized in setting the OFL just as soon as it became available.

Among the motivations for changing the overfishing definitions is the need to assure that the Council and NMFS are compliant with provisions of the Administrative Procedures Act (APA). The APA requires that impacted small businesses be given ample notice of Federal regulations impacting their operation. It is the time-line for supplying notice that provokes establishing either the hard OFL or the OFL process in June of each year. It is not clear to me whether adopting the procedures in June satisfies the APA in the same way that adopting hard OFLs would satisfy this act. Alternative 3, if it is judged to meet the provisions of the APA, is the preferred alternative in this draft EA. It provides for an updated overfishing definition that is more compliant with NS1 than the current definition and still allows for the utilization of the most current survey information to inform the OFL setting process.

Alternative 2 has another potential drawback. The CPT argued that if the OFL set under Alternative 2 were too high, given the crab survey results that become available after the June Council meeting, the ADFG could use their discretion to lower the GHL regardless of the Council established OFL. This is all fine and dandy for conservation of crab stocks but there is a corollary problem: what happens if the OFL is too low given the subsequent crab survey? In this instance the OFL could be constraining on the ADFG. They could not set the GHL higher than the OFL despite the results of the summer survey. Preliminary attempts to

evaluate the OFL estimated for king crab using the most recent survey data and survey data 1-year old resulted in underestimates of stock abundance in 7 of 10 years. While these results may not be typical or predictive of future events, they do illustrate a risk to fishermen of applying the Alternative 2 approach. It is possible that the long-term sustainable productivity of the crab stock could be under utilized if the OFL definitions consistently underestimated available yield and constrained the GHM accordingly.

Other Issues:

More stocks will have their OFLs determined under tiers 4 and 5 than under tiers 1, 2 or 3. The Plan Team seemed wrapped around the axel trying to identify how they would specify B_{MSY} for stocks in tier 4. In this tier, it is assumed that the scientists know current biomass from a survey, have a measure of natural mortality for the stock and have a proxy measure of B_{MSY} . Unlike tier 3, the proxy B_{MSY} is not available from simulation modeling or from evaluation of spawning biomass per recruit. Rather, this proxy B_{MSY} would be based on the average survey biomass over some unit of time (much like the status quo OFL rule currently in place). The CPT has not been specific about how they will quantity this value. The BSFRF may have limited interests in tier 4 stocks. If proxy B_{MSY} values are based on average survey biomass, you may want to recommend a moving average (10 years or 20 years for example) without an explicitly defined time sequence (e.g., 1986-2006). The idea is to make the proxy a process not a specific time frame that requires amending the FMP to change.

Similar issues confound the establishment of OFLs under tier 5, where long-term average catch becomes the default OFL. This needs to be frame worked as well, i.e., no direct stipulation of the years for computing the average, rather a stipulation to use a suitable time sequence consistent with the development and experience in the fishery. The OFL should be a fraction of the average catch over the "suitable time period" rather than the average itself. The motive here is to provoke those who would like to promote more aggressive harvest to obtain sufficient data to move the stock up the tier system. If the OFL is set at the mean catch, there may be no incentive to get better data.

Stocks recommended for OFL determination by tier:

Tier 1 and 2:

No stocks.

Tier 3:

Bering Sea snow crab

Bering Sea tanner crab

Bristol Bay red king crab

Tier 4:

Saint Matthew blue king crab

Pribilof Islands blue king crab

Pribilof Islands red king crab

Eastern Aleutian Islands (Dutch Harbor) red king crab

Norton Sound red king crab

Eastern Aleutian Islands Tanner crab

Tier 5:

Pribilof Islands golden king crab
Saint Matthew golden king crab
Western Aleutian Tanner crab
Saint Lawrence Island blue king crab
Aleutian Islands scarlet king crab
Eastern Bering Sea scarlet king crab
Bering Sea triangle tanner crab
Eastern Aleutian Islands triangle tanner crab
Eastern Aleutian Islands grooved tanner crab
Western Aleutian Islands grooved tanner crab
Bering Sea grooved tanner crab
Western Aleutian Islands (Adak) red king crab
Aleutian Islands golden king crab

Timelines:

The CPT decided that substantial work needed to be done to get the draft EA into shape for initial review. They had originally intended to present the EA to the Council in December, but have delayed that to February, 2007. The Plan Team is requesting that the edited version of the EA be available by January 15, 2007. The team plans to meet via conference call between January 2 and January 12, 2007 to review the revised draft one last time. The Council should receive the draft for initial review in February barring any unforeseen hiccup. Final review will follow in April. It is unlikely that the revised definitions will be in place for the 2007/2008 harvest year, but this remains to be seen.

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February 6, 2005

Gary Painter, President
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1900 W. Nickerson Street, Suite 207
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and,

Steve Hughes, Representing
Bering Sea Fisheries Research Foundation
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Re: Feb 5, 2007 NPFMC SSC Meeting, Agenda D-2(a), Crab Overfishing Definitions

Dear Gary and Steve:

The NPFMC SSC heard staff presentations yesterday on the draft Crab Overfishing EA¹. Staff presentations began at 10:30 AM and concluded at 4:30 PM. Public testimony was limited to 5 minutes for each person and provided by myself, Steve Minor, and Arni Thompson. BSFRF also provided written comments which are attached to this letter.

The SSC is recommending that the Council not send the document out for public review at this time; rather they requested that the draft EA be revised and returned to the SSC for subsequent review at the June, 2007 Council meeting². In the interim, the SSC recommended that the EA be reviewed by the Crab Plan Team at the annual spring meeting. To accommodate the notice requirements for delivery of the revised EA to the Council, Diana Stram, NPFMC staff, advised that the document would need to be ready for distribution four weeks before the Council meeting, i.e., by May 7th. Consequently, the spring Plan Team meeting typically held in May will have to be rescheduled for some time in April.

It is my view that the SSC will approve the revised EA in June and send it out for public review and final approval at the October, 2007 Council meeting³.

¹ Crab Plan Team Review Draft Environmental Assessment for proposed Amendment 24 to the Fishery Management Plan for Bering Sea and Aleutian Island King and Tanner Crabs to Revise Overfishing Definitions. NPFMC, Anchorage, AK.

http://www.fakr.noaa.gov/npfmc/membership/plan_teams/KTC24_overfishingdef.pdf

² The NPFMC June meeting is scheduled for Sitka, during the week of June 4th.

³ The NPFMC October meeting is scheduled for Anchorage during the week of October 1st.

Comments of the SSC: SSC comments were summarized by Terry Quinn with contributions from Steve Parker, Keith Criddle, Frans Mueter, Doug Woodby, Patty Livingston and Ann Hollowed. In short, the SSC commended the Crab Plan Team and specifically the analysts from the overfishing working group for the enormous work presented in the EA. The consensus view of the SSC seemed to be that the technical approach was precisely what the SSC had requested, certain deficiencies notwithstanding, and they were enthusiastic in their praise.

SSC Issues:

1. The EA needs to be specific regarding those quantities hard-wired into the amended FMP and those frame-worked and thereby changeable without further amendment.
2. The SSC was uncertain if it was legal to have a Tier 6 as defined in the revised overfishing control rule (see p 15 of the EA for a description of the tier system, and p 12 for the list of stocks proposed for each tier). Tier 6 applies to 9 of 22 managed crab stocks; under the definition there would be no OFL set for any of these stocks due to insufficient data upon which to base the OFL. The SSC proposes to flag the issue for the Council and NOAA GC.
3. The SSC regarded the snow crab spawner-recruit curves presented on page 77 of the EA (Figure 7-4) as suspicious and requested the analysts take a closer look at the objective function being fitted to the data. The concern was the pattern of residuals around the fitted line, observed values typically will be equally distributed above and below the line; in this case they are not so distributed.
4. The SSC specifically requested more discussion regarding the change in the definition of spawning biomass. Characterized as the “currency” for the OFL rule, spawning biomass under Alternative 1 is Total Mature Biomass (males + females); for Alternatives 2 and 3, the “currency” is Mature Male Biomass. The SSC requested that the analysts identify what fraction of the change in the proposed OFL is due to the change in “currency” versus the change in the OFL control rule. They also asked for more discussion on why the use of MMB is robust, and whether there are species specific problems in utilizing this as the measure of spawning abundance.
5. The SSC wants to see more justification of the gamma (γ) values utilized in the OFL Tier 4 control rule. Gamma is a multiplier on the estimated natural mortality (M) for a tier 4 stock (6 stocks with annual or periodic trawl survey biomass data). The quantity γM (gamma times M) becomes the proxy F_{MSY} value.
6. B_{MSY} proxy for the Tier 4 species is calculated as an average of survey estimated MMB. The SSC wants a better justification for the stock specific time periods selected to average survey biomass.
7. The SSC noted insufficient analysis of social and economic impacts of the proposed amendment. They requested that the analysts take a longer view of the impacts, and that they do more to “flesh out” impacts on industry.
8. The SSC embraced the BSFRF recommendation that the document be organized around the tier system, i.e., presenting those stocks within a tier in a section, rather than the sequential listing of species and stock groups
9. The SSC noted the lack of discussion on the uncertainties associated with the analysis. There was no discussion of the errors around the survey estimates of abundance, or for any of the long-term (30, 100 year) stock projections.

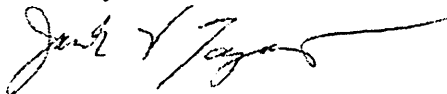
-
10. The SSC asked for a more explicit description of how Alternative 2 and Alternative 3 will actually work. For example, it is not clear precisely what the Council's annual June action will be under Alternative 3.
 11. Finally, the SSC recommended, as requested by BSFRF, that a table summarizing Alternative 1 versus Alternative 2-3 OFLs be added to the EA.

Once adopted, the revised overfishing rules will have a profound impact on crab TACs; particularly in the short-term (3-5 years). The OFL is the upper limit for harvest. ADFG is obligated to set their recommended TAC (GHLs) below the OFL. The EA proposes using $F_{40\%}$ exploitation rates as illustrative of the buffer expected between the OFL control rule and the TAC, although ADFG is not obligated to use the $F_{40\%}$ harvest rule so long as their proposed TAC is less than OFL and has room to assure total catch will not exceed OFL. For example the short-term impact for Bristol Bay red king crab is estimated to be a 5-11% reduction in catch in 2008 and 2009, but an increased catch thereafter through 2012 with a cumulative impact of 1% gain in total catch from 2008-2012 (see EA Table 4-7 p 49 and 50); while the impact on the snow crab harvest is estimated to be a 10% reduction in cumulative catch over the period 2008-2012 (see EA Table 7-9 p 74). Over the long-term (100 y time horizon), the $F_{40\%}$ harvest strategy provides about the same total yield as the current ADFG harvest strategy; although the benefits of the revised control rule won't likely be felt for at least 5-10 years post implementation.

With respect to AI Golden king crab, this stock is proposed as a Tier 5 species with the OFL set as the average of total catch between 1985 and 2005. The OFL is subject to revision if the SSC is provided new information which either updates the current OFL or improves the total available information thus changing the tier level used to set OFL. Average catch over the period '85-05' is 7.527 million pounds. If the TAC is set at 75% of the OFL, TAC would be 5.646 million pounds (slightly less than the current allowable harvest of 5.7 million pounds). Moreover, as long as the stock remains a Tier 5 species, should the stock abundance improve, there is no way to increase the OFL unless the SSC adapts (based on "best available science") some ad hoc multiplier to increment the average catch (an unlikely proposition).

If you have any questions please don't hesitate to contact me.

Sincerely,



Jack V. Tagart, Ph.D.

Attachments (1): Written comments on the draft EA.

February 5, 2007

Dr. Gordon Kruse, Chairman
North Pacific Fishery Management Council
Scientific and Statistical Committee

Re: February 2007 SSC Meeting, Agenda Item D-2(a) – Initial review of BSAI crab overfishing definition analysis: Crab Plan Team Review Draft Environmental Assessment for proposed Amendment 24 to the Fishery Management Plan for Bering Sea and Aleutian Island King and Tanner Crabs to Revise Overfishing Definitions.

Testifying on behalf of the Bering Sea Fisheries Research Foundation (BSFRF), Gary Painter, President.

Dr. Kruse:

The NPFMC Crab Plan Team is presenting its initial draft EA of proposed changes to the BSAI Crab FMP overfishing definitions in which the expected impacts of those changes on the management system and fishery are evaluated. We want to commend the Plan Team for persevering on what we recognize is a very difficult technical task. We have reviewed the draft EA and have the following comments:

Process: The EA makes a point of documenting a deliberative process employed by the Plan Team and their technical working group to arrive at this EA. While the public was allowed to participate in formal Crab Plan Team meetings, Council and SSC meetings where the overfishing definitions were discussed, most of the heavy lifting in the conceptualization, development and illustration of the implementation of the proposed overfishing revisions has been undertaken by the Plan Team overfishing working group and their business has been conducted predominately in private. The EA makes note of two levels of independent review of the proposed overfishing definitions: a biological workshop held in February 2006 and subsequent CIE review conducted in April 2006 (Appendices D and E). The BSFRF wishes to note that neither of these workshops was open to the public. During the long evolution of the proposed revisions to the overfishing definitions there has been disagreement among working group members regarding how best to conceptualize and parameterize population models integral to the development of evaluation tools used in the EA. Consensus among working group members on how to resolve these disagreements was not reached until July 2006, following the independent reviews. Consequently, the EA represents the first documentation of the working group's agreed methodology for evaluation of the overfishing definitions accessible to the public. Because this is a complicated technical issue, we are asking the SSC to assure that there is sufficient time allotted to allow the public to review and understand the methodologies employed in the EA and the implications of the proposed changes to the OFL rules. We do not believe the EA needs to rush to final approval in April 2007.

Issues: Our immediate issues with the draft EA include the following: 1) organization, 2) clarity of presentation, 3) technical interpretation of results and 4) errors and omissions.

Organization: The organization of the EA is a bit clumsy. In particular section 3 (Effects on Crab Stocks) is a little hard to follow. One would expect discussions of individual crab stocks to be subsections of section 3 rather than independent sections as outlined in the EA. We are not sure if this was a word processing numbering glitch or an intended structure but it detracts the reader. Sections of the document are referenced which do not exist (e.g., p 24 refers to section 3.5.3, p 33 refers to section 3.2.3 neither of which exist).

Organization is in part a matter of personal preference and NEPA necessity. There may be utility in arranging the presentation of the crab stock impacts of revised OFL definitions by aggregating by the proposed OFL tier for the stock, i.e, tier 3 stocks as a group, tier 4 stocks as a group, and tier 5 stocks as a group. The authors can present the characteristics of the tier as applied to all stocks then illustrate the impacts to particular stocks within the tier.

Clarity of Presentation: The EA has the feel of a hurried draft document and would probably profit from the opportunity to polish the content to make the document more readable.

Throughout the EA the critical abundance index relevant to revised definitions of OFL is the B_{MSY} expressed as mature male biomass (MMB). In repeated instances the writers comment on B_{MSY} and/or MMB while presenting figures or text that references number of mature males. To illustrate, see page 34-35 discussion of Pribilof District red king crab where the authors cite Figure 4-4 to note that the stock is well below its B_{MSY} proxy; however, the figure portrays crab abundance in millions of crabs not biomass. Moreover, the quantities associated with the B_{MSY} are never expressed. This type of inconsistent presentation makes important comparisons extremely difficult.

Section 2.2.3.1 attempts to explain why the Plan Team elected to characterize spawning biomass as MMB rather than the more traditional mature female biomass or total egg production. The section is choppy and absent an independent background on the topic we believe the reader would have difficulty following the rationale presented.

When transitioning from discussions of OFLs under Alternative 1 to those under Alternative 2 and 3, the index of abundance shifts from total mature biomass (TMB) to MMB. The document does not necessarily make the distinction apparent. Clarity is needed here to make this transition.

Technical Interpretation: The single most glaring problem we find is the lack of a summary of the Alternative 1 versus Alternative 2-3 OFLs for each stock. We believe that for each managed crab stock there should be a table that provides the information required (actual numbers) to specify the OFL for each alternative (1 versus 2-3) in a given year. For example, under alternative 1 we need the mean TMB 1983-1997, M , and the TMB in year t to estimate the OFL for year t . For Alternative 2-3, we need the B_{MSY} or B_{MSY} proxy, F_{MSY} or

F_{MSY} proxy, M and α , β , and γ to compute the OFL. Where proxy values are provided they should be defined (e.g., $F_{35\%}$ or $F_{40\%}$). For each stock and each alternative the estimated OFL for a given year should be stipulated. In such a presentation it would be better not to confuse the GHM or TAC setting estimates with the OFL estimates.

We recommend that the Plan Team illustrate the consequence of implementing the revised OFL definitions by showing what the revised OFLs (Alternatives 2 and 3) would have been in the last 3 to 5 years (2001-2006) compared to what they were under Alternative 1. Tables 4-7 (p 49) and 7-9 (p 74) are an attempt to create the type of contrast we are seeking but they utilize projected population abundance of king crab and snow crab; moreover, labels on these tables do not bring focus to the Alternative 1 versus Alternative 2 OFL view of the world. Similarly, section 12.7 reprises the projections and attempts to itemize anticipated OFLs without the comprehensive tabular data we believe are needed. Part of the difficulty associated with interpretation of the potential outcomes is missing information, another part is labeling and organization of existing information.

The search for proxy values under tier 3 relies on a projection model for king crab and snow crab using parameter values adapted from the respective population models. In particular, the projection models rely on estimated recruitment from a fitted spawner-recruit function for each of these stocks. The fitted S/R function regression parameters are not presented in the EA nor are the estimates of the root mean square errors. Since neither stock is proposed to be regulated as a tier 1 stock we conclude that there is no reliable S/R estimate. This begs the question on the sensitivity of the estimated proxy values to alternate S/R functions. We are unable to determine if the range in S/R steepness employed in the projection model generates a set of recruitments that covers the dynamic range of the population model estimates of recruitment. The authors could provide plots of the simulated recruitment distribution versus spawning stock size and contrast with the observed values used to generate the function.

Although the SSC embraced the snow crab population model in the October 2006 review of the crab SAFE, we continue to have concerns that the model has not stabilized. For example, there were dramatic shifts in estimated survey selectivity between the 2005 model and the 2006 model. Survey selectivity estimates in the 2006 model are substantially different than those generated independently by Somerton and Otto (see Figure 23, p A 46 of the 2006 Crab SAFE). Because the model is critical to calculations of the proxy overfishing levels we ask the SSC to evaluate the outcomes with a very critical eye.

We are confused by the discussion of snow crab handling mortality (p 75-77). For the main portion of the simulation analysis, parameters of the S/R curve are estimated using recruitment data from 1978 to 2006 where steepness for the Beverton-Holt (B-H) S/R curve is estimated to be 0.68 (p 64). The main simulations consider handling mortality at 25% and 50% without any changes in the B-H steepness parameter. In the discussions of the effects of handling mortality, S/R curves are fit to recruitment data from 1985 to 2005, for fixed levels of handling mortality 25%, 40%, 50% and 60%. Because the population model estimates of recruitment change with different handling mortality rates, the B-H steepness parameters for each handling mortality level were estimated to be 0.72, 0.72, 0.75 and 0.73 respectively. (Note, the displayed B-H curve for handling mortality rate 50% (Figure 7-4c) is completely

different than those for the other handling mortality rates.) Yield curves in Figure 7-4 indicate an evaluation conducted over the range of handling mortality assuming a B-H S/R function with steepness 0.53. Needless to say, we don't understand why h should be set to 0.53 in this circumstance. We also note the apparent sensitivity of the S/R curve estimated steepness to the different data input time periods (1976-2006 $h=0.68$ versus 1985-2005 $h=0.72-0.75$).

Tier 5 OFL values rely on average catch. The rule as proposed sets the time period to average the catch as 1985 to 2005 (21 y). The SSC is given license to amend the OFL based on best available science. Establishment of a fixed time period to stipulate stock productivity was one of the deficiencies in the status quo OFL control rule. Should the SSC elect to construct a moving average for the catch or increment the time period with each new year of catch, given the need to create a buffer between OFL and TAC, the OFLs for tier 5 stocks could only decline over time.

Errors or Omissions: We believe the description of Alternative 3 is incorrect. The distinction between Alternative 2 and Alternative 3 is in the timing for the computation of OFLs. Alternative 2 has the Council set the OFLs annually in June, relying on model and survey estimated abundance that used input data from the prior years trawl survey. Alternative 3 is intended to have the Council chose the process for setting OFLs annually in June, but allow the OFL calculations to take advantage of the current year's trawl survey data, computing the OFLs in September-October of each year. Language in Alternative 3 as written precludes updating Tier 1-Tier 3 modeled population estimates with the current year's survey data. The language as it now reads is "Final determination of model parameters and tier levels would be established by the SSC meeting and reviewed by the Council at the June meeting. OFLs would be calculated after the survey data are available in late August. Model parameters would not be changed in the interim." Since incorporation of a summer survey biomass data point and attendant size data into a population model would be associated with a revised estimate of parameters (recruitment, selectivity, fishing mortality, etc), the modeled populations look as though they are indeed excluded from the opportunity to update information made available by Alternative 3. We do not believe this was the intent of the alternative.

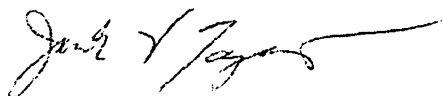
With respect to selecting the process for setting OFLs in June under Alternative 2, it is unclear precisely what the Councils options would be. We surmise that the Council would simply stipulate the OFL tier that will be used to set the OFL following incorporation of current year survey data. Under this scenario, it is possible for stocks whose June classification is tier b (i.e., 3b, or 4b) to see an improvement in survey estimated stock abundance such that current biomass exceeds B_{MSY} following the incorporation of current survey data. Thus the September-October calculation of OFL, if held to the June tier b requirement would cause the F_{OFL} to be greater than F_{MSY} because $B_{MSY}/B_{current}$ would be greater than 1.

References to actual calculated OFL levels are often omitted. In the Executive Summary (p iv) the Bristol Bay OFL control is said to be $F_{35\%}$; this is incorrect, $F_{35\%}$ is the proxy F_{MSY} the control rule is much more complicated than the simple proxy fishing mortality rate. On page

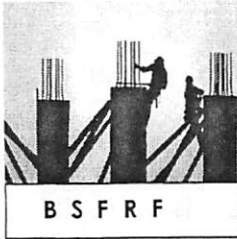
1 of the document the first list is miss-numbered 4-6 when it should be 1-3. For Tier 4 stocks the OFL control rule is silent on what constitutes an estimate of $B_{MSYproxy}$. On page 20 the EA references tables of survey estimated abundance; these tables are not provided within the EA. On page 24 there is a reference to section 3.5.3 which does not exist. Page 27 references projection model formulas in Appendix B, but they are actually in Appendix A. Page 33 cites Figure 3-8 but should cite Figure 4-9, and there is a reference to section 3.2.3 which does not exist. We are certain there are additional labeling errors, but our point is made.

Summary: The BSFRF is as anxious as any to see a sound scientifically credible revision to the OFL definitions that helps us to assure long-term sustainability of the managed crab stocks. There are clear problems in the current EA as drafted which we believe can be remedied. We have confidence that the SSC will assure the final product is improved and that the anxious public has adequate time to review the analyses, absorb the consequences of the proposed actions and present comments as needed.

Sincerely,



Jack V. Tagart, Ph.D.
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BERING SEA FISHERIES RESEARCH FOUNDATION

620 6TH ST. SOUTH KIRKLAND, WA 98033

FORGING COOPERATIVE RESEARCH PARTNERSHIPS IN THE BERING SEA

March 21, 2007

Dr. Doug DeMaster
Director, Alaska Fisheries Science Center
7600 Sand Point Way NE
Seattle, WA 98115

Re: Cooperative Work/Snow Crab Model

Dear Doug:

Bering Sea Fisheries Research Foundation (BSFRF) and Alaska Fisheries Science Center (AFSC) have established a successful track record of cooperative research on Bering Sea crab resources over the past three years. Together, we have now drafted an update to our Memorandum of Agreement (MOA), which will carry our cooperative research through the spring of 2008. Most of our cooperative research to date has focused on Bering Sea crab resource assessment surveys aimed at expansion of snow crab assessment to the northeast and completion of the 2005 pilot survey of Bristol Bay red king crab to evaluate new crab assessment survey gear and sampling designs. While these efforts are progressing well and are slated to continue during the next year, the BSFRF sees a strong need to also focus on the revision of Bering Sea crab "Over Fishing Definitions" and review of the population dynamics models developed for revising the over fishing definitions.

At this point, our primary focus is on the Bering Sea snow crab model, generally referred to as the "Turnock Model." We would like to establish a procedure whereby BSFRF could gain access to this model for the purpose of conducting a series of sensitivity analyses. Given the importance of this model in future crab management, it may be most desirable to include Crab Plan Team members from Alaska Department of Fish and Game (ADF&G) and the North Pacific Fishery Management Council (NPFMC) in the determination of sensitivity tests and their analysis. In any case, BSFRF is prepared to hire the expertise to understand the model, evaluate biological reference points, and participate in conducting a series of sensitivity analyses. We appreciate your suggestions on how to proceed with this task, how BSFRF would gain

access to the model, and how this work could be best accomplished in a cooperative manner.

We see the work herein proposed as an extension to the work conducted by the Center of Independent Experts (CIE) in April 2006. Below is an initial listing of Bering Sea snow crab model sensitivity issues that we would like to see evaluated:

1. Natural mortality
 - a. Inductive reasoning to rationalize estimate of M.
 - b. M is assumed to be different for males and females, but set to 0.23 for both sexes in model.
 - c. How sensitive is model outcome to alternate estimates of M; what is a plausible range?
2. Growth increments
 - a. Two-parameter linear function estimated in the model with priors from EBS observed data. Observations are limited (n=14 for male, 0 for female).
 - b. Parameter estimates give the appearance of a tight constraint, i.e., may not be allowed to wander too far from the prior values.
 - c. What is the sensitivity of the constraints on parameter estimates?
3. Distribution of lengths for each molt (i.e., growth transition matrix)
 - a. For each size bin lengths are distributed according to a gamma function (this is a two parameter pdf) where alpha is set as the mean growth increment from the linear function above, and beta is fixed at 0.75.
 - b. What is the sensitivity of the size distribution to the fixed beta parameter?
 - c. Perhaps the variance should be fixed and both alpha and beta estimated freely?
4. Fishery selectivity
 - a. A single estimated selectivity function for all years.
 - b. Ample evidence that selectivity may have changed over time due to changes in escape panel requirements, and the spatial distribution of the fleet.
 - c. What is the sensitivity of the model to single versus multiple periods of estimated fishery selectivity?
5. Survey selectivity
 - a. Currently estimated in three periods.
 - b. Model estimate for 1989 to present is grossly different than the independent estimates of Somerton and Otto (1999) [see Figure 23, p A-46 of the 2006 Crab SAFE].

c. Why the large difference?

6. Survey q

- a. Survey catchability appears fixed at 1 for all three selectivity periods.
- b. Previously estimated a $q < 0.6$ for period 1.
- c. In some years, catch equals or exceeds survey estimated abundance of legal male crab: q is likely less than 1.

7. Priors and penalties

- a. Prior values are reported but penalties for deviation from the priors are not.
- b. What is the sensitivity of the priors and constraints on deviations from the priors?

8. Recruitment

- a. Different size distribution for incoming recruits (i.e., gamma function) than for distribution of lengths between molts (growth transition matrix).
- b. Beta parameter fixed at 1.5, alpha estimated in the model.
- c. Question of sensitivity to fixed beta.

9. Population projections

- a. Sensitivity of the assumed S/R function to population projections.
- b. Utility of the mature male biomass to predict recruitment.

10. Handling mortality

- a. Model assumes 50% HM, management assumes 25%.
- b. How sensitive is the model to different estimates of discard mortality?

11. Discard estimates

- a. Model estimates discards prior to 1991 based on selectivity estimates from 1992 to present, but admits possible bias due to different escape panel regulations
- b. How sensitive is the model to estimated discard?

12. Maturity

- a. The male maturity schedule is estimated based on "morphometrics" using the size of the chelae.
- b. Schedule previously estimated from a logistic function (poorly fit the empirical data), currently estimated as individual probability at a given size from empirical observations.
- c. How good is the current data, and how sensitive is the model to the estimated schedule?

Doug DeMaster
March 21, 2007
Page 4

At this point Doug, we look forward to your suggestions on how to proceed. We support an open evaluation process and the sharing of results with the National Marine Fisheries Service (NMFS), ADF&G and the crab industry. We believe that the evaluation should move forward quickly so that results may be available for further development of NPFMC's Amendment 24. Thanks for your consideration and I look forward to hearing from you.

Sincerely,

Bering Sea Fisheries Research Foundation

Steve Hughes
Executive Director

SEH:eni

CC: Denby Lloyd, Commissioner, ADF&G
Stephanie Madsen, Chair, NPFMC
Chris Oliver, Executive Director, NPFMC
Gary Painter, President, Bering Sea Fisheries Research Foundation
Jim Coe, Assistant Director, AFSC
Forrest Bowers, Chair, Crab Plan Team
Wayne Donaldson, Director, Westward Shellfish Region ADF&G
Russ Nelson, Director, RACE Division AFSC
Pat Livingston, Director, REFM Division AFSC
Steve Minor, Chairman, PNCIAC

EXECUTIVE SUMMARY

The king and Tanner crab fisheries in the Exclusive Economic Zone (3 to 200 miles offshore) of the Bering Sea and Aleutian Islands (BSAI) off Alaska are managed under the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (FMP). The FMP establishes a State/Federal cooperative management regime that defers crab fisheries management to the State of Alaska with Federal oversight. The FMP defers much of the management of the BSAI crab fisheries to the State of Alaska using the following three categories of management measures:

1. Those that are fixed in the FMP and require an FMP amendment to change;
2. Those that are framework-type measures that the State can change following criteria set out in the FMP; and
3. Those measures that are neither rigidly specified nor frameworked in the FMP and are at the discretion of the State.

The proposed action is to establish a set of overfishing levels (OFLs) that provide objective and measurable criteria for identifying when a BSAI crab fishery is overfished or when overfishing is occurring, in compliance with the Magnuson-Stevens Act. The Magnuson-Stevens Act, in §303(a)(10), requires that FMPs specify objective and measurable criteria for identifying when the fishery is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stock). The OFLs are a Category 1 measure in the FMP. As such, revisions to the OFLs require an FMP amendment.

Determinations of total allowable catches (TACs) and guideline harvest levels (GHLs) are a Category 2 management measure and are deferred to the State following the criteria in the FMP. Catch levels established by the State must be in compliance with OFLs established in the FMP to prevent overfishing. As described in Chapter 2, NMFS annually determines if catch levels exceed OFLs or if stocks are overfished or are approaching an overfished status. If either of these occurs, NMFS notifies the North Pacific Fishery Management Council (Council) and the Council must immediately end overfishing and develop an FMP amendment to the rebuild the stock within two years.

Purpose and Need

Chapter 1 describes the proposed action and its purpose and need. The purpose of the proposed action is to establish status determination criteria in compliance with the Magnuson-Stevens Act and the national standard guidelines. The current OFLs were implemented under Amendment 7 to the FMP in 1998. In the environmental assessment (EA) for that amendment, the Crab Plan Team stated its intent to review the definitions after 5 years or when environmental conditions have changed such that revising the definitions may be necessary.

The need for the proposed action is explained in the Crab Plan Team's problem statement:

New overfishing definitions are necessary to reflect current scientific information and accomplish the following:

- *Provide an FMP framework for definition values to facilitate use of the best available scientific information as it evolves.*
- *Provide a new Tier system that accommodates varying levels of uncertainty of information and takes advantage of alternative biological reference points.*
- *Define the status determination criteria and their application to the appropriate component of the population.*

Alternatives

Chapter 2 describes and compares the three alternatives and two sets of options. The alternatives and option analyzed in this EA are consistent with the Magnuson-Stevens Act and the national standard guidelines. Chapter 2 also provides (1) a comparison of the status determination criteria under each alternative, (2) a comparison of the two options for OFL setting and review process under Options 1 and 2, and (3) the a discussion of alternatives considered and eliminated from detailed study.

Table EX-1 Alternative and Options analyzed in this Environmental Assessment.

Alternatives	Options
Alternative 1: Status quo	Option A: Remove Specific Stocks from FMP or Option B: Status quo - no removal of stocks
Alternative 2: Tier system with five Tiers	Option 1: Council annually adopts OFLs in June or Option 2: Council annually reviews OFLs in the Fall
	Option A: Remove Specific Stocks from FMP or Option B: Status quo – no removal of stocks
Alternative 3: Tier system with six Tiers	Option 1: Council annually adopts OFLs in June or Option 2: Council annually reviews OFLs in the Fall

The three alternatives are summarized as follows:

Alternative 1: (Status Quo) Amendment 7 provided fixed values in the FMP for the status determination criteria: minimum stock size threshold (MSST), maximum sustainable yield (MSY), optimum yield (OY), and maximum fishing mortality threshold (MFMT) for the BSAI king and Tanner crab stocks.

Alternative 2: Tier system with five Tiers. The FMP amendment would specify the Tier system and a framework for annually assigning each crab stock to a Tier and for setting the OFLs (see Options 1 and 2). The Tier system with five Tiers would provide an OFL for all FMP stocks (see Options A and B).

Alternative 3: Tier system with six Tiers. The FMP amendment would specify the Tier system and a framework for annually assigning each crab stock to a Tier and for setting the OFLs (see Options 1 and 2). The Tier system with six Tiers would provide an OFL for stocks with sufficient catch history and, in Tier 6, set a default OFL of zero for those stocks with insufficient information from which to set an OFL, unless the SSC establishes an OFL based on the best available scientific information

The two sets of options are summarized as follows:

Options 1 and 2 provide options for the OFL setting and review process by which stocks would be annually assigned to Tier levels, the OFLs would be set, and the timing of the annual review process by the Crab Plan Team, Scientific and Statistical Committee, and Council.

Option 1: Council annually adopts OFLs. In June, the Council would adopt the final Tier level assignments and OFLs for each stock. OFLs would be determined based upon model estimates prior to the summer survey because the Council would adopt the OFLs before the survey.

Option 2: Council annually reviews OFLs. OFLs would be calculated after the survey data are available in late August. The Council would review the status of the stocks, the OFLs, and the TACs in the Fall.

Options A and B provide options for the stocks managed under the FMP, and therefore, determine the stocks for which OFLs are required.

Option A: This option would remove eleven stocks from the FMP for which the State is interested in the conservation of management of the stock and there is no need for additional Federal management.

Option B: Status quo FMP species

Status determination criteria

The status determination criteria provided in Alternative 1 are fixed in the FMP and reflect the understanding of crab biology and abundance at the time that Amendment 7 was adopted. Alternatives 2 and 3 were designed to incorporate this new scientific information and provide a mechanism to continually improve the status determination criteria as new information becomes available. Alternatives 2 and 3 use a Tier system that accommodates varying levels of uncertainty of information and takes advantage of alternative biological reference points in setting the OFLs. The OFLs established under these alternatives would be specified for the appropriate component of the population.

Table Ex-2 provides a comparison of the biological reference points provided in the alternatives. Additional information on the biological reference points for specific species is contained in the Chapter for that species.

Table Ex-2 Comparison of biological reference points used in the alternatives.

Biological Reference Points	Alternative 1 (Status quo)	Alternatives 2 and 3
Maximum Sustainable Yield (MSY) or MSY proxy	average of the annually computed sustained yield over the 15-year period, 1983-1997 (total mature biomass * M)	Calculated by applying F_{MSY}^{\dagger} or F_{MSY} proxy [†] in Tier system to appropriate biomass estimate
MSY Biomass (B_{MSY})	average annual estimated total mature biomass for the 15-year period, 1983-1997	Mature male biomass [†] at MSY level
Minimum stock size threshold (MSST)	$\frac{1}{2} B_{MSY}$	$\frac{1}{2} B_{MSY}$
Maximum fishing mortality threshold (MFMT or F_{OFL} control rule)	MSY control rule applied to the current total mature biomass	F_{OFL} control rule calculated by applying Tier system: Tiers 1 and 2 – MSY and F_{MSY} Tier 3 - F_{MSY} proxy = $F_{35\%}^{\dagger}$ Tier 4 - F_{MSY} proxy = $\gamma^{\dagger} * M$
MSY control rule	M	F_{OFL} control rule
Natural mortality rate (M)	0.2 for all species of king crab 0.3 for all <i>Chionoecetes</i> species	0.18 [†] for all species of king crab 0.23 [†] for male and 0.29 [†] for female <i>Chionoecetes</i> species
Sustainable yield (SY)	Total mature biomass * M	N/A
Optimum yield (OY)	OY range 0 - MSY	OY range 0 - < OFL level catch

[†] These parameters are frameworked in the Tier system and the values used for this analysis are based on the best available scientific information and can change with new scientific information through the OFL setting process outlined in Options 1 and 2.

Timing of OFL determination

The timing of the OFL determinations is important because it determines two key factors: (1) who the decision-maker can be, and (2) what information is used in the OFL determinations. Timing also impacts the level and extent of peer review and information shared with the public. Options 1 and 2 establish different processes for OFL setting and review. The OFL setting and review process establishes (1) the placement of stocks into Tiers; (2) the information utilized in the projection models for OFL determination; (3) the setting of the OFLs; and (4) the determinations of the status of the stocks relative to the OFLs. This review process includes the SSC and the Council review for determining appropriate Tier levels and OFLs on an annual basis.

The timing of the OFL determinations similarly affect the fisheries for the surveyed stocks, Bristol Bay red king crab, snow crab, Tanner crab, Pribilof Islands king crab, and Saint Matthew blue king crab. Stocks not subject to the NMFS annual eastern Bering Sea trawl survey are not impacted by the timing of the OFL determinations.

Crab Stocks Under the FMP

The FMP manages 22 crab stocks. NMFS annually surveys five of these 22. Option A would remove eleven specific stocks from the FMP for which there is no directed fishery, a limited exploratory fishery, or the majority of catch occurs in State waters. The State would have sole management authority for these species, as they do for hair crab (the hair crab fishery, which occurs in the EEZ, was removed from the FMP).

Summary of the environmental consequences of the alternatives

This EA evaluates the alternatives and option for their effects within the action area. The environmental consequences of each alternative for 22 crab stocks under the FMP, crab bycatch in the groundfish fisheries, Endangered Species Act-listed marine mammals and seabirds, and the economy, are assessed in Chapters 4 through 13 of this EA.

This EA Tiers off of the Bering Sea Aleutian Islands Crab Fisheries Final Environmental Impact Statement (NMFS/NPFMC 2004) to focus the analysis on the issues ripe for decision and eliminate repetitive discussions. The Crab EIS provides the status of the environment and analyzes the impacts of the crab fisheries on the human environment, including habitat, the ecosystem, non-target species, safety, and community impacts. This EA details the specific impacts of the proposed action to establish overfishing definitions for the crab stocks under the FMP.

Bristol Bay Red King Crab

Under Alternative 1, the B_{MSY} for Bristol Bay red king crab is 89.6 million pounds of total mature biomass and the MSST is 44.8 million pounds. The 2006 total mature biomass estimate is above B_{MSY} at 157.2 million pounds. Under Alternatives 2 and 3, the Bristol Bay red king crab estimate of B_{MSY} would be 74.79 million pounds of mature male biomass. For comparison, the 2006 estimate of mature male biomass for this stock is 65.5 million pounds. Thus, this stock status would be below B_{MSY} under the Alternative 2 and 3, rather than above it as with Alternative 1.

Under Alternative 1, overfishing occurs when the TAC is above the estimated sustained yield (SY). The Bristol Bay red king crab TAC for the 2006/2007 fishery was 15.5 million pounds, which is below the 2006 SY of 31.4 million pounds. Under Alternatives 2 and 3, overfishing would be defined as any amount of fishing in excess of a prescribed maximum allowable rate as prescribed through the Tier system described in Chapter 2. The recommended OFL control rule for the Bristol Bay red king crab stock is an $F_{35\%}$ control rule.

To evaluate the impacts of the alternatives on Bristol Bay red king crab, fourteen harvest strategy scenarios were investigated to predict the changes in stock abundance levels under various harvest rates. For Alternative 1, two harvest control rules were simulated to predict the possible effects of this alternative on stock biomass; the status quo harvest strategy and fishing at the status quo OFL control rule. For Alternative 2 and 3, an evaluation was made of control rules in Tiers 2 to 5.

The Alternative 2 and 3 harvest control rule scenarios produced higher retained yield and lower mean rebuilding time compared to the Alternative 1 scenarios. The status quo harvest strategy performed similarly or slightly worse than some of the Alternative 2 and 3 scenarios. Fishing under the Alternative 1 OFL control rule performed worst of all, with very low mean number of recruits, a higher overfished percentage, and no stock rebuilding.

Pribilof Islands Red King Crab

The Alternative 1 status determination criteria for Pribilof Island red king crab established a B_{MSY} of 6.6 million pounds of total mature biomass and an MSST of 3.3 million pounds. The 2006 total mature biomass estimate is above B_{MSY} at 19.0 million pounds. Under Alternatives 2 and 3, the Pribilof Islands king crab estimate of B_{MSY} proxy would be 7.82 million pounds of mature male biomass. For comparison, the 2006 estimate of mature male biomass for this stock is 6.43 million pounds. Thus, this stock status would be below B_{MSY} proxy under the Alternative 2 and 3, rather than above it as with Alternative 1. The stock would still be above its MSST proxy, and thus would not be considered overfished.

Other Red King Crab

For the remaining red king crab stocks, no status determination criteria were established under the Alternative 1. Under Alternatives 2 and 3, Dutch Harbor red king crab and Norton Sound red king crab stocks would be managed under Tier 4, while Adak red king crab would be managed under Tier 5. Status determination criteria are provided for Tier 4 stocks, while maximum fishing mortality rates would be prescribed by the Tiers 4 and 5 formulas. Under Alternatives 2 and 3, the 2006 Norton Sound red king crab mature male biomass would be well above the B_{MSY} proxy and the MSST proxy.

Snow Crab

Under Alternative 1, snow crab has been declared overfished and is under a rebuilding plan. The Alternative 1 status determination criteria for snow crab establish a B_{MSY} of 921.6 million pounds of total mature biomass and an MSST of 460.8 million pounds. The 2006 total mature biomass estimate is 547.6 million pounds, above the MSST for this stock but below the B_{MSY} . While the estimated total mature biomass under Alternative 1 is above MSST, and hence no longer in an overfished condition, this stock remains under a rebuilding plan until the stock is above B_{MSY} for two consecutive years.

The status of snow crab is similar under the three alternatives. Under Alternatives 2 and 3, B_{MSY} for snow crab would be measured by mature male biomass. The long-term B_{MSY} estimate for the stock would be 413.4 million pounds of mature male biomass. An MSST for this stock would be 206.7 million pounds. The 2006 mature male biomass estimate is 211 million pounds and just above this MSST.

Under Alternative 1, overfishing occurs when the TAC is above the estimated SY. The snow crab TAC for the 2006/2007 fishery was 36.6 million pounds, which is below the 2006 SY of 164.5 million pounds. Under Alternatives 2 and 3, overfishing would be defined as any amount of fishing in excess of a prescribed maximum allowable rate as prescribed through the six Tiers described in Chapter 2. The recommended OFL control rule for the snow crab stock is an $F_{35\%}$ control rule.

To evaluate the impacts of the alternatives on snow crab, thirteen harvest strategy scenarios were investigated to predict the changes in stock abundance levels under various harvest rates. For Alternative 1, two harvest control rules were simulated to predict the possible effects of this alternative on stock biomass; the status quo harvest strategy, and fishing at the Alternative 1 OFL control rule. For Alternatives 2 and 3, an evaluation was made of the control rules in Tiers 2 to 5.

The status quo harvest strategy control rule and the $F_{35\%}$ control rule produced similar simulation results for rebuilding times, and short-term and long-term yields. Fishing at the Alternative 1 OFL control rule did not rebuild the stock.

Tanner Crab

Under Alternative 1, Tanner crab has been declared overfished and is under a rebuilding plan. The Alternative 1 status determination criteria for eastern Bering Sea Tanner crab establish a B_{MSY} of 189.6 million pounds of total mature biomass and an MSST of 94.8 million pounds. The 2006 total mature biomass estimate is 253.3 million pounds, above the B_{MSY} for this stock. While the total mature biomass under Alternative 1 estimate the stock above its B_{MSY} , this stock remains under a rebuilding plan until the stock is above B_{MSY} two consecutive years.

Under the Alternative 2 and 3 status determination criteria, B_{MSY} for Tanner crab would be measured in mature male biomass. The long-term B_{MSY} estimate for the stock would be 63.25 million pounds of mature male biomass, with an MSST of 31.62 million pounds. For comparison, the 2006 estimate of Tanner crab mature male biomass is 62.76 million pounds. Therefore, under Alternatives 2 and 3, this stock would be above the MSST but below its B_{MSY} in 2006.

Under Alternative 1, overfishing occurs when the TAC is above the estimated SY. The Tanner crab TAC for the 2006/2007 fishery was approximately 3 million pounds, which is below the 2006 SY of 76.1 million pounds. Under Alternatives 2 and 3, overfishing would be defined as any amount of fishing in excess of a prescribed maximum allowable rate as prescribed through the six Tiers described in Chapter 2. Overfishing would be evaluated by comparison of actual harvest rates and the recommended control rules for this stock. Under Alternatives 2 and 3, an $F_{35\%}$ control rule would be the recommended OFL control rule for Tanner crab. Harvest rates in recent years have been well below this control rule.

To evaluate the impacts of the alternatives on Tanner crab, twelve harvest strategy scenarios were investigated to predict the changes in stock abundance levels under various harvest rates. For Alternative 1, two harvest control rules were simulated to predict the possible effects of this alternative on stock biomass; the status quo harvest strategy and fishing at the Alternative 1 OFL control rule. For Alternatives 2 and 3, an evaluation was made of control rules under Tiers 2 to 4.

Alternatives 2 and 3 simulations with an $F_{35\%}$ control rule produced higher retained short-term and long-term yields. The status quo harvest strategy was satisfactory, with performance similar to the Alternative 2 and 3 scenarios. Fishing under the Alternative 1 OFL control rule performed worst of all, with a very low mean number of recruits, higher overfished percentage, and much lower long-term biomass.

Under Alternative 1, no estimates of B_{MSY} or MSST are made for the other Tanner crab stocks. Under Alternative 2 and 3, the eastern Aleutian Islands Tanner crab stock would be under Tier 4. For this analysis, average biomass from 1999 to 2005 was used as a B_{MSY} proxy for eastern Aleutian Islands Tanner crab. Stock status would be below its B_{MSY} proxy but above MSST proxy. Historical comparison of stock status shows that the stock was below the MSST proxy in all years prior to 2000, with the exception of 1999. Under Alternative 3, Western Aleutian Islands Tanner crab would be under Tier 6 due to lack of available information and a default OFL would be set a zero for this stock. Under Option A, Eastern and Western Aleutian Islands Tanner crabs would be removed from the FMP and managed by the State.

Blue King Crab

Under Alternative 1, Pribilof Islands blue king crab and Saint Matthew blue king crab have been declared overfished and are under rebuilding plans. Under Alternatives 2 and 3, both of these stocks would be managed as Tier 4 stocks. As such, proxy B_{MSY} values would be estimated but no MSST. Under Alternatives 2 and 3, the status of these blue king crab stocks would be similar to the status under Alternative 1.

The Alternative 1 status determination criteria for Pribilof Island blue king crab establish a B_{MSY} of 13.2 million pounds of total mature biomass and an MSST of 6.6 million pounds. The 2006 total mature biomass estimate is 1.6 million pounds, well below the MSST for this stock. Under Alternatives 2 and 3, the Pribilof Islands blue crab estimate of B_{MSY} proxy would be 6.68 million pounds of mature male biomass, with an MSST of 3.34. For comparison, the 2006 estimate of mature male biomass for this stock is 0.63 million pounds.

For Saint Matthew blue king crab, a B_{MSY} of 22.0 million pounds of total mature biomass was established with an MSST of 11.0 million pounds. The 2006 total mature biomass estimate for this stock is 11.2 million pounds, just slightly above the MSST. Under Alternatives 2 and 3, the Saint Matthew blue king crab estimate of B_{MSY} proxy would be 13.92 million pounds of mature male biomass, with an MSST of 6.96 million pounds. For comparison, the 2006 estimate of mature male biomass for this stock is 7.41 million pounds.

Under Option A, Saint Laurence blue king crab would be removed from the FMP and managed by the State.

Golden King Crab

Under Alternative 1, no estimates of B_{MSY} or MSST are made for any of the golden king crab stocks. Under Alternatives 2 and 3, two golden king crab stocks (Pribilof Islands, Aleutian Islands) are preliminarily recommended for Tier 5. Under Tier 5, the OFL would be set using a fishing mortality estimate based on average catch. For Aleutian Islands golden king crab, if average catch is used to establish an OFL for this stock, the OFL would be very close to the current total allowable catch. Under Alternative 3, Saint Matthew golden king crab would be recommended for placement in Tier 6 whereby a default OFL would be set at zero. Option A would remove Saint Matthew golden king crab from the FMP to be managed by the State.

Other Crab Stocks

Under Alternative 1, no B_{MSY} or MSST was specified for these stocks and the maximum fishing mortality threshold was based on the MSY control rule of 0.3 for Tanner crabs and 0.2 for king crabs.

Under Alternative 2, these stocks would all be under Tier 5, OFLs would be calculated for each stock based upon average catch.

Under Alternative 3, these stocks would be under Tier 6. For Tier 6 stocks, a default OFL would be set equal to zero, unless the SSC determines a value based on the best available information. No additional status determination criteria are currently estimated for these stocks nor proposed under the revised definitions.

Option A would remove the following other crab stocks from the FMP; EBS grooved Tanner crab, Eastern Aleutian Islands grooved Tanner crab, and Western Aleutian Islands grooved Tanner crab, Aleutian Islands scarlet king crab, EBS scarlet king crab, Bering Sea triangle Tanner crab, and Eastern Aleutian Islands triangle Tanner crab. The State would continue to manage these stocks.

Incidental Catch Limits

Chapter 10 analyzes the effects of the alternatives on crab caught incidentally in the BSAI groundfish fisheries. Bycatch limits are established in BSAI groundfish fisheries for red king crab, Tanner crab, and snow crab. Once these limits are exceeded, the specified area closures are triggered for the fishery. Crab species are also incidentally caught in the Alaskan scallop fishery and bycatch limits by species are established for this fishery.

Under Alternatives 2 and 3, OFLs would restrict current harvest levels for crab and it is possible that this would likewise affect the stair-step regulations implementing the bycatch limits. Bycatch limits, however, are based on overall abundance, not on harvest amounts. If abundance is projected to increase over time under the new OFLs, then the amount allocated for bycatch would increase. If the abundance is projected to decrease under the alternatives, the bycatch allocation would decrease.

Endangered Species Act Listed Species

Chapter 11 analyzes the effects of the alternatives on species currently listed under the Endangered Species Act (ESA). Twenty-one species occurring in the action area are currently listed as endangered, threatened, or candidate species under the ESA. The group includes seven species of great whales, one pinniped, four Pacific salmon, three seabirds, one albatross, four sea turtles, and sea otters.

None of the alternatives would have direct effects on ESA-listed species or critical habitat. If NMFS declared a stock overfished under any of the alternatives, then the Council would take action to develop a rebuilding plan for the stock. If overfishing was predicted to occur, the State would reduce the TAC to below the OFL. Both of these actions would reduce any adverse effects of the crab fisheries on ESA-listed species and critical habitat by reducing or eliminating fishing for the crab stock.

Economic and Social Effects

Chapter 12 analyzes the economic and social effects of the alternatives. The economic and social impacts are largely qualitative and deal with impacts on persons and on communities. The economic impacts of Alternatives 2 and 3 depend on the extent to which those control rules constrain the status quo harvest strategies used in establishing TACs. The short-term simulation projections suggest that TACs under Alternatives 2 and 3 would be less than under Alternative 1. The extent of this difference depends on the degree to which actual TACs are set below the proposed OFLs. Under the Alternative 1, the MSY control rule for these fisheries has not been constraining. However, the proposed OFLs for Alternatives 2 and 3 would be lower than those under Alternative 1, so TACs would likely have to be set lower to adjust for the lower OFLs.

In general, any decline in the TAC is likely to contribute to reduced gross revenues to harvesters, processors, and other businesses that rely on the crab fishery. In addition, any prolonged reduction in the TAC could also contribute to fleet consolidation. Reductions in TAC could also negatively impact communities through reduced spending in that community by processors, harvesters, crab support businesses, residents that work in the crab industry, and other residents and businesses that indirectly depended on the snow crab industry. However, in the long-term, Alternative 2 and 3 OFLs could result in higher retained yields and lower rebuilding times for these fisheries, which would likely contribute to increased gross revenues to harvesters and processors in the future and could contribute to some fleet expansion.

Any change in TAC resulting from the proposed action will likely impact several communities. The impacts will likely vary across communities depending on the degree of importance the crab fishery contributes to the local economy. Communities with a high degree of dependency on the crab fishery will likely be impacted to a heavier degree than communities with low a dependency on the fishery. For communities like St. Paul, St. George, and King Cove, EBS snow crab is crucial to the local economy. Any changes in the snow crab OFL that result in a change in the snow crab TAC will likely impact these community to a much higher degree than Dutch Harbor or Kodiak, which is more diversified across many different fisheries. Communities like Dutch Harbor, Kodiak, and Akutan are more dependent on Bristol Bay red king crab, so any changes in the TAC for this species will impact these communities. The Bering Sea Tanner crab fishery is primarily concurrent with the regionalized Bristol Bay red king crab and Bering Sea snow crab fisheries, which made the regional designation of Tanner crab landings unnecessary. As a result, Bering Sea Tanner crab fishery does not have regional delivery requirements. Looking at the 2005/2006 fishing season, approximately 38 percent of the Bering Sea Tanner crab was landed in Dutch Harbor, followed by St. Paul at 24 percent. Assuming similar delivery patterns in the future, any changes in the EBS Tanner crab TAC will likely impact St. Paul, Dutch Harbor, Akutan, and King Cove.

Cumulative Effects

Chapter 13 analyzes the cumulative effects of the alternatives. The cumulative effects of crab fishing are analyzed in the Crab EIS, including the interactive effects of any past, present, and reasonable foreseeable future external actions. That analysis is incorporated by reference. The Crab EIS concludes that for the majority of the components of the environment analyzed, the cumulative effects of the crab fisheries are insignificant based on the best available scientific information. For some environmental components analyzed, the Crab EIS determined the cumulative effects were unknown, because of a lack of sufficient

information on the cumulative condition or the inability to predict effects of external future actions. No new significant information is available that would change these determinations in the Crab EIS. This action would not result in additional impacts beyond those considered in the Crab EIS and is not anticipated to change any of the cumulative effects conclusions.

Errata Sheet
Initial Review Draft Environmental Assessment
For
Amendment 24 to the Fishery Management Plan for
Bering Sea and Aleutian Islands King and Tanner Crabs (May 2007)

Location	Correction
Table of Figures	
Page xv:	Insert the following Figures after Figure 4-7: Figure 4-8 Comparison of total mature biomass and mature male biomass for Pribilof Islands red king crab.....page 60 Figure 4-9 Norton Sound estimated legal male biomass for red king crab.....page 61 Figure 4-10 Catch and catch per pot lift for Norton Sound red king crab.....page 61 Figure 4-11 Adak red king crab historic catch compared to the suggested OFL under Alternatives 2 and 3page 62
Page xv:	Insert a new Figure after Figure 6-2 as, Figure 6-3 Stock-recruitment fit for the EBS Tanner crab...page 97 Change the subsequent Figure labels to Figure 6-4, Figure 6-5, and Figure 6-6.
Page xvi:	Insert the following Figures after Figure 7-6: Figure 7-7 Comparison of total mature biomass and male mature biomass for Pribilof Islands blue king crab...page 108 Figure 7-8 Comparison of total mature biomass and male mature biomass for St. Matthew Island blue king crab.....page 108
Chapter 2	
Page 11, Tiers 1 through 3, line 9	For Tier 3.....change "spawning per recruit" to "fertilized egg production per recruit"
Page 11, last paragraph	Add: "Tier 4 stocks do not have sufficient information to estimate stock recruit relationship or to perform SPR analysis to estimate F35% or B35% proxy values."
Page 11, last paragraph	Change "The most important parameter...." to "An important parameter...."
Page 12, line3:	Change 'never' to 'not'
Page 13, Table 2-3	Information available, row Tier 4, Change "M" to Mproxy"
Page 13, Table 2-3	Add qualifier for Tier 3, F35%, of "unless the SSC establishes an alternative value based on the best scientific information available."
Page 23, line 3:	Change 'the F _{35%} would be reduced to 0.67' to '0.8 would be

	reduced to 0.67'
Chapter 3	
Page 32, line 8:	Change 'which would effect' to 'which would affect'
Page 34 last line of paragraph 2:	Change '(section 3.1.6)' to '(section 3.2.6)'
Page 35 last paragraph, line 2:	Change 'ESB' to 'EBS'
Page 38, Table 3-5	Remove 'estimated' from before BMSY in the table caption.
Page 38, Table 3-6	Remove Table 3-6 and paragraph that starts with "Table 3-2 illustrates....."
Page 39, last paragraph	Delete sentence "Since OFLs are set for the directed fishery only, incidental harvests of Tier 6 stocks would not be affected by an OFL of zero." Modify the following sentence to read "Prior to the opening of a directed/exploratory fishery or retention of incidental harvest for a Tier 6 stock, the OFL would be developed along with ADF&G's TAC/GHL for that fishery."
Chapter 4	
Page 44, line 19:	Change '(2,015 t)' to '(6,577 t)'
Page 46, section 4.3.2, last line of the paragraph:	Change '(Tables 4-1 and 4-2)' to '(Tables 4-2 and 4-3)'
Page 47, the start of the paragraph on line 17:	Change 'Table 4-3' to 'Table 4-4'
Page 48:	Add a reference to Table 4-7 to paragraph starting with "The F=0 scenarios....."
Page 53, Table 4-7, column Tier 3 (F ₄₀ CR):	In the row, Mean mature male biomass (t): add a '9' to read 40019. In the row, Mean mature female biomass (t): add a '3' to read 46353.
Chapter 5	
Page 67, Table 5-1	Incorrect table based on wrong model output.
Page 68, last paragraph	Change (Turnock et. al. 2006) to (Turnock and Rugolo 2006)
Page 69, section 5.2.3.1, line 2:	Change '(Table 5-10 and Table 5-11)' to '(Table 5-4 and Table 5-5)'
Page 70 to 79, Tables 5-2 through 5-11:	Change (t) to (1000t).
Page 77, Table 5-9, caption:	Change (tons x 10 ⁻³) to (1000t)
Page 79, Table 5-11:	Change caption from 'discard' to 'handling' Change the column headings '...dm' to '...hm'

Chapter 6	
Page 87, section 6.2.2	Remove sentence "The statistical fit also confirmed the choice (see Chapter 3)."
Page 87, section 6.2.4, line 2:	Change '0.0.80' to '0.80'
Page 89, paragraph 1, line 7:	Change 'Table XX2' to 'Table 6-4'
Page 89, paragraphs 1 and 2:	Change all mention of 'ESB' to 'EBS'
Page 90, line 1:	Change 'ESB' to 'EBS'
Page 90, Table 6-4 heading, line 3:	Change 'ESB' to 'EBS'
Page 91, start of paragraph 4:	Change 'Table 6-5' to 'Table 6-6'
Page 91, start of paragraph 5:	Change 'Table 6-6' to 'Table 6-7'
Page 91, start of paragraph 6:	Change 'Table 6-7' to 'Table 6-8'
Page 93, Table 6-5, column Status quo OFL CR:	In the row, Mean retained yield (t): change '66894' to '6894'
Page 94, Table 6-6, column Flat F ₃₅ :	In the row, Mean mature male biomass (t): change '3.539' to '30539'

Page 97, Table 6-3	In caption, change "eastern Bering Sea Tanner crab" to "Bristol Bay Tanner crab."
Chapter 8	
Page 113, third paragraph	Change "TAC" to "GHL"
Page 113, Figure 8-2	Add to caption: "Catches after 2002 were confidential."
Chapter 9	
Page 117, complete paragraph 3	Modify second sentence to read: "For purpose of this analysis, Tier 5 OFLs <i>were</i> calculated based on average catch in years..."
Chapter 10	
Page 119, Table 10-1	Add to caption: (in numbers of crabs).
Chapter 12	
Page 129, Table 12-2	Change season date for St. Matthew/Pribilof Islands king crab from "September 15" to "October 15"
Global	Use common names: change "bairdi" to "Tanner crab" and "opilio" to "snow crab".

Global	Check references – many citations are not included in reference chapter.
References	
Page 174, immediately below Ricker W.E. 1954,	Insert the following reference: Rugolo, L.J., D. Pengilly, R. MacIntosh, and K. Gravel. 2005. Reproductive dynamics and life history of snow crab (<i>Chionoecetes opilio</i>) in the eastern Bering Sea. Final completion report to the NOAA, Award NA17FW1274, Bering Sea Snow Crab Fishery Restoration Research.
Page 173,	The following references are not complete: Lowe et al. 2006. Mecum 2006.
Appendix A	
Page 178, Appendix A.1:	Insert the following above the definition for R: P_i^{s*} = probability of recruits of sex s falling into length-class i, $P_{i,j}^s$ = probability of crabs of sex s in a length-class i growing into a length-class j,
Page 182, item 3 under Auxiliary Models:	Change 'Gamma distribution function is used to estimate growth increment probability and recruitment distribution probability' to 'Gamma distribution function is used to estimate growth increment probability, $P_{i,j}^s$, and recruitment distribution probability, P_i^{s*}
Appendix B	
Page 183, column Female:	In the row, Instantaneous M: change '0.1' to '0.18'

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May 29, 2007

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Re: May 22-24, 2007 NPFMC CPT Meeting

Dear Gary and Steve:

As requested, I attended the May 22 to May 24, 2007 NPFMC Crab Plan Team (CPT) meeting held in Seattle, at the NMFS/AFSC. CPT members in attendance included:

- Bill Bechtol (UAF), recent appointment
- Forrest Bowers (ADF&G/Dutch Harbor) Chairman
- Wayne Donaldson (ADF&G/Kodiak)
- Ginny Eckert (UAF)
- Gretchen Harrington (NMFS/RO)
- Doug Pengilly, (ADF&G/ Kodiak)
- Andre Punt (UW), recent appointment
- Lou Rugolo (AFSC/Kodiak)
- Herman Savikko (ADF&G/Juneau), attended via conference call
- Shareef Siddeek (ADF&G/Juneau)
- Diana Stram (NPFMC)
- Jack Turnock (AFSC/Seattle)

Absent members:

- Joshua Greenberg (UAF)

The CPT agenda is provided as Attachment 1. The main focus of the meeting was a Plan Team review of the Initial Review Draft of the Environmental Assessment for Amendment 24 to the FMP for Bering Sea and Aleutian Islands King and Tanner Crab to Revise Overfishing Definitions. A copy of the draft EA is available on the NPFMC web site.¹

¹ http://www.fakr.noaa.gov/npfmc/current_issues/crab/KTC24_507.pdf

REVIEW OF THE PROPOSED OVERFISHING EA

The May 22nd meeting was the first comprehensive review of the revised EA by the Plan Team. The members of the CPT had a great many questions and made extensive recommendations for revision of the report.

Deficiencies abound in the revised draft EA. Prior to the meeting, analysts had prepared a multi-page errata. The CPT assumed that during this meeting they would add to the errata as necessary and provide in their minutes the revised errata along with a limited number of suggested table or figure changes. Collectively, they had anticipated that their minutes would form the basis for a limited set of changes to the EA which, given approval by the SSC and Council, could be incorporated into a revised draft to be released for public review. However, by the time they had completed their review, it was readily apparent the EA would require substantial revision.

The CPT reviewed the EA chapter by chapter and page by page. Major problems included disagreements over how to apply the OFL control rule (CR) and measure compliance with the CR. The CPT rejected the analytical approach employed to estimate stock-wide OFLs for tanner crab and acknowledged that the entire section on tanner crab (Ch 6 and Ch 12.8.4) would have to be re-written. They asked for substantial revision to Tables 4-1, 5-1 and 6-4 to standardize and reorganize the tables and include a column retrospectively estimating annual OFLs using the new proposed tier system. They plan to add a similar retrospective OFL table for Golden King Crab. The CPT intends to create a retained catch OFL (R_{OFL}) and a total catch OFL (C_{OFL}) to accommodate and discriminate among stocks where discard data are and are not unavailable. They recommended adding a single table in which the Alt 2-3 OFLs are calculated for the 2006 assessment year for each of the 22 listed stocks.

Diana Stram recorded extensive notes on the CPT's proposed revisions to the EA. The revisions are too numerous to itemize here; but, I will embellish on some of the items.

Application of and compliance with revised OFLs. Disagreement among Plan Team members emerged with respect to how to apply the metric for measuring OFLs on species where data are limited, in particular for proposed Alternative 2 and 3 (Alt 2-3) tier 4 and tier 5 species. OFL is set for tier 5 species based on historic catch. The disagreements centered on whether compliance with an established OFL should include retained and discarded catch. In some fisheries (e.g., Golden King Crab), current practices provide 100% observer coverage; thus, discarded catch is known. However, historic fishery catch may not have included discards. Since OFL is based on average historic catch, the CPT debated what OFL compliance standard will be applied to the current fishery. One side argued in favor of retained + discarded catch, the other for retained catch only. The disagreement was a perfect illustration of the CPT's failure to evaluate the application of their proposed OFL CR. Had they systematically applied the proposed rules to each of the 22 managed species (as we have consistently asked them to do) this problem would have come to light and a solution would have been presented.

The disagreement generated a major problem for the CPT because the fishery impact section of the EA (Chapter 12) was constructed with the assumption that OFLs would be judged

against retained catch. The CPT will have to revise the EA text to show explicitly, tier by tier what metric will be used to judge OFL compliance (total or retained catch).

Description of the OFL process. The EA needs a simple flow chart or other illustrative schematic to indicate to readers what the sequential steps are for determining 1) when a stock is experiencing overfishing, and 2) when a stock is overfished. The schematic should identify where the data for each determination are obtained (tier by tier). For example, under the proposed OFL CR, annually in May the CPT judges the status of stocks and recommends OFL tier levels and/or explicit stock by stock OFLs to the SSC and NPFMC for consideration at their June meeting. Under Alt 2-3, overfishing occurs for a tier 1-3 stock (modeled stocks) when the estimated fishing mortality for the most recent catch year exceeds the F_{msy} or F_{msy} proxy. For a tier 4 stock, overfishing is based on whether the catch in the most recently completed catch season is greater than the OFL maximum allowable catch at the F_{OFL} fishing rate (γM). Here, typically, the estimate of OFL maximum allowable catch will be derived by estimating the exploitation rate² consistent with the F_{OFL} and multiplying it by the estimated abundance of the fully recruited size classes from the most recent survey [this distinction is not reported in the EA]. If the actual catch exceeds the F_{OFL} catch, overfishing is occurring. A stock is overfished when the estimated Mature Male Biomass (MMB) of the stock in the most recent assessment year is less than $1/2B_{MSY}$ or $1/2B_{MSY}$ PROXY. [Note, classification of the most recent assessment year changes under Options 1 and 2 in Alt 2-3.]. A tier 5 stock is experiencing overfishing when the most recent assessment year's catch exceeds the defined historic average catch. There is no means of determining whether a tier 5 stock is overfished. The mechanics of this process are not described in the EA.

Viability of Alternatives. Dr. Punt took exception to the tier 6 proposal where multiple stocks are acknowledged as being so limited in their information content that the OFL is set to zero. Catch history typically exists for all proposed tier 6 species; so, they could be accommodated in tier 5. The CPT recommended that a table of species (stock) specific historic catch be prepared to show readers the range of catch data available. Select years used to estimate average catch for the OFL will be highlighted.

As it turns out, some species suggested for tier 6 have a longer time series of catch data than other species recommended for tier 5, the difference being that the crab managers believe the data for tier 6 species is less reliable. There is no apparent bright line that distinguishes the differences in the quality of the data for species in these categories; rather, classification depends on a species by species judgment call from the fishery managers.

The tier 6 proposal is fraught with problems. Setting OFL to zero presents a tricky management problem. Any catch, directed or incidental, would constitute overfishing. There would be no basis to judge when a tier 6 stock was overfished. There is a potential for fisheries to be closed wherever there is any amount of incidental catch of a tier 6 species. In my view, this alternative (Alt 3) should be rejected.

² Exploitation rate (μ) is $F/Z (1-\exp(-Z))$ where F is the fishing mortality rate (F_{OFL}) and Z is $F+M$ (fishing plus natural mortality rate; e.g., let $F=0.5$ and $M=0.3$ then $\mu=0.5/0.8 * (1-\exp(-0.8))=0.344$.

Tanner crab. The simulation modeling for tanner crab utilizes a model for the eastern portion of the EBS stock (east of 168°). Analyst developed and applied ratio estimators expanding estimates from the eastern stock to calculate the B_{MSY} estimates for the entire EBS stock area. The Plan Team, Dr. Punt in particular, did not like the use of these ratio estimators. Although historically, the lions share of the catch had occurred in the eastern stock area, at the current level of stock abundance and the distribution of MMB the fishery is prosecuted in near equal shares east and west of 168°. Analysts report they are working to develop a two-stock or regional model but it is not ready at this time. They acknowledge that there may be some genetic differences between the east and west stocks, however individuals are known to migrate and some mixing is likely. Also, there are regional differences in growth rate.

Therefore, the modeled eastern stock doesn't work well to estimate the total stock OFL. Subsequently, and because the entire stock is surveyed, the CPT recommended moving the stock from tier 3 to tier 4 and re-writing all relevant tanner crab text. The simulation modeling completed for the eastern (modeled) portion of the stock remains useful however. With respect to moving the stock to tier 4, the simulation modeling results will be used to estimate an appropriate γ (gamma) value for the whole stock. Under tier 4, F_{OFL} is γM (gamma times natural mortality) rather than $F_{35\%}$. It remains to be seen if the SSC shares the level of concern expressed by the Plan Team and is accepting of the tier 4 recommendation.

Snow crab. One item which I happened to bring forward was a discontinuity between the reported best fit steepness of the spawner/recruit (S/R) curve as presented in Table 3-4 on page 36, and the range of S/R steepness values used in the simulation modeling (see Figure 5-4 page 80). The fit to the S/R data was not provided in the previous EA and is something both we and the SSC had asked the analysts to include. My motive for asking for this information was to gain assurance that the range of steepness used in the simulation modeling bracketed the dynamic range of the value as estimated from current data. Steepness for the best fit Beverton-Holt S/R model is reported to be 0.467 to 0.494. The range of B-H steepness parameter values used in the simulation modeling is 0.53 to 0.77. The $F_{xx\%}$ value ($F_{MSY\ PROXY}$ used in tier 3 OFL calculations) is identified as the value that occurs at the intersection of the minimum and maximum steepness curves as illustrated in Figure 5-4. The minimum comes from the S/R curve generated at the low end of the B-H steepness range. Since the range of the simulation steepness values does not include the reported best fit value, the estimated proxy F_{MSY} may not be correct. A lower steepness value implies a less productive stock and would move the $F_{xx\%}$ calculation to a larger percentage value and a lower allowable F. Dr. Turnock acknowledged the discontinuity but said the fit to the S/R data was not good, so the estimated best fit steepness is not that reliable. The range of steepness values used in the simulation he argued remained appropriate. The CPT recommended one of three possible solutions: 1) remove the "unreliable" best fit estimate from the document, 2) keep the best fit estimate in the document and include a simulation run that brackets the best fit estimate, or 3) keep the best fit S/R estimate and rationalize the use of a steepness range in the simulation modeling that doesn't include the best fit. If the best fit is unreliable, solution 1 is preferred; however, the EA should include additional rationalization of the simulation model outcomes to indicate

why the range of modeled steepness curves covers the expected productivity of the stock. Note that the majority of the snow crab simulation work utilized an S/R curve with steepness 0.68 (i.e., the simulation runs assumed a much more productive stock than that estimated as the best fit³).

Response to the BSFRF February 2007 comments on the first iteration of the EA. (see Attachment 2).

1. Organization: -- The EA maintained the same basic organizational structure as presented in February. However, some items were reordered, and new items introduced. The revised EA was not organized around the tiers as we had suggested.

2. Clarity of presentation: -- There was some improvement in the presentation, for example where stock trends had been displayed in terms of millions of crab, the revised EA presents millions of pounds. The analysts attempted to improve the rationalization for switching to MMB as their index of spawning stock size but the discussion remains a bit obtuse. There continues to be discontinuities in the discussion when the writer shifts from comments in terms of TMB to MMB; and there are numerous instances where Figures are in one set of units (e.g., tons) and companion tables are in another (pounds).

3. Technical Interpretation: -- The authors have not included a synoptic stock by stock table of the Alt 1 versus Alt 2-3 estimated OFLs. In our February testimony we identified this as the number one deficiency. Table 2-8 p 22 attempts to provide a comparison for surveyed stocks, but there is no estimate of OFL for Alt 2-3 and no estimates for other managed stocks. Tables 4-1, 5-1 and 6-4 attempt to provide a retrospective view of OFLs new and old, but the tables miss the mark. As indicated above, the CPT recommended that these tables be revised to include what we have asked them to do: estimate OFL. Table 9-1 has OFLs for "other crab stocks" (lesser fished species). Tables 12-9 through 12-11 p 152-154 have the project yields under status quo and F35% (new OFL harvest control rules). However there is no single table that presents the Fmsy, Fmsy proxy, Bmsy, Bmsy proxy, M and gamma for each of the managed species (i.e., the component pieces of the proposed revised OFL control rule). The CPT appeared to accept a recommendation that such a table be generated.

4. Errors and Omissions: -- The revised EA attempted to clarify the Alt 3 decision points, but I am not certain they have eliminated the problems. I still believe the opportunity to have OFLs > Bmsy exists. The CPT, during their meeting discussion of this issue, clarified that the intent under Alt 3 is to have the SSC and Council stipulate the integer tier level (i.e., Tier 1, 2, 3, 4, 5, or 6 not 1a, 1b, 1c, 2a, 2b, 2c etc.). The new EA adds alternatives including two "status quo" alternatives. By definition there can only be one status quo. Prior to the meeting the CPT members compiled a three page errata; after the meeting, I am certain the list is much longer.

³ When a spawning stock is reduced to 40% of its unfished spawning biomass (the target area for MSY), a steepness of 0.467 implies that expected recruitment will be 70% of the unfished recruitment level; by contrast at steepness 0.68, annual recruitment would be 85% of the unfished level, 15 percentage points higher.

Response to the SSC's February 2007 comments: In the SSC's February 2007 minutes are 16 recommendations to the CPT regarding the first iteration of the EA (see Attachment 3).

1. Reorganize the document -- see response to the BSFRF
2. Clarify use of MMB -- see response to the BSFRF
3. Clarify which parameters are frameworked and which are fixed -- see table 2-7 p 22. Frameworked parameters are footnoted
4. Regarding species/stocks with insufficient data to estimate OFL (tier 6) -- the SSC requested that the Plan Team gather a legal opinion to determine if this alternative was feasible. The Plan Team amended tier 6 to set OFL to zero rather than leave it unspecified. [It is my view that tier 6 and therefore Alternative 3 should be considered non-viable.]
5. The SSC requested reporting of the statistical properties of the S/R functions used in the simulations -- see Tables 3-2, 3-3 and 3-4 on p35-36. Note also comments on snow crab above.
6. The SSC requested tabular presentations that made clear the impact of changing from total mature biomass to mature male biomass as the index of spawner abundance.-- Tables 4-1, 5-1 and 6-4 were partially aimed at answering this request; however, the effects of "changing currency" remain a bit obscure.
7. The SSC wanted the authors to justify their choice of γ (gamma) values used in tier 4 OFL calculations. See section 3.3 p 37 and Table 3-5 p 38.
8. The SSC requested further detail on the choice of the OFL parameters α and β -- The case is made from the simulation studies; however, as noted by Dr. Punt during the CPT meeting the justification and rationale for choosing $\alpha=0.1$ and $\beta=0.25$ is weak. These are basically policy choices.
9. The SSC asked for clarification on the viability of Alt 3 in the Feb 2007 EA -- Additional discussion of the revised Alt 2 -3 is provided in the EA, but the application of Option 2 (equivalent to the Feb version of Alt 3) remains somewhat vague.
10. The SSC asked for more biological justification that MMB was a suitable proxy for an egg production index -- I don't believe there is any additional information to meet the expectation under this SSC recommendation.
11. The SSC was looking for uncertainty indices on results from the simulation modeling -- Tables 4-4 through 4-7, 5-4 through 5-9, 6-5 and 6-6 all have indications of the coefficient of variability (CV) associated with simulation modeling yield estimates. New measures of S/R variability are offered in Tables 3-2 through 3-4. More could be done, but it is not as if there are no indicators.
12. The SSC requested rationalization for the choice of years used to average catch for tier 5 stocks -- The rationalization remains weak, the CPT plans to add a new table showing the catch history for these stocks.
13. The SSC was looking for more information on the processes used to apply the OFL rules -- the BSFRF has also been looking for this and the revised EA remains deficient in this area.
14. The SSC requested a comparative table of recent past and projected performance under the Alt 1, 2 and 3. -- there is no such table in the revised EA. Tables 4-1, 5-1

and 6-4 provide a retrospective view for Bristol Bay red king crab, EBS snow crab and Bristol Bay tanner crab, Tables 4-8, 5-8 and 6-9 provide a projected time view for the same stocks.

15. The SSC noted the lack of a true economic analysis – A qualitative economic analysis is provided in section 12-1 through 12-6. I am sure the SSC will continue to note the lack of true economic analyses.
16. The SSC noted the lack of community impacts analysis -- same as 15 above.

Comments on the potential impacts of the revised OFL rules on the fishery. The EA analysis of revised OFL rules suggest that past fishing management practices have not adequately constrained harvest to assure long-term maintenance of an MSY level spawning biomass. The existing (Alt 1) OFL rules provide no reasonable expectation that stocks will avoid overfishing. Nevertheless, the current ADFG practices for setting harvest guidelines (TACs) appear to do as well as the proposed OFL control rule and the associated potential harvest control buffers at maintaining stock viability. So, although the existing OFL rules don't appear to work, ADFG's harvest strategy does.

Once adopted, the revised OFL control rules place an upper bound on the total allowable catch that can be set by ADFG. NMFS assumes that ADFG will impose a suitable buffer between the TAC and OFL so as to assure that the OFL is not exceeded. Proposed buffers include but are not limited to, using a harvest rate equivalent to 75% of the F_{MSY} or F_{MSY_PROXY} , application of an $F_{40\%}$ harvest control rule, or some other measure that puts space between the OFL and TAC. The simulation modeling provides a measure of the effect of imposing a harvest control rule buffer on TAC: comparison of average yields for Bristol Bay red king crab reported on Table 4-4 for example indicates that retained yield could be 6-8% less than the proposed Alt 2-3 OFL using a harvest control buffer to set TAC⁴. Differences between OFL and expected harvest in the first 10-years of implementation of the revised OFL CR are greater than the 30-year average ranging from 13-17%, then dropping in the next 20-year interval to 4-6 %. Table 5-6 provides similar numbers for snow crab where the 30-year mean retained yield is estimated to be about 5% less than OFL under a buffered harvest control rule and about 9-10% less in the first 10-y of implementation of the OFL control rule. Impacts vary slightly depending on level of stock biomass at the beginning of the simulation ($1/2 B_{msy}$ or B_{msy}) and for snow crab depending on the handling mortality assumption.

Section 12 of the revised EA attempts to provide short term yield projections for king crab, and snow crab (see Table 12-9 p 152 and 12-10 p 153) at the status quo and OFL levels of harvest. The comparison is flawed however, because it overstates the frequency with which the OFL would constrain the assumed TAC. The CPT asked the analysts to redo these tables so that each year's projected harvest is taken at the ADFG harvest rate and the OFL computed thereafter. The result should indicate a less severe constraint on potential harvest. We will have to wait and see how it works out.

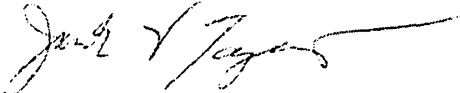
The current impact estimates for tanner crab are all flawed. This species will have to be moved to tier 4, and all impacts re-evaluated. Golden king crab are a tier 5 species. The

⁴ Compares mean retained yield for Tier 3 F35 CR with Tier 3 75% F35 CR and Tier 3 F40 CR.

revised analysis changed the time period over which the catch is averaged to set the proxy OFL. They now use 1985-1999 to set the OFL, and it does not constrain catch below the current 5.7 million pounds allowance. The OFL will constrain growth in the catch however.

If you have any questions regarding the content of this report, please don't hesitate to contact me.

Sincerely,



Jack V. Tagart, Ph.D.

Attachments (3).

NPFMC Crab Plan Team meeting

May 22-24, 2007

AFSC Traynor Room, Seattle, WA

Draft Agenda

May 22

9:00 am -12:00 pm:

Administration

- Introductions,
- Additions to agenda and approval of agenda,
- Membership
- September meeting scheduling and location (Seattle or Anchorage)

Discussion of new Magnuson Stevens Reauthorization Act (MSRA) requirements

- Annual Catch Limits (ACLs) and Accountability Measures (AMs):
Implications for the Crab FMP (Stram/Harrington)

Review of draft Crab Overfishing Definitions Assessment

- CPT review new alternatives and options,
- CPT approval of draft document,
- Considerations for June council meeting,
- Public comments/questions

12:00 pm – 1:00 pm

Lunch break

1:00 pm - 5:00 pm:

Continue review of draft Crab Overfishing Definitions Assessment

May 23

9:00 am -12:00 pm:

Continue review of draft Crab Overfishing Definitions Assessment

12:00 – 1:00

Lunch break

1:00 pm - 5:00 pm:

Review of 2006/07 BSAI Crab Fisheries:

- Brief presentation on 2006/07 fisheries – ADF&G (Bowers),
- Review 2006/07 crab bycatch data – ADF&G (Pengilly/Bernard)

Trawl Surveys

- **NMFS Trawl survey overview from 2006 (Bob Lauth?)**
- **2007 BSFRF Bristol Bay RKC survey**
 - CPT discussion of reviewing and receiving survey results, data access, and any forthcoming NRC report (purpose and intent)

Summer research plans/schedule

- NOAA,
- ADF&G,
- BSFRF.

Aleutian Islands Fishery Ecosystem Plan

- Brief presentation on draft plan (Bowers),
- CPT comments on draft plan,
- Public comments on draft plan.

May 24

9:00 am -12:00 pm:

Review of stock assessment models

- CPT input on models prior to start of assessment cycle in August
- Public input to assessment authors
- Stock status projections

Review and approve guidelines for external stock assessment reviews

12:00 pm – 1:00 pm

Lunch break

1:00 pm - 5:00 pm:

Bering Sea Crab EFH Measures considered by Council

- Presentation on EBS snow crab motion for June Council meeting (Savikko),
- CPT comments on motion,
- Public comments on motion.

Discussion of SAFE and other reporting issues

Review of Crab Research Priorities

Other issues/new business

Adjourn - (5:00 pm)

CPT members please schedule your travel so that you are able to attend the entire meeting.

Tagart Consulting

Fisheries Science and Management

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February 6, 2005

Gary Painter, President
Bering Sea Fisheries Research Foundation
c/o Natural Resource Consultants
1900 W. Nickerson Street, Suite 207
Seattle, WA 98119

and,

Steve Hughes, Representing
Bering Sea Fisheries Research Foundation
c/o Natural Resource Consultants
1900 W. Nickerson Street, Suite 207
Seattle, WA 98119

Re: Feb 5, 2007 NPFMC SSC Meeting, Agenda D-2(a), Crab Overfishing Definitions

Dear Gary and Steve:

The NPFMC SSC heard staff presentations yesterday on the draft Crab Overfishing EA¹. Staff presentations began at 10:30 AM and concluded at 4:30 PM. Public testimony was limited to 5 minutes for each person and provided by myself, Steve Minor, and Arni Thompson. BSFRF also provided written comments which are attached to this letter.

The SSC is recommending that the Council not send the document out for public review at this time; rather they requested that the draft EA be revised and returned to the SSC for subsequent review at the June, 2007 Council meeting². In the interim, the SSC recommended that the EA be reviewed by the Crab Plan Team at the annual spring meeting. To accommodate the notice requirements for delivery of the revised EA to the Council, Diana Stram, NPFMC staff, advised that the document would need to be ready for distribution four weeks before the Council meeting, i.e., by May 7th. Consequently, the spring Plan Team meeting typically held in May will have to be rescheduled for some time in April.

It is my view that the SSC will approve the revised EA in June and send it out for public review and final approval at the October, 2007 Council meeting³.

¹ Crab Plan Team Review Draft Environmental Assessment for proposed Amendment 24 to the Fishery Management Plan for Bering Sea and Aleutian Island King and Tanner Crabs to Revise Overfishing Definitions. NPFMC, Anchorage, AK.

http://www.fakr.noaa.gov/npfmc/membership/plan_teams/KTC24_overfishingdef.pdf

² The NPFMC June meeting is scheduled for Sitka, during the week of June 4th.

³ The NPFMC October meeting is scheduled for Anchorage during the week of October 1st.

Comments of the SSC: SSC comments were summarized by Terry Quinn with contributions from Steve Parker, Keith Criddle, Frans Mueter, Doug Woodby, Patty Livingston and Ann Hollowed. In short, the SSC commended the Crab Plan Team and specifically the analysts from the overfishing working group for the enormous work presented in the EA. The consensus view of the SSC seemed to be that the technical approach was precisely what the SSC had requested, certain deficiencies notwithstanding, and they were enthusiastic in their praise.

SSC Issues:

1. The EA needs to be specific regarding those quantities hard-wired into the amended FMP and those frame-worked and thereby changeable without further amendment.
2. The SSC was uncertain if it was legal to have a Tier 6 as defined in the revised overfishing control rule (see p 15 of the EA for a description of the tier system, and p 12 for the list of stocks proposed for each tier). Tier 6 applies to 9 of 22 managed crab stocks; under the definition there would be no OFL set for any of these stocks due to insufficient data upon which to base the OFL. The SSC proposes to flag the issue for the Council and NOAA GC.
3. The SSC regarded the snow crab spawner-recruit curves presented on page 77 of the EA (Figure 7-4) as suspicious and requested the analysts take a closer look at the objective function being fitted to the data. The concern was the pattern of residuals around the fitted line, observed values typically will be equally distributed above and below the line; in this case they are not so distributed.
4. The SSC specifically requested more discussion regarding the change in the definition of spawning biomass. Characterized as the “currency” for the OFL rule, spawning biomass under Alternative 1 is Total Mature Biomass (males + females); for Alternatives 2 and 3, the “currency” is Mature Male Biomass. The SSC requested that the analysts identify what fraction of the change in the proposed OFL is due to the change in “currency” versus the change in the OFL control rule. They also asked for more discussion on why the use of MMB is robust, and whether there are species specific problems in utilizing this as the measure of spawning abundance.
5. The SSC wants to see more justification of the gamma (γ) values utilized in the OFL Tier 4 control rule. Gamma is a multiplier on the estimated natural mortality (M) for a tier 4 stock (6 stocks with annual or periodic trawl survey biomass data). The quantity γM (gamma times M) becomes the proxy F_{MSY} value.
6. B_{MSY} proxy for the Tier 4 species is calculated as an average of survey estimated MMB. The SSC wants a better justification for the stock specific time periods selected to average survey biomass.
7. The SSC noted insufficient analysis of social and economic impacts of the proposed amendment. They requested that the analysts take a longer view of the impacts, and that they do more to “flesh out” impacts on industry.
8. The SSC embraced the BSFRF recommendation that the document be organized around the tier system, i.e., presenting those stocks within a tier in a section, rather than the sequential listing of species and stock groups
9. The SSC noted the lack of discussion on the uncertainties associated with the analysis. There was no discussion of the errors around the survey estimates of abundance, or for any of the long-term (30, 100 year) stock projections.

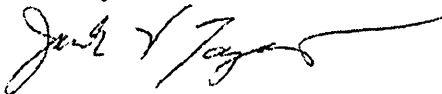
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10. The SSC asked for a more explicit description of how Alternative 2 and Alternative 3 will actually work. For example, it is not clear precisely what the Council's annual June action will be under Alternative 3.
 11. Finally, the SSC recommended, as requested by BSFRF, that a table summarizing Alternative 1 versus Alternative 2-3 OFLs be added to the EA.

Once adopted, the revised overfishing rules will have a profound impact on crab TACs; particularly in the short-term (3-5 years). The OFL is the upper limit for harvest. ADFG is obligated to set their recommended TAC (GHLs) below the OFL. The EA proposes using $F_{40\%}$ exploitation rates as illustrative of the buffer expected between the OFL control rule and the TAC, although ADFG is not obligated to use the $F_{40\%}$ harvest rule so long as their proposed TAC is less than OFL and has room to assure total catch will not exceed OFL. For example the short-term impact for Bristol Bay red king crab is estimated to be a 5-11% reduction in catch in 2008 and 2009, but an increased catch thereafter through 2012 with a cumulative impact of 1% gain in total catch from 2008-2012 (see EA Table 4-7 p 49 and 50); while the impact on the snow crab harvest is estimated to be a 10% reduction in cumulative catch over the period 2008-2012 (see EA Table 7-9 p 74). Over the long-term (100 y time horizon), the $F_{40\%}$ harvest strategy provides about the same total yield as the current ADFG harvest strategy; although the benefits of the revised control rule won't likely be felt for at least 5-10 years post implementation.

With respect to AI Golden king crab, this stock is proposed as a Tier 5 species with the OFL set as the average of total catch between 1985 and 2005. The OFL is subject to revision if the SSC is provided new information which either updates the current OFL or improves the total available information thus changing the tier level used to set OFL. Average catch over the period '85-05' is 7.527 million pounds. If the TAC is set at 75% of the OFL, TAC would be 5.646 million pounds (slightly less than the current allowable harvest of 5.7 million pounds). Moreover, as long as the stock remains a Tier 5 species, should the stock abundance improve, there is no way to increase the OFL unless the SSC adapts (based on "best available science") some ad hoc multiplier to increment the average catch (an unlikely proposition).

If you have any questions please don't hesitate to contact me.

Sincerely,



Jack V. Tagart, Ph.D.

Attachments (1): Written comments on the draft EA.

February 5, 2007

Dr. Gordon Kruse, Chairman
North Pacific Fishery Management Council
Scientific and Statistical Committee

Re: February 2007 SSC Meeting, Agenda Item D-2(a) – Initial review of BSAI crab overfishing definition analysis: Crab Plan Team Review Draft Environmental Assessment for proposed Amendment 24 to the Fishery Management Plan for Bering Sea and Aleutian Island King and Tanner Crabs to Revise Overfishing Definitions.

Testifying on behalf of the Bering Sea Fisheries Research Foundation (BSFRF), Gary Painter, President.

Dr. Kruse:

The NPFMC Crab Plan Team is presenting its initial draft EA of proposed changes to the BSAI Crab FMP overfishing definitions in which the expected impacts of those changes on the management system and fishery are evaluated. We want to commend the Plan Team for persevering on what we recognize is a very difficult technical task. We have reviewed the draft EA and have the following comments:

Process: The EA makes a point of documenting a deliberative process employed by the Plan Team and their technical working group to arrive at this EA. While the public was allowed to participate in formal Crab Plan Team meetings, Council and SSC meetings where the overfishing definitions were discussed, most of the heavy lifting in the conceptualization, development and illustration of the implementation of the proposed overfishing revisions has been undertaken by the Plan Team overfishing working group and their business has been conducted predominately in private. The EA makes note of two levels of independent review of the proposed overfishing definitions: a biological workshop held in February 2006 and subsequent CIE review conducted in April 2006 (Appendices D and E). The BSFRF wishes to note that neither of these workshops was open to the public. During the long evolution of the proposed revisions to the overfishing definitions there has been disagreement among working group members regarding how best to conceptualize and parameterize population models integral to the development of evaluation tools used in the EA. Consensus among working group members on how to resolve these disagreements was not reached until July 2006, following the independent reviews. Consequently, the EA represents the first documentation of the working group's agreed methodology for evaluation of the overfishing definitions accessible to the public. Because this is a complicated technical issue, we are asking the SSC to assure that there is sufficient time allotted to allow the public to review and understand the methodologies employed in the EA and the implications of the proposed changes to the OFL rules. We do not believe the EA needs to rush to final approval in April 2007.

Issues: Our immediate issues with the draft EA include the following: 1) organization, 2) clarity of presentation, 3) technical interpretation of results and 4) errors and omissions.

Organization: The organization of the EA is a bit clumsy. In particular section 3 (Effects on Crab Stocks) is a little hard to follow. One would expect discussions of individual crab stocks to be subsections of section 3 rather than independent sections as outlined in the EA. We are not sure if this was a word processing numbering glitch or an intended structure but it detracts the reader. Sections of the document are referenced which do not exist (e.g., p 24 refers to section 3.5.3, p 33 refers to section 3.2.3 neither of which exist).

Organization is in part a matter of personal preference and NEPA necessity. There may be utility in arranging the presentation of the crab stock impacts of revised OFL definitions by aggregating by the proposed OFL tier for the stock, i.e, tier 3 stocks as a group, tier 4 stocks as a group, and tier 5 stocks as a group. The authors can present the characteristics of the tier as applied to all stocks then illustrate the impacts to particular stocks within the tier.

Clarity of Presentation: The EA has the feel of a hurried draft document and would probably profit from the opportunity to polish the content to make the document more readable.

Throughout the EA the critical abundance index relevant to revised definitions of OFL is the B_{MSY} expressed as mature male biomass (MMB). In repeated instances the writers comment on B_{MSY} and/or MMB while presenting figures or text that references number of mature males. To illustrate, see page 34-35 discussion of Pribilof District red king crab where the authors cite Figure 4-4 to note that the stock is well below its B_{MSY} proxy; however, the figure portrays crab abundance in millions of crabs not biomass. Moreover, the quantities associated with the B_{MSY} are never expressed. This type of inconsistent presentation makes important comparisons extremely difficult.

Section 2.2.3.1 attempts to explain why the Plan Team elected to characterize spawning biomass as MMB rather than the more traditional mature female biomass or total egg production. The section is choppy and absent an independent background on the topic we believe the reader would have difficulty following the rationale presented.

When transitioning from discussions of OFLs under Alternative 1 to those under Alternative 2 and 3, the index of abundance shifts from total mature biomass (TMB) to MMB. The document does not necessarily make the distinction apparent. Clarity is needed here to make this transition.

Technical Interpretation: The single most glaring problem we find is the lack of a summary of the Alternative 1 versus Alternative 2-3 OFLs for each stock. We believe that for each managed crab stock there should be a table that provides the information required (actual numbers) to specify the OFL for each alternative (1 versus 2-3) in a given year. For example, under alternative 1 we need the mean TMB 1983-1997, M , and the TMB in year t to estimate the OFL for year t . For Alternative 2-3, we need the B_{MSY} or B_{MSY} proxy, F_{MSY} or

F_{MSY} proxy, M and α , β , and γ to compute the OFL. Where proxy values are provided they should be defined (e.g., $F_{35\%}$ or $F_{40\%}$). For each stock and each alternative the estimated OFL for a given year should be stipulated. In such a presentation it would be better not to confuse the GHM or TAC setting estimates with the OFL estimates.

We recommend that the Plan Team illustrate the consequence of implementing the revised OFL definitions by showing what the revised OFLs (Alternatives 2 and 3) would have been in the last 3 to 5 years (2001-2006) compared to what they were under Alternative 1. Tables 4-7 (p 49) and 7-9 (p 74) are an attempt to create the type of contrast we are seeking but they utilize projected population abundance of king crab and snow crab; moreover, labels on these tables do not bring focus to the Alternative 1 versus Alternative 2 OFL view of the world. Similarly, section 12.7 reprises the projections and attempts to itemize anticipated OFLs without the comprehensive tabular data we believe are needed. Part of the difficulty associated with interpretation of the potential outcomes is missing information, another part is labeling and organization of existing information.

The search for proxy values under tier 3 relies on a projection model for king crab and snow crab using parameter values adapted from the respective population models. In particular, the projection models rely on estimated recruitment from a fitted spawner-recruit function for each of these stocks. The fitted S/R function regression parameters are not presented in the EA nor are the estimates of the root mean square errors. Since neither stock is proposed to be regulated as a tier 1 stock we conclude that there is no reliable S/R estimate. This begs the question on the sensitivity of the estimated proxy values to alternate S/R functions. We are unable to determine if the range in S/R steepness employed in the projection model generates a set of recruitments that covers the dynamic range of the population model estimates of recruitment. The authors could provide plots of the simulated recruitment distribution versus spawning stock size and contrast with the observed values used to generate the function.

Although the SSC embraced the snow crab population model in the October 2006 review of the crab SAFE, we continue to have concerns that the model has not stabilized. For example, there were dramatic shifts in estimated survey selectivity between the 2005 model and the 2006 model. Survey selectivity estimates in the 2006 model are substantially different than those generated independently by Somerton and Otto (see Figure 23, p A 46 of the 2006 Crab SAFE). Because the model is critical to calculations of the proxy overfishing levels we ask the SSC to evaluate the outcomes with a very critical eye.

We are confused by the discussion of snow crab handling mortality (p 75-77). For the main portion of the simulation analysis, parameters of the S/R curve are estimated using recruitment data from 1978 to 2006 where steepness for the Beverton-Holt (B-H) S/R curve is estimated to be 0.68 (p 64). The main simulations consider handling mortality at 25% and 50% without any changes in the B-H steepness parameter. In the discussions of the effects of handling mortality, S/R curves are fit to recruitment data from 1985 to 2005, for fixed levels of handling mortality 25%, 40%, 50% and 60%. Because the population model estimates of recruitment change with different handling mortality rates, the B-H steepness parameters for each handling mortality level were estimated to be 0.72, 0.72, 0.75 and 0.73 respectively. (Note, the displayed B-H curve for handling mortality rate 50% (Figure 7-4c) is completely

different than those for the other handling mortality rates.) Yield curves in Figure 7-4 indicate an evaluation conducted over the range of handling mortality assuming a B-H S/R function with steepness 0.53. Needless to say, we don't understand why h should be set to 0.53 in this circumstance. We also note the apparent sensitivity of the S/R curve estimated steepness to the different data input time periods (1976-2006 $h=0.68$ versus 1985-2005 $h=0.72-0.75$).

Tier 5 OFL values rely on average catch. The rule as proposed sets the time period to average the catch as 1985 to 2005 (21 y). The SSC is given license to amend the OFL based on best available science. Establishment of a fixed time period to stipulate stock productivity was one of the deficiencies in the status quo OFL control rule. Should the SSC elect to construct a moving average for the catch or increment the time period with each new year of catch, given the need to create a buffer between OFL and TAC, the OFLs for tier 5 stocks could only decline over time.

Errors or Omissions: We believe the description of Alternative 3 is incorrect. The distinction between Alternative 2 and Alternative 3 is in the timing for the computation of OFLs. Alternative 2 has the Council set the OFLs annually in June, relying on model and survey estimated abundance that used input data from the prior years trawl survey. Alternative 3 is intended to have the Council chose the process for setting OFLs annually in June, but allow the OFL calculations to take advantage of the current year's trawl survey data, computing the OFLs in September-October of each year. Language in Alternative 3 as written precludes updating Tier 1-Tier 3 modeled population estimates with the current year's survey data. The language as it now reads is "Final determination of model parameters and tier levels would be established by the SSC meeting and reviewed by the Council at the June meeting. OFLs would be calculated after the survey data are available in late August. Model parameters would not be changed in the interim." Since incorporation of a summer survey biomass data point and attendant size data into a population model would be associated with a revised estimate of parameters (recruitment, selectivity, fishing mortality, etc), the modeled populations look as though they are indeed excluded from the opportunity to update information made available by Alternative 3. We do not believe this was the intent of the alternative.

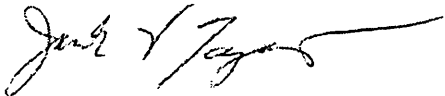
With respect to selecting the process for setting OFLs in June under Alternative 2, it is unclear precisely what the Council's options would be. We surmise that the Council would simply stipulate the OFL tier that will be used to set the OFL following incorporation of current year survey data. Under this scenario, it is possible for stocks whose June classification is tier b (i.e., 3b, or 4b) to see an improvement in survey estimated stock abundance such that current biomass exceeds B_{MSY} following the incorporation of current survey data. Thus the September-October calculation of OFL, if held to the June tier b requirement would cause the F_{OFL} to be greater than F_{MSY} because $B_{MSY}/B_{current}$ would be greater than 1.

References to actual calculated OFL levels are often omitted. In the Executive Summary (p iv) the Bristol Bay OFL control is said to be $F_{35\%}$; this is incorrect, $F_{35\%}$ is the proxy F_{MSY} the control rule is much more complicated than the simple proxy fishing mortality rate. On page

1 of the document the first list is miss-numbered 4-6 when it should be 1-3. For Tier 4 stocks the OFL control rule is silent on what constitutes an estimate of $B_{MSYproxy}$. On page 20 the EA references tables of survey estimated abundance; these tables are not provided within the EA. On page 24 there is a reference to section 3.5.3 which does not exist. Page 27 references projection model formulas in Appendix B, but they are actually in Appendix A. Page 33 cites Figure 3-8 but should cite Figure 4-9, and there is a reference to section 3.2.3 which does not exist. We are certain there are additional labeling errors, but our point is made.

Summary: The BSFRF is as anxious as any to see a sound scientifically credible revision to the OFL definitions that helps us to assure long-term sustainability of the managed crab stocks. There are clear problems in the current EA as drafted which we believe can be remedied. We have confidence that the SSC will assure the final product is improved and that the anxious public has adequate time to review the analyses, absorb the consequences of the proposed actions and present comments as needed.

Sincerely,



Jack V. Tagart, Ph.D.
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February 2007

D-2(a) BSAI Crab Overfishing Definitions

The SSC reviewed the Environmental Assessment for Amendment 24 to the King and Tanner Crab FMP to amend overfishing definitions. The staff presentation was coordinated by Diana Stram (NPFMC), with technical presentations from Crab Workgroup members, Shareef Siddeek (ADF&G), Jie Zheng (ADF&G), and Jack Turnock (AFSC). Public testimony was provided by Jack Tagart (Bering Sea Research Foundation), Steve Minor (Mayor, St. Paul), and Arni Thompson (Alaska Crab Coalition).

The development process for this amendment dates back to at least 1998, when the first overfishing Amendment 7 was established with a clear understanding that it should eventually be modernized and frameworked. Serious work on the amendment package commenced in 2003 with establishment of a workgroup made up of 2 ADF&G and 2 NMFS scientists. Their hard work is coming to fruition with the production of this draft EA, which shows that substantial progress has been made since the last time the SSC visited this issue in October 2006. Milestones include the text of the EA, a well-written problem statement, refinement of the tiers comprising the overfishing definitions, assignment of species to tier levels, defining a new measure of "currency" for reproductive potential, fleshing out the parameters in the tiers, comprehensive simulations evaluating the alternates, and informative analyses for choosing between the alternatives.

Results from the simulation analyses show some major differences from previous SAFEs in determining OFLs, particularly for EBS snow crab. Results show that use of the current OFL often leads to population decline or even depletion, highlighting that timely consideration of this amendment (in the next year) is certainly warranted.

The SSC recommends that this EA does not go out for public review at this time. Rather, the document should be revised according to comments provided below and then reviewed at the June 2007 meeting for release to the public. Delaying until June allows for the Crab Plan Team to review the document at its May meeting. Because of the complexity of the overfishing issue, the SSC believes that the document must be clear in its presentation so that the public understands the alternatives being proposed, along with their limitations and advantages. The recommendations by the SSC concern mainly organization, clarification, and rationale, not analytical flaws. Nevertheless, until these clarifications are made, the SSC is unable to validate that the analyses constitute best scientific information available.

The SSC recommends the following changes to the EA:

1. The document should be thoroughly reorganized around the Tier system changes. Currently the document presents the alternatives by species and area groups, which is very confusing.
2. The document should clarify that the use of "mature male biomass" as the measure of biomass is a frameworked measure. If and when a better measure becomes available,

- such as effective female spawning biomass, the change should be possible without amending the FMP.
3. Similarly, the document should clarify that the values for natural mortality M and limit parameter γ in Tier 4 are frameworked values and can be changed in SAFE documents and other Council actions without amending the FMP.
 4. The EA contains a new tier 6 for those species with so little information that it is not possible to determine an OFL. These species are rarely harvested, occur infrequently in surveys, and have rarely been studied. The problem is that species within an FMP are required to have an objective determination of OFL. The workgroup should consult within NOAA to see if this would be a permissible tier level according to regulations. In addition, the workgroup should consider some alternatives: (1) pooling groups of similar species and areas into a complex for which an OFL can be determined, (2) removing these species from the FMP, or (3) continue the status quo values from Alternative 1 for these species.
 5. The fitted Beverton-Holt stock-recruitment relationships represented in Figure 7-4 appear to be biased and should be reevaluated. In addition, the statistical properties of the estimated stock-recruit relationships (coefficient and serial correlation coefficient estimates, standard errors, F statistics, etc) should be reported for all eight relationships represented in Figure 7-4, all six relationships in Figure 4-8, and both relationships in Figure 8-5.
 6. One major difference between Alternative 1 and Alternatives 2 and 3 is that mature male biomass is used instead of total mature biomass. The EA should provide extensive comparisons in time series, projections, and assessment results between these two sets of alternatives, so that the change in "currency" can be fully understood. Does the change in currency alter our perception of the status determination criteria and whether they have been breached in the past? If big differences in OFL are found, how much is due to the change in currency and how much is due to a change in the biological reference point?
 7. There was a tentative recommendation to restrict γ in Tier 4 to 1 – 1.5 for red and blue king crabs, 1 – 2 for Tanner crabs, and 2 – 4 for golden king crabs. The rationale given was that these ranges would be conservative, which would seem a consideration more appropriate for an ABC than an OFL. The authors need to give a more compelling justification, or else they should simply return to the range indicated from the analytical results.
 8. The authors need to provide further explanation for the restrictions on the values of α and β in the simulations. Simulation results suggested that higher values might provide even better performance statistics, but they were not used. Analysts should consider inclusion of the CV on catch as an index of expected fluctuations in catch.
 9. Further explanation of how Alternative 3 is a viable alternative should be given. It seems unwieldy that the SSC and Council would approve a procedure to determine OFL in June but have the actual calculations done by NMFS and ADFG, NMFS overfishing determinations done and then implemented by the state of Alaska prior to seeing the results of its implementation at the October meeting.
 10. The CIE review suggested utilizing some biomass indicator that is proportional to total fertilized egg production, and suggested mature male biomass as an interim proxy. Because the choice of spawning biomass currency is the key metric for

population status determination, a solid justification for this relationship incorporating theory and supporting experimental data should be supplied in the analysis. In addition, the form and slope of the relationship between mature male biomass and total fertilized egg production would be expected to vary among species and potentially vary based on other biological or environmental factors. These assumptions and the sensitivity of assessment models to these assumptions should be documented and explored in the document.

11. The current analysis and projection models do not portray uncertainty in survey biomass estimates or in outputs of the projection model. The SSC appreciates the work in developing the stock assessment models. Because the evaluation of alternatives requires comparison of the performance of control rules, a measure of uncertainty in those projected values is needed to determine substantive differences in performance (e.g., differences in yield, rebuilding times, or ending biomass) as shown for some measures in tables 4.2-6, 7.4-9, or 8.4-7. Measures of variance in figures showing biomass time trends would also be helpful (e.g. figs 4-1, 4-2, 4-4, etc).
12. The rationale for the choice of years used to determine mean catch for Tier 5 should be transparent, objective and not be influenced by regulatory actions or closures during those periods. These levels are assumed to be sustainable and also robust to changes in environment. If a reliable catch history cannot be determined, these stocks should be placed in with those in Tier 6.
13. The SSC requests a more detailed description of the process, federal and state management options, and risks associated with the timing of events proposed under each alternative.
14. The SSC requests the addition of a table showing a comparison of recent past and projected future performance for each stock occurring under alternatives 1, 2, and 3. This will help with addressing comment 6.
15. This document does not contain a true economic analysis, which should be reviewed prior to public review. The discussion provided in section 12.7 (Effects of Alternatives) is incomplete. As presently constructed, section 12.7 is nothing more than a discussion of point estimates of catch projections under the three alternatives. This section needs to be expanded to reflect the variation associated with those catch projections, the likelihood of fishery closures under those catch projections, and an analysis of the anticipated economic consequences of the alternatives. The economic analysis should include forecasts of changes in CPUE across the alternatives and through the simulation period. In addition, the analysis should use current prices to estimate revenues under each alternative and through the forecast period. These revenue projections should be used to derive net present value estimates of revenues through the forecast period. Where possible, the analysis should draw on data reported under the mandatory data collection program implemented in conjunction with crab rationalization to estimate expected net revenues. Because the putative benefits of the alternatives rely on the premise that conservative harvest strategies will yield increased long term average yields, the time frame represented in the discussion included in this section should be calculated to allow stock-recruit relationships to affect harvestable populations. Inclusion of 100 year projections of economic consequences would help to characterize potential long term benefits.

16. This document does not contain a true analysis of community impacts, which should be reviewed prior to public review. The discussion provided in section 12.6 (Communities) is incomplete. Section 12.6 needs to be expanded to more fully describe the unique relationships between fisheries for the 22 managed crab stocks that would be affected under this amendment. While some of these stocks are fished by many vessels and delivered to several processors, other stocks are fished by small numbers of vessels and delivered to a single processor. Similarly, while some crab stocks are harvested and processed by participants who also participate in other crab and groundfish fisheries, other stocks are harvested and processed by participants who specialize in a single crab stock. The combination of these unique relationships with particular Tier classifications can be expected to lead to different impacts among the varied communities that are dependent on the crab fisheries. One useful metric for evaluating the effect on communities is the number of years the fishery would be closed under the sets of alternatives, which has obvious consequence for the sustainability of a community.

NPFMC Testimony of Tom Casey
for
BSAI Crab ITQ-owners
John Jorgenson & Walt Casto

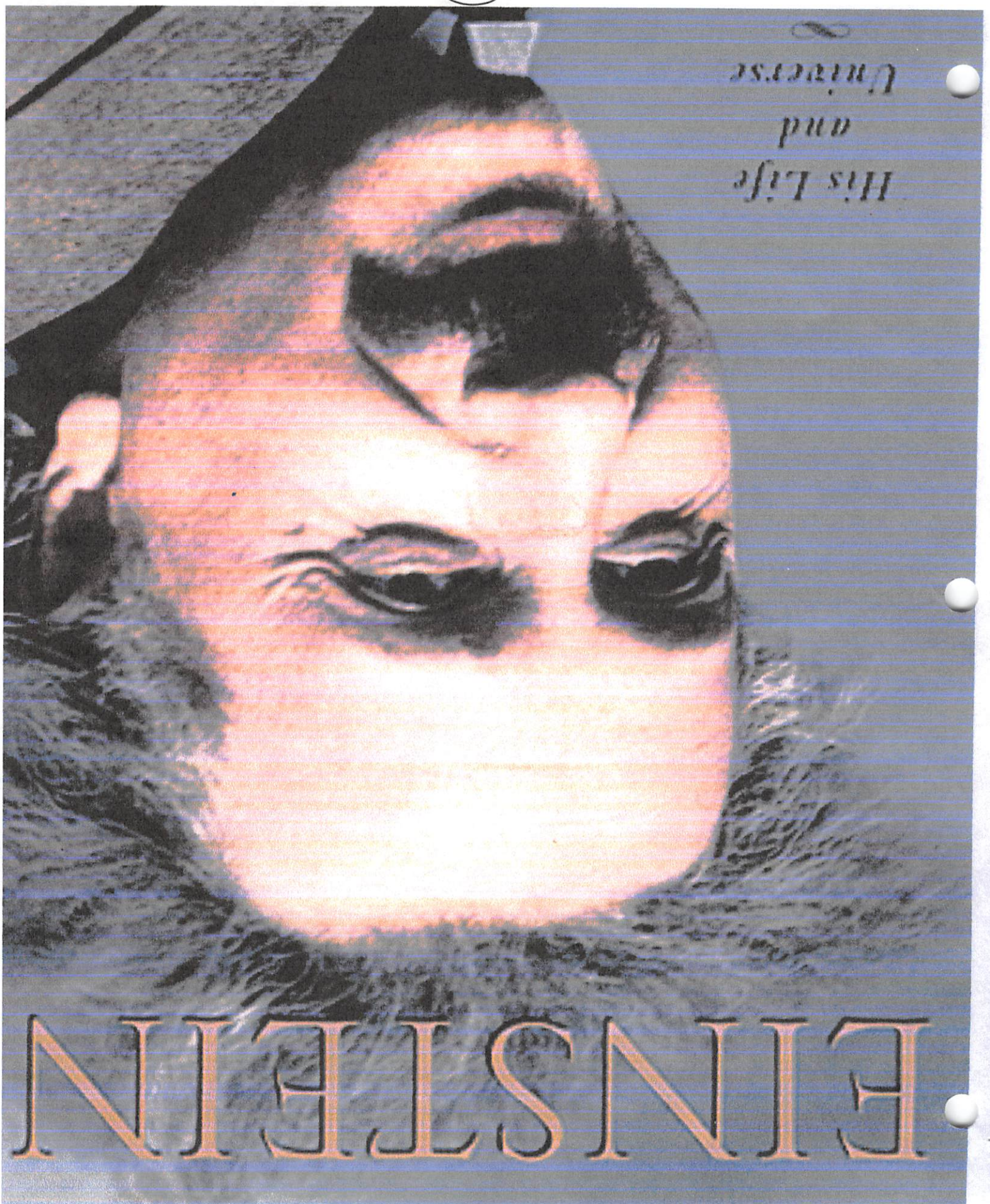
9 June 2007
Sitka, Alaska

C-4 (b) BSAI Crab Management
Initial Review of crab over-fishing definition analysis

“Measure twice. Cut once.”

2

His Life
and
Universe



EINSTEIN

Figure 5. Comparison of harvest strategy specified and actual exploitation rates on males > 119-mm carapace length in the Bristol Bay red king crab commercial fishery, 1993-2005/2006.

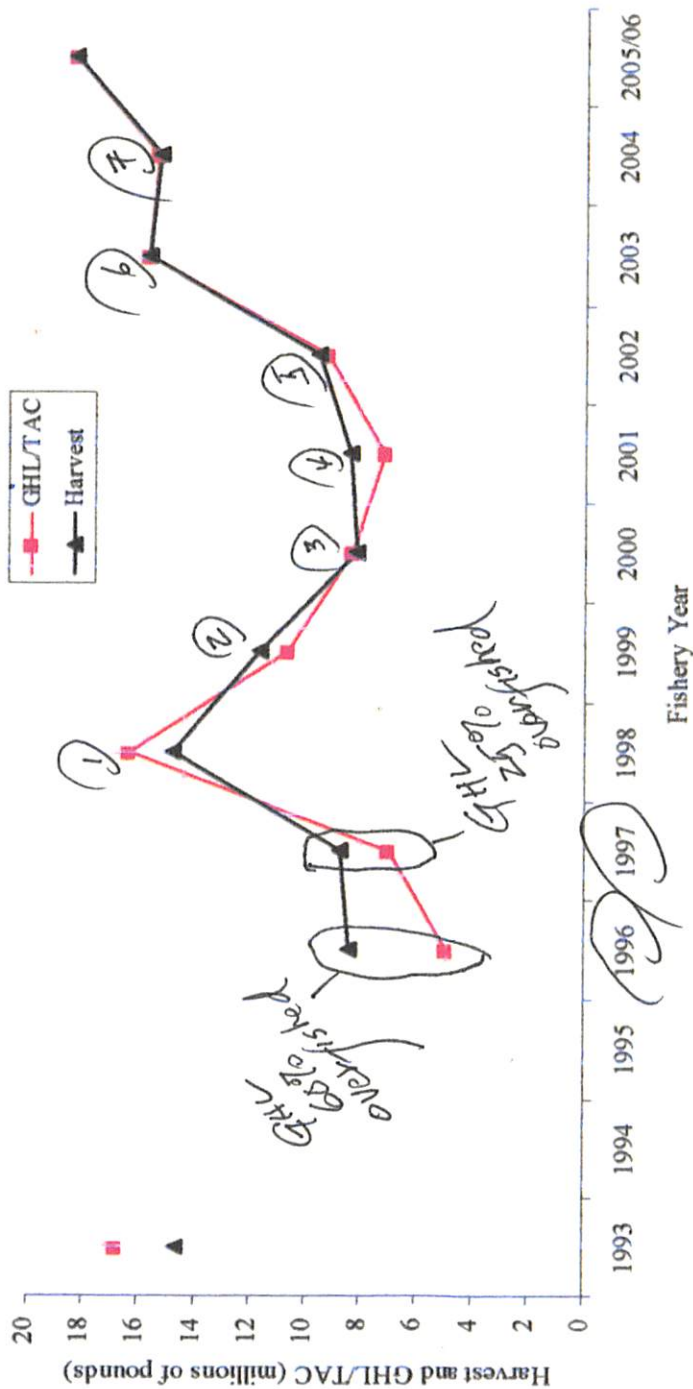


Figure 6. Bristol Bay commercial red king crab general/IFQ and CDQ fishery harvest and guideline harvest levels, 1993-2005/2006.

REQUEST: NPTMC ADVISES CPT TO ANALYZE THESE OVER-FISHING IMPACTS BY DEC'07 MEETING
4-9

(3)

THE WRITTEN TESTIMONY OF

**GORDON H. KRUSE, Ph.D.
UNIVERSITY OF ALASKA FAIRBANKS
SCHOOL OF FISHERIES AND OCEAN SCIENCES, JUNEAU CENTER
JUNEAU, ALASKA**

**HEARING ON
THE EFFECTS OF CLIMATE CHANGE AND OCEAN ACIDIFICATION ON LIVING
MARINE RESOURCES**

**BEFORE THE
SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
SUBCOMMITTEE ON OCEANS, ATMOSPHERE, FISHERIES, AND COAST GUARD
UNITED STATES SENATE**

RUSSELL SENATE OFFICE BUILDING, ROOM 253

MAY 10, 2007

Long-term forecasts of the implications of global warming and fisheries management in Alaska are highly speculative, given present levels of understanding. Just as there was a reorganization of marine ecosystems after the regime shift of the late 1970s, marine ecosystems off Alaska might be expected to reorganize again, perhaps to a new unobserved state, in response to a climate regime shift associated with continued global warming. If so, then a commensurate reorganization of the fishing industry is to be expected. Uncertainty increases as conditions (e.g., temperature, percent sea ice cover) move outside the range of historical observations. Under science-based management, increasing uncertainty typically translates into more precaution.

Thus, more precautionary management under greater uncertainty, coupled to the increasing use of ecosystem-based fisheries management, will likely result in more conservative fish harvests in Alaska in the future.

Data Gaps and Research Needs

Predictions of future changes of marine ecosystems for the Gulf of Alaska, Aleutian Islands, and eastern Bering Sea are uncertain, partly owing to gaps in our understanding of mechanisms affecting the dynamics of living marine resources and partly due to uncertainties in climate forecast models at the level of detail necessary for the Alaska region. A combination of improved monitoring, process-oriented studies, modeling, and policy development are recommended to improve our ability to forecast and address likely future marine ecosystem changes in Alaska:

- Arctic baselines – very few data are available on the abundance, distribution, and life history of marine species in the northern Bering Sea and Arctic. It is critical at this time to establish baseline understanding of community structure and function before the Arctic region is perturbed by human impacts and climate change.

How necessary?