

MEMORANDUM

TO: Council, SSC and AP Members
FROM: Chris Oliver *Chris*
Executive Director
DATE: May 25, 2005
SUBJECT: Crab Management

ESTIMATED TIME 1 HOUR

ACTION REQUIRED

- a) Crab Plan Team Report
- b) Update on Crab overfishing amendment progress (SSC only)

BACKGROUND

The Crab Plan Team met on May 16-18th, 2005 in Seattle, WA to review the 2004 crab fisheries and discuss summer research plans and other relevant issues for the team. The agenda from the meeting is attached as Item D-2(a). Draft minutes from the meeting are attached as Item D-2(b). In addition to other items contained in the meeting minutes, the team discussed at length a white paper produced by NMFS in response to concerns regarding the estimates of snow crab abundance. This paper is attached as Item D-2(c). The Crab Plan Team minutes detail relevant portions of the discussion regarding the points raised in the paper. The team also revised their Terms of Reference. The revised Terms of Reference are attached as Item D-2(d). The team also discussed the State/Federal Action plan (attached as Item D-2(e)). Suggestions by the team on revisions to this action plan are contained in the plan team minutes.

An update on the on-going work to revise the overfishing definitions for crab stocks in the BSAI crab FMP will be provided to the SSC. Currently this amendment is scheduled for initial review by the Council in April 2006.

Crab Plan Team meeting

May 16-18, 2005

**Traynor Room, Alaska Fisheries Science Center,
Seattle, Washington**

Monday, May 16, 12:00 PM-5pm

- Introductions, Review agenda, additions to agenda, approve September meeting CPT minutes
- Issues related to snow crab abundance estimates based on trawl survey data, discuss analysis of spatial distribution of snow crab surveyed abundance and harvest
- Review of State/Federal action plan for Crab FMP

Tuesday, May 17, 8:30 AM-5pm (break 12-1pm lunch)

- Review 2004 BSAI FMP crab fisheries
- Economic aspects of BSAI crab fisheries
- Norton Sound red king crab stock status review (*Note: 1pm time certain*)
- Review of stock assessment models and stock status projections

Wednesday, May 18, 8:30 AM-3pm (break 11:30-12:30 lunch)

- Summer research issues, BSFRF survey issues
- Crab overfishing amendment workgroup review
- Update on crab rationalization
- New business, September meeting schedule, other issues

Crab Plan Team Report

May 16-18, 2005

Seattle , WA

Members present:

Bob Otto (Chairman) (NMFS), Forrest Bowers (Vice-Chair) (ADF&G) , Doug Pengilly (ADF&G), Diana Stram (NPFMC), Gretchen Harrington (NMFS), Lou Rugolo (NMFS), Jack Turnock (NMFS), Wayne Donaldson (ADF&G), Tom Shirley (UAF), Joshua Greenberg (UAF), Shareef Siddeek (ADF&G), Herman Savikko (ADF&G)

Public and state and agency staff present:

Doug DeMaster (NMFS-AFSC), Pat Livingston (NMFS-AFSC), Denby Lloyd (ADF&G), Brent Paine, Glenn Reed, Jack Tagart, Dave Benson, Keith Colburn, Ken Tippit, Arni Thompson, Lance Farr, Jie Zheng (ADF&G), Gary Painter, Steve Hughes, Girard Conan, John Boggs, Tom Kohler (ADF&G, phone), Terry Cosgrove, Eric Peterson, Erik Olsen, Russ Nelson (AFSC/RACE-NMFS), Michelle Goheen, , Rob Rogers, Kevin Kaldestad, Phil Hanson, Bill Widing

Introductions, Review agenda, additions to agenda, approve September meeting CPT minutes

The meeting of the Crab Plan Team convened on Monday May 16th, 2005 at 12pm at the Alaska Fisheries Science Center, Seattle, WA. The following agenda items were agreed upon for the meeting:

- Introductions, Review agenda, additions to agenda, approve September meeting CPT minutes
- Issues related to snow crab abundance estimates based on trawl survey data, discuss analysis of spatial distribution of snow crab surveyed abundance and harvest
- Review of State/Federal action plan for Crab FMP
- Review 2004 BSAI FMP crab fisheries
- Economic aspects of BSAI crab fisheries
- Norton Sound red king crab stock status review (*Note: 1pm time certain*)
- Review of stock assessment models and stock status projections
- Summer research issues, BSFRF survey issues
- Crab overfishing amendment workgroup review
- Update on crab rationalization
- New business, September meeting schedule, other issues

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The team gratefully acknowledged the hard work and dedication of Dr. Tom Shirley who will be stepping down from his Crab Plan Team duties as he leaves UAF for a position with Texas A&M. Tom has been a dedicated member of the team for many years and his insights and participation will be sorely missed.

The team approved the September 2004 minutes. These will now be posted on the Council website.

Issues related to snow crab abundance estimates based on trawl survey data, discuss analysis of spatial distribution of snow crab surveyed abundance and harvest

The team discussed the paper entitled "AFSC Response to Questions for Crab Plan Team on Estimates of Snow Crab Abundance". Bob Otto took the lead on reviewing the discussion items in the paper. Discussion was organized by numbered subject heading according to the questions and responses contained in the paper.

Question #1: What is the best estimate of abundance for the snow crab stock, based on the data available from 2004?

In addition to summarizing the material presented in the paper for this question, Bob provided the team with an overview of the history behind the problems encountered with the 2004 snow crab survey estimate and graphs of the 2000-2004 snow crab survey indices. There was no additional discussion by the team regarding this and no public comment.

Question #2: How did the precision of the abundance estimate change with and without the additional tows from the BSFRF charter vessel in 2004?

Bob again provided an overview of the information presented in the discussion paper and provided additional detail (following questions from the public) regarding the nature of the underlying problem with the survey results in the previous year and years past. A review by the NRC of the time series data indicated that approximately 14 stations are missing at various times throughout the series, and specifically from 1996 on there are 3 stations that are almost always consistently absent. This is likely due to a problem between decoupling the plotting procedure from the estimation procedure. The problem exists for all crab species whose assessment is dependant upon the annual survey but is less problematic for all stocks but snow crab. The relative impact on snow crab abundance estimates varies by year depending upon the relative density at the stations (and was not unidirectional). These calculations are all in the process of being re-evaluated. NRC is currently working on the blue king crab data.

Question #3: Is there a more efficient survey design for the BSFRF vessel in terms of precision?

Bob summarized the information in the discussion paper, noting that various methods of stratification and survey design are possible and changes in abundance will occur depending on how the data is stratified. Usually these data are stratified by management area. Bob provided an overview of the problems encountered and the reasons why the survey often conducts multiple tows, sometimes via cooperative surveys or unplanned additional tows.

Doug Pengilly noted that the survey was initially designed for king crab not snow crab. Bob concurred but added that there are weighting problems relative to multiple tow areas and some primary stratification (e.g. east and west of 173°) that are designed specifically for snow crab.

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Question #4: How should the precision and accuracy of the 2004 snow crab abundance estimate be factored into the GHL setting process?

Bob reviewed the summary information and noted that it is difficult to incorporate variability in the survey inside of one season. There is additional on-going research regarding the vulnerability of crab species to the net and the estimates will need to be revised accordingly when these results are available. Discussion ensued of the upwards adjustment applied to the abundance data to account for the mean net width. It was noted that this is a flat adjustment and does not vary based upon net efficiency. The snow crab assessment model incorporates net selectivity but the trawl survey estimate does not. Further discussion focused upon the different adjustments which could be made to account for catchability and the inherent gear optimization problems with using a single type of trawl for all species of crab and finfish in a multipurpose survey. However, it was noted that it would be financially impossible to utilize different nets for finfish and crab in the current survey.

Question #5: How can CPUE of the commercial harvest in a given year be used to estimate abundance directly or used to supplement the survey-based estimate of abundance?

Bob reviewed the information in the paper. Forrest noted the difficulty in using commercial CPUE as a direct correlation for abundance, particularly in short fishery seasons where there is inadequate time to monitor CPUE. Wayne Donaldson further noted that while commercial CPUE is often quite useful for fishery management, in cases where there is available survey data this should be the primary source of information. Discussion focused on the use of CPUE as an indication of a potential problem (e.g., low CPUE indicating potential conservation concerns) but for management CPUE should be used only in cases where no additional information is available. Public comments from John Boggs noted that some note should be made of commercial CPUE and some merit given when population estimates are notably flat while CPUE continues to rise. It was noted by team members that it is difficult to detect where CPUE is representing concentrated crab population rather than overall stock abundance, and that assessment information is on a broader scale and the fine-scale vessel CPUE examination is not feasible for management.

Arni Thompson requested comments on the use of CPUE data in the AI brown crab fishery as a strong source for estimated the GHL while a triennial survey is still done in this region. Forrest noted that the survey is not deigned to generate overall abundance estimates, rather it is designed to estimate harvest rates in a small portion of the AI region. Therefore in this instance management is dependant on fishery data which is very useful for management, however this is only one source of the data used to manage this data-limited fishery. Other sources include tagging data, catch rate of legal males, sub-legal males, fecundity in females, distribution, shell age and size. A relative abundance estimate is used here rather than an absolute abundance estimate.

Question # 6: Can the CPUE of commercial harvest be used to make infernces regarding trends in snow crab abundance (total) or the abundance of 4-inch male snow crab?

Review of this information in the paper was linked with the previous discussion of question number 5. Dave Benson asked if it would be possible to look at a fish-down effect by evaluating data from the Olympic fishery in comparison with the CDQ fishery. Discussion by team members noted that this would be difficult given the different variables for comparison and the relative timing of each. It was noted that this has been examined but in the absence of a controlled experiment, it is difficult to make any conclusions regarding this. The CPUE appears to be variable year to year thus precluding the conclusion of an absolute fish-down effect.

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Question #7: What is the best estimate of natural mortality of 4-inch male snow crabs?

Jack Turnock reviewed the summary information in the discussion paper as well as on-going work with respect to natural mortality estimates by the CPT working group for the revision of overfishing definitions. Discussion focused on how the working group estimated this new natural mortality rate for snow crabs and how this comported with snow crab aging work in other regions. Lou Rugolo noted that some Canadian tagging data corroborates these estimates. Tom Shirley also concurred that some recent research that he has been involved in estimating aging of snow crabs also corroborates these estimates. The team also discussed recent results from work elsewhere on radiometric shell aging and longevity of crabs, noting the expensive involved in these types of research projects.

Question #8: Is the estimate of snow crab abundance negatively biased?

This question was already discussed previously with respect to snow crab survey issues. The team continued previous discussions on the issues involved with the area-swept calculations and the distinction between area-swept calculation adjustments and net efficiency adjustments. Jack Tagart raised concerns that the net width estimate is negatively biased while the efficiency could be positively or negatively biased and that this should be acknowledged in the white paper. Lou Rugolo noted that it was true that there are selectivity issues with the net and the ad hoc adjustment approach was not intended to compensate for non-selectivity adjusted estimates. Additional comments from the public requested information and consideration of what portion of the net width is actually on the bottom during tows and how is this accounted for in the calculations. It was noted that previous survey results saw a distinct difference when the tickler chain was utilized.

The team members agreed that there are many issues with respect to this that need to be considered. It was noted that many of these would be better addressed through modeling techniques, though other team members disagreed and discussed that improved tuning could be looked at as well as rigging the net for stabilization and improved tow to tow performance.

Question #9: Does the current procedure for estimating snow crab abundance appropriately account for any negative bias in the survey data?

Much of this was noted to have been previously discussed with respect to the survey adjustments which are applied. Bob noted that future directions for estimating abundance are towards improved modeling techniques which would incorporate more information than simply net and survey information.

Question #10: What is the fecundity of mature female snow crab? Does the fecundity rate of mature female snow crab vary by latitude (or by water temperature)?

Bob summarized information in the paper and noted that there are two main issues here, one the relationship between size and fecundity and the other regarding the indications that in cold water areas crab do not necessarily spawn annually. The team had an extended discussion regarding the tendency towards biennial spawning dependant upon water temperature. It was noted that on-going research in Canada as well as laboratory studies at University of Washington and Juneau corroborate this finding. Discussion focused upon what the possible trigger mechanisms are that cause this biennial spawning mode. It was noted to be related solely to water temperature with hypotheses of the ability to detect the spring bloom (via excess organic material on the bottom) triggering eggs to hatch coincident with the spring bloom.

Doug DeMaster noted that the fraction of mature female crabs that have clutches compared to the fraction with fully fertilized clutches was not considered in answering this question. Bob Otto commented that while we do not have adequate data on that right now there is information

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available on Tanner crabs. He noted that additional aspects that could have been included in addressing this question include the change in snow crab distribution and the impact on annual production due to the proportion of females in biennial spawning mode. Lou noted that during the summer survey when females are observed with a clutch, the assumption is that this clutch is fertilized. He noted that we do not know at this time what the implications may be if this assumption does not hold true. The team discussed the management implications of biennial spawning and the potential to impact the threshold levels examined for the overfishing definitions. It was noted that how this will be incorporated into the harvest control rules has yet to be determined. Lou noted that he is working on developing an index of female reproductive potential in order to improve upon the existing survey convention of listing a clutch score. Bob noted that while egg production as compared to subsequent recruitment is quite useful to examine he cautioned that this is still a complicated issue and other factors are also related

Question #11: Can the 2004 survey data and commercial catch data be used to test the snow crab localized depletion hypothesis (as discussed by the CPT at the September 2004 meeting)? It was noted that localized depletion of snow crab was a discussion item at the September 2004 CPT meeting not a hypothesis. Bob presented overlays of percent of crab catch from the survey with percent of crab catch from the commercial fishery. It was noted that the fishery is concentrated because the resource is concentrated. The concentration of the resource appears to be north and east of concentrations observed in the current fishery.

Discussion focused on survey station K24 which has represents the largest station in the present survey as well as over time historically. Questions were posed regarding the possible uniqueness of K24 habitat and why crabs appear to concentrate in this region. This was noted to be an important question to resolve though currently understanding of why the crabs concentrate here is not well known. Bob noted that in examining shell condition of crabs, "old" shells appear to be dominant in this area, though in 2004 very old shells (which have a high incidence of barrenness) were dominant.

The team discussed concerns regarding the high concentration of very old shell crabs observed in 2004, coupled with the high incidence of barrenness in this category. Lou noted that this could represent a problem given that for two years the fishery has been concentrated in this area, there is evidence of aging of females and low recruitment to this area. The question of to what extent there may be disproportionate harvest on this area was discussed. Lou indicated that the exploitation rate is inappropriately specified if it is specified for the entire stock when the fishery exploitation rate continues to concentrate on this region.

Jack Tagart noted that there is a mismatch between the summer survey and the winter fishery and that the harvest rates subscribed by area should be based upon the abundance estimates at that time. Girard Conan commented that maps of abundance by age could be made available to the fishermen in order to assist them in fishing and avoiding vulnerable segments of the population. The team discussed that while this might be a good idea the winter fishery does not necessarily coincide with the summer age distribution.

Review of State/Federal action plan for Crab FMP

The team discussed the State/Federal Action plan, which is included in the FMP and was last addressed in 1993. Doug DeMaster indicated that Doug Mecum (ADF&G) had requested that this State/Federal Action plan be revised in order to reflect the State/Federal protocol and schedule for providing the abundance estimates necessary to establish GHs (and eventually TACs). The

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team agreed that if it is the intention of both agencies to revise this agreement, that it would be appropriate for the CPT to review and comment on it.

An extended discussion was held on the language in the Action Plan with respect to the role of the Crab Plan Team and the utility of specifying a schedule for meeting dates necessary for abundance estimates to calculate GHLs (and TACs). The team reviewed their existing Terms of Reference and added the following language to them to reflect the need to be specific regarding the meeting schedule and the role of the CPT.

To the section on meetings the following was added:

“The fall meeting shall be held at a time that ensures the availability of TAC specifications for the allocation of crab resources under crab rationalization”

To the section on functions, the following was added:

“(c) Peer Review. The plan team deliberations shall constitute part of the peer review process specified by current OMB policies provided that members directly involved in the production of a scientific product will recuse themselves from the review.”

The section on “Peer Review” was added per the team’s understanding that it was necessary for the team to act as a peer review group per OMB guidelines. The team had an extended discussion regarding the nature of the peer review process and what products were to be reviewed by the team: was it to be only the area-swept estimates of abundance, or were all stock assessments (state or federally authored) to be included in this peer review? Opinions on the team differed as to what should fall under the peer review process.

The team’s discussion focused on two aspects that would be included in the peer review: 1) the status of stocks relative to overfishing and 2) the NMFS abundance estimate given to the state for purposes of managing the fishery. To what extent additional items would be included in the peer review was disputed but left unresolved.

The CPT unanimously agreed to act as a peer review body, but notes that there are substantial concerns and questions remaining regarding how this process will occur and be applied. The CPT seeks guidance from both the SSC and the Agency on the appropriate means to adhere to these peer review guidelines. The team also noted that there are specific timing constraints with respect to acting as the peer review body including the timing of providing a review of data prior to the utilization of that data in assessing and managing the fishery.

Discussion by the team focused on timing needs for the September Plan Team meeting (2005) and the timing constraints imposed by the issuance of quotas in the fall. The team discussed the ability to meet and review data on a compressed schedule to meet arbitration requirements. ADF&G is committed to establishing TACs by October 1st. The team noted that the survey abundance estimates need to be reviewed by the team prior setting the TACs and in a reasonable time frame for the ability to meet both CPT review and OMB requirements. The team was unable to resolve the timing of the September meeting without further guidance on the due date for establishing TACs. The team also noted the difficulties posed by scheduling of other meetings and plan teams during that time period.

The team further recommends that both agencies carefully consider the membership on the plan team relative to those producing products to be reviewed by the team.

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The team made several recommendations and comments for revisions to the State/Federal Action plan. These are the following:

1. Change GHL to TAC where appropriate
2. Recommend that the second paragraph (under the role of the CPT) be revised to more adequately reflect the process and the role of the Crab Plan Team
3. Change the third paragraph (same section) regarding the plan team's input to the Board of Fisheries. This should be changed such that the purpose of the report is not to describe the GHL or TAC-setting process. The sentence should be changed to the following (with all remaining sentences deleted): "The Plan Team shall compile an annual SAFE report to be provided to and reviewed by the State, NMFS and the Council and made available to the public on an annual basis."
4. Recommend that the State/Federal Action plan incorporate by reference the Terms of Reference for the Crab Plan Team for further clarifications or revisions to the function of the team.

Norton Sound red king crab stock status review

Tom Kohler briefed the team (by phone) on the Norton sound red king crab fishery and an overview of the fishery history and stock status. He provided some tables and overview charts of the population estimates and modeling results. He noted that there is evidence of increased recruitment in 2004. He indicated that model estimates for 2005 are the highest on record and results indicate that the population has peaked and is now expected to decrease in 2006 and 2007. Discussed focused upon the harvest rate which is applied to this stock for the GHL. Tom indicated the harvest rate was very conservative and approximately 8% of legal males for the GHL. The harvest rate was established on the portion of the male crab population that is marketable. The harvest rate is specified such that it can be as high as 10% but that the department felt that 8% was a more appropriate exploitation rate. It was noted that this fishery is specifically constrained by ice.

Review 2004 BSAI FMP crab fisheries

Forrest Bowers provided the team with an overview of the 2004 fisheries. Preliminary handouts were provided to the team and made available to the public regarding the overview by fishery. This information was preliminary but will be finalized and included in the SAFE report in the fall of 2005.

Review of stock assessment models and stock status projections

No information on stock assessment models or projections was available for discussion at this meeting. Staff timing and availability precluded model projections at this point, however it is the intention that CPT discussion in the future will include projections of stock status at this Spring meeting to the extent that this is possible.

The spring meeting was identified as a time when models may be reviewed by the team prior to their use in stock assessments (similar to the process employed by the groundfish plan teams). It is the team's intention to review the snow crab assessment model in the spring of 2006. This model has not yet been employed to establish the abundance estimation used in establishing the GHL and will not be used for that in the fall of 2005.

Economic aspects of BSAI crab fisheries

The team discussed the information which would be useful for inclusion in the economic chapter of the 2005 Crab SAFE report (to be compiled at the fall 2005 CPT meeting). Some team members expressed that currently economic and socio-economic considerations are not being included in the determinations of OY/MSY/TAC, although others indicated that this does occur via public testimony to the Board of Fisheries. Lou Rugolo expressed that there is a lack of fisheries economic sections in existing FMPs and that expanded economic assessments should be included.

The team seeks guidance from the SSC on what information should be included in the economic chapter of the SAFE report? The team noted that under crab rationalization additional economic information will be available and that it would be important to not duplicate existing efforts. It was discussed that it would be useful to have both pre and post IFQ discussion of data included in the SAFE report. The team felt that the SAFE report would be a useful place for summarizing and synthesizing existing information.

The team discussed the intent that both Council staff and AFSC economists will be analyzing new information following the implementation of crab rationalization. Some questions by team members on the nature of this information and questions for future studies included the following: what types of new data will be reviewed annually? How will industry realign itself in the revised fishery? What will happen to pots and fishing behavior under crab rationalization? What will be the impact of a longer time period for fishing? How might TAC procedures change?

Gretchen Harrington informed the team that NMFS and the State will be preparing annual reports summarizing much of this new data. The team requested that Council staff (Mark Fina) or AFSC staff (e.g. Ron Felthoven) participate in a fall or spring CPT meeting to brief the team on what information will be available following the implementation of the new program and if (spring meeting) information is available, to summarize some of the preliminary finding for the team at that time.

Update on crab rationalization

Wayne Donaldson updated the team on issues for the State in implementing crab rationalization. These issues include the following: season start dates, Bairdi management, pot limits and changes to observer coverage.

Gretchen Harrington provided an overview of on-going federal issues for crab rationalization including the issuance of quota, electronic reporting requirements, processor quotas, binding arbitration and economic data reporting requirements. Summer research issues, BSFRF survey issues

Summer research issues, Bering Sea Fisheries Research Foundation survey issues

Dr. Russ Nelson, deputy director of RACE (NMFS) provided the team with an overview of the summer research issues and the BSFRF cooperative. He noted that this cooperative research effort is something that the AFSC is committed to continuing and that this is likely the only means of expanding existing crab research efforts given the current budgetary constraints on increasing government resources. He reviewed the 2004 research plan and results of the

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cooperative research last summer as well as plans for 2005. 2005 plans include expanded opilio stations to the north and east of the standard survey area.

Terry Cosgrove, the president of the BSFRF provided an overview of the foundation and a list of projects planned or underway. He noted that the foundation has contracted Dr Girard Conan and Dr. Jack Tagart for research projects including reviewing model methodologies and the upcoming revision to overfishing definitions. He noted that the foundation would like to see an open peer review process.

Gary Painter discussed the long-term science goals of the foundation and indicated the interest of the foundation in including ADF&G in an upcoming MOU for cooperative research. He noted that the foundation would also like to sponsor a workshop for the exchange of scientific knowledge which would be open to the public as well.

Dr. Steve Hughes provided the team an overview of some recent finding by the NRC on the review of 2003 and 2004 red king crab and opilio survey data. He discussed some stations that were omitted by NMFS resulting in an underestimate of crab abundance estimates. He noted that results from this review indicated that how strata are handled in the abundance estimation procedure is very sensitive to population estimates and that this should be evaluated more closely.

Dr. Girard Conan provided an overview of current research on snow crab abundance estimation and survey design. He noted that summer research in 2005 in the Bering Sea will be conducted to evaluate improved survey design methodology and design. The focus in 2005 will be on red king crab.

The team had extended discussion of additional issues with respect to the summer research and noted some problems and concerns in the use of these additional data. The team commends the foundation on their continued efforts but notes that many issues remain to be resolved in the ability to incorporate these data into existing assessment and survey efforts. The foundation staff noted that the purpose was on improving the overall long-term survey methodology and greater precision of survey estimates.

Crab overfishing amendment workgroup review

Jack Turnock provided a brief update on the on-going work by the plan team's overfishing workgroup in revising the existing overfishing definitions. He noted that they do not yet have results to show to the team at this point and workgroup members are still struggling with scenarios and parameter estimation and resolving lingering details with model structure and model scenarios. He noted that there are currently two alternatives being considered by the group, 1-status quo and 2-frameworked reference points in the FMP. He noted difficulty amongst the workgroup members in reaching consensus upon some issues. The team requested that options be included under alternative 2 in cases where the work group is divided on which direction is preferable.

The team discussed the natural mortality estimates in the white paper (agenda item 1) and requested clarification on how these will be included, will M be estimated or frameworked in the plan. Jie Zheng indicated that it would be based on the 1% rule. The team questioned to what extent the FMP amendment would include a mechanism for estimating M. Jack indicated that while this idea was included in the original workplan (devised by the workgroup) it was not

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included in the on-going work and it was unclear to what extent this would be included in the revision.

Jack Tagart requested clarification on what additional options might be included and what issues the work group is struggling to come to consensus on. Siddeek provided an example of the use of females only for effective spawners or using total male and female, as well as consensus regarding the mating ratios and stock-recruitment relationships for some stocks. Natural mortality was also noted to be problematic as to the use of male or female or what the appropriate value should be.

The team discussed the timing of this amendment package and the potential for review by the team. The work group felt that a realistic timeline for completion of the analysis (and the subsequent EA) would be the following:

December 31st, 2005: workgroup report completed and sent to CPT members for review
January: CPT meeting to review and provide guidance on workgroup report. Report will be made available to the public at plan team meeting.
April: Initial Review by SSC/AP/Council of EA.

New business, September meeting schedule, other issues

The team noted that with Tom Shirley leaving, they will need to solicit an additional team member, preferably someone with a crab research perspective from academia. The timing of the September CPT meeting has not yet been determined and is contingent on resolving the timing of the start date for the season with respect to crab rationalization and binding arbitration.

The meeting adjourned at 2:30pm on Wednesday May 18th.

White Paper for Review by the Crab Plan Team – 13 May 2005

**AFSC Response to Questions for Crab Plan Team
on Estimates of Snow Crab Abundance
10 May 2005**

**Prepared by the staff of the Alaska Fisheries Science Center and Alaska Regional
Office of the NOAA Fisheries Service**

1. What is the best estimate of abundance for the snow crab stock, based on the data available from 2004?

Summary:

For management purposes, the estimate of abundance for commercial-size male snow crab that is considered most consistent with previous estimates of abundance is the estimate based on data collected in 2004 from the standard survey area using two charter vessels (F/V Aldebaran and F/V Arcturus). This estimate is the only one that is directly comparable to the EBS survey time series that has been used in assessment modeling and which has been the basis for evaluating whether the annual GHLL is appropriate relative to the definition of “overfished” contained in the FMP for Bering Sea/Aleutian Islands King and Tanner crabs. The estimate of abundance of commercial-sized male snow crab based on data collected in 2004 from the standard survey area using three charter vessels, which incorporates data collected aboard the F/V Sea Wolf (industry sponsored), was found to be more precise and larger than the estimate of abundance based on data collected by two vessels (see below). Unfortunately, the degree to which the abundance estimate based on data collected using three charter vessels was biased relatively to previous estimates could not be assessed prior to providing the information to ADFG.

Details Regarding the Results of the 2004 Survey:

The Bering Sea Fisheries Research Foundation partnered with Alaska Fisheries Science Center in 2004 to supply a third charter vessel for the eastern Bering Sea crab/groundfish bottom trawl survey (1) to increase the number of trawl tows in the snow crab area with the objectives of reducing the variance of the abundance estimates in the area where mature female snow crab has been most abundant and (2) to expand the survey area to the area north of the standard survey which was last sampled in 2001. The majority of these tows were randomly located in grid squares while a smaller number of tows were assigned to grid corners in the area south of St. Matthews Island where we normally tow corner stations. The area expansion to the north was to evaluate whether the reproductive portions of snow stock has significantly shifted northward.

A total of 75 tows were conducted by the F/V Sea Wolf chartered by the Foundation. Of these 41 stations were towed at random locations in grid squares in the additional high density squares in northwestern area of the standard survey area, and an additional 11 stations were towed at the corners of the survey grid pattern immediately below the St. Matthews high station density area. Thirty-three stations

were towed in squares to the west, north and east of the standard survey area. Of these 25 were sampled in the 2001 survey. The survey by the F/V Sea Wolf was lead by an experienced NMFS biologist; all trawling was conducted with standard NMFS survey nets and net monitoring system following explicit survey protocols.

The estimate from the standard 2004 survey, conducted by two NMFS chartered fishing vessels, is directly comparable to the eastern Bering Sea survey time series. This time series of estimates has been used in the assessment modeling to set guideline harvest levels and has been the basis of judging annual abundance relative to the definition of “overfished” contained in the FMP for the Bering Sea/Aleutian Islands King and Tanner Crabs. The incorporation of the catch data from the third vessel for the standard area improved the precision slightly and increased the estimate of abundance for the commercial-size male snow crab. Unfortunately the analysis of the data from the 2004 survey using the data from all three vessels was not completed until just days before the start of the snow crab season leaving no time to evaluate which data set was preferred for management purposes for estimating the abundance of size/sex categories and to understand why the catch rates of the F/V Sea Wolf were greater than the two NMFS chartered vessels.

On average, the catch rates of commercial-size male snow crab for the F/V Sea Wolf were greater than for the two NMFS chartered vessels. The performance measures of the survey trawl net used by the Sea Wolf were nearly identical to adjacent tows made by the two NMFS charter vessels.

2. How did the precision of the abundance estimate change with and without the additional tows from the BSFRF charter vessel in 2004?

Summary:

The estimate of abundance of commercial-size male snow crab based on data collected as part of the three vessel survey was larger (i.e., 11%- 76.7 million crabs versus 68.9 million crabs), as well as more precise (i.e., 12%- CV of 0.32 versus 0.36), than estimates from the standard (i.e., two vessel) survey.

Details Regarding the Results of the 2004 Survey:

Between 25 September 2004 and 25 April 2005, 13 separate analyses were conducted regarding the estimation of abundance for commercial-size male snow crab. These included estimates using data from two and three vessels, various stratification schemes, and several different adjustments to the haul data. Overall, the abundance estimates did not vary significantly relative to the 95% confidence interval (CI) for the estimate. That is, the range of estimated abundance of commercial-size male snow crab was 65.2 million to 77.8 million, whereas the range for the relative CI was 24% to 36%.

The estimate of abundance of commercial-size male snow crab based on data from the two vessel survey was 68.9 million crab (95% CI was plus or minus 36% of the

estimate of abundance), while the estimate of abundance based on data from the three vessel survey was 76.7 million crab (95% CI was plus or minus 32% of the estimate of abundance).

3. Is there a more efficient survey design for the BSFRF vessel in terms of precision?

Summary:

Yes.

Detailed Response:

Various methods of stratification and various survey designs are possible. However, increases in precision will most likely require larger numbers of trawl tows. In addition, the data collected in 2004 will be used by the analysts at the AFSC and ADFG to investigate the possibility of altering the survey design to improve precision or lessen bias. However, given the data from the traditional two vessel trawl survey are also used to estimate the biomass of other commercially important species, there are significant constraints on how much the existing survey design can be altered.

4. How should the precision and accuracy of the 2004 snow crab abundance estimate be factored into the GHL setting process?

Summary:

Uncertainty in the estimates of abundance could potentially be incorporated in the GHL estimation protocol by establishing a threshold for the probability that a given estimate is below the overfished level. This would most likely be accomplished through the use of integrative models that incorporate fishery-dependent and – independent data. Such a model is currently under development. Until the model under development is finalized and recommended for use by the Council, NMFS, and the ADFG, the existing “ad hoc” approach to adjusting the survey area-swept estimate of abundance will continue to be used.

Detailed Response:

In general information regarding the precision of estimates of abundance has not been taken into account in setting GHLS since 1982 when GHL ranges were replaced by point estimates. Given that 2005 allocation procedures require fixed apportionments for IFQ, point estimates are necessary from a management perspective. Uncertainty in the estimates of abundance could potentially be incorporated in the GHL estimation protocol by establishing a threshold for the probability that a given estimate is below the overfished level. This would most likely be accomplished through the use of integrative models that incorporate fishery-dependent and – independent data. Such a model is currently under development at the AFSC.

The incorporation of accuracy into an estimate of abundance is currently achieved in a somewhat ad hoc manner (see answer to Question 8). At present we have information from field studies as to the efficiency (i.e., accuracy) of the 83-112 trawl. However, this estimate does not include information on the availability of crabs to the trawl survey. The following values for net efficiency are computed from the equations reported in Somerton and Otto (1998. Net efficiency of a survey trawl for snow crab, *Chionoecetes opilio* and Tanner crab, *C. bairdi*. Fish. Bull. 97:617-625). Based on the reported results, the efficiency of the trawl survey is a function of crab size. In estimating the efficiency rates reported below, it was necessary to assume that all size-sex groups are equally vulnerable and are representatively sampled. Both of these are unproven assumptions.

Reference Point	Carapace Width (mm)	Trawl Efficiency
Near mean female maturity	50	.383
Near men male maturity/legal size	78	.546
Commercial-size male	102	.735
Near average in fishery landings	110	.788
Near 99 percentile for fishery	130	.880
Near maximum known EBS size	160	.950

In the current approach for the estimating survey-based population abundances for all stocks, NMFS incorporates an indirect or 'ad-hoc' adjustment for net efficiency which it applies to all sizes of both sexes. This adjustment results from the use a fixed 50' net width opening in the area-swept calculations as opposed to the actual net width opening of each tow or, alternatively, the mean net width opening of all tows. Since actual net width openings exceed 50' on average, use of the fixed 50' in the calculation results in an adjustment in the abundance estimates that is directly proportional to the ratio of actual tow width [ft] divided by 50. In this approach, the magnitude of the adjustment varies annually depending on the actual performance of each tow in the survey. For example, if the actual net width openings of two tows were 55' and 60', the respective adjustments in area-swept abundance estimates of these tows would be 10% and 20% respectively.

5. How can the CPUE of the commercial harvest in a given year be used to estimate abundance directly or used to supplement the survey-based estimate of abundance?

Summary:

Analytical modeling approaches that integrate various sources of fishery-independent and fishery-dependent information are customarily used to assess the status of fishery resources. The output from these models is used to formulate management advice. As noted above, assessment scientists at the AFSC are currently working on such a model. Apart from technical difficulties, it is very unlikely that fishery-based

estimates of abundance will alone be useful for within-season management of crab stocks under the current allocation system.

Detailed Response:

Analytical modeling approaches that integrate various sources of fishery-independent and fishery-dependent information are customarily used to assess the status of fishery resources, and to formulate management policies that provide for the conservation and optimal utilization of the stocks. Such integrated stock assessment models combine research survey and fishery data, life-history information (e.g., natural mortality, maturity, growth), address the patterns of survey and fishery selectivity and account for inter-annual sampling variability in estimates of stock abundance and management target rates. Integrating these key sources of information in a model provides improved understanding of the status of the stock. Integrative models are also one way to incorporate information on uncertainty in input parameter values. For the management of stocks under the aegis of the North Pacific Fishery Management Council, stock assessment models are used whenever possible for estimation of stock biomass, target fishing mortality values and catch quotas. An integrative model for use in assessing the status of snow crab is currently under development at the AFSC.

Estimates of uncertainty in catch rates from survey and commercial data are incorporated into the snow crab assessment model currently under development. Survey selectivities are estimated in the model to address availability and capture probability.

Integrated stock assessment models can incorporate fishery catch-per-unit-effort (CPUE) as a so-called tuning index to assist model performance in terms of comparisons of survey-based estimates of abundance versus those projected by the model. In such models, one can also compare model-based estimates of fishery CPUE with that observed in the fishery. Such approaches provide redundancy in measures of stock and fishery metrics from the model, and refinement in targets for stock management; be they stock or fishery thresholds or annual harvest quotas. The snow crab stock assessment model currently under development incorporates fishery CPUE for these purposes.

There are several methods that have been developed to estimate abundance using fishery data within a fishing season. Fisheries conducted over short time periods with uneven distribution of fishing effort are not suitable for the application of CPUE-based abundance methods directly. Fishery-based estimates of abundance either require that a trend can be observed between declining CPUE and cumulative removals from the stock (e.g., Leslie-DeLury estimates) or that part of the population be marked (or otherwise identified) and randomly distributed in the population as a whole (mark recapture and change in ratio methods). Fishery-based methods also require that effort is distributed over the geographic range of the stock during each fishing period or that the fraction of the stock being fished can somehow be estimated. Mark-recapture methods require that all tags or marked individuals be

tallied or that the portion tallied be known among other frequently difficult to establish assumptions.

Apart from technical difficulties, it is very unlikely that fishery-based estimates of abundance will alone be useful for within-season management of crab stocks under the current allocation system and even less so with IFQs because allocations must be made in advance.

6. Can the CPUE of the commercial harvest be used to make inferences regarding trends in snow crab abundance (total) or the abundance of 4-inch male snow crab?

Summary:

The estimates of abundance based on data from surveys that systematically sample the range of snow crab in the Bering Sea are likely to be more reliable than estimates of abundance based on commercial catch data (i.e., CPUE), which are typically based on fishing effort from a relatively small portion of the population distribution.

Detailed Response:

The contemporary snow crab fishery is temporarily constrained given the comparatively small guideline harvest quotas and the potential fishing power of the fleet. The relative briefness of recent fisheries (i.e., on the order of hours-days versus several weeks-months in the past) further concentrates the fishery spatially since time spent searching or prospecting comes at the possible expense of time spent fishing prior to the closure. In many past years, the grounds that could be fished in the Bering Sea snow crab fishery have been restricted by ice cover as well as practical considerations such as logistics of meeting delivery schedules. The area from which the majority of fishery catch is extracted in recent years given these constraints, may not be representative of the underlying population abundance; hence, measures of fishery performance (CPUE) do not necessarily (or strictly) represent an index of overall population abundance or trends in abundance of the population. In fisheries which exploit stocks over their range (i.e., for which population abundance and fishery quotas are estimated), fishery performance in terms of CPUE, and specifically, the time-course change in fishery performance, can be illustrative of the underlying stock abundance. To employ fishery CPUE as an index of stock abundance, and especially to compare CPUE between years, it requires that there has been no change in the constant of proportionality between catch-per-unit-effort and true abundance. If this proportionality is not maintained, comparisons of CPUE between years or trends in CPUE across years, would lead to erroneous judgments of stock abundance or changes in that abundance over time.

Bering Sea snow crab may be more or less concentrated in certain areas depending on environmental conditions and time of year and overall abundance. For example, some schooling fish are more concentrated at times of very low abundance and so are more vulnerable to fishing. In this case, estimates of CPUE from commercial fisheries may be increasing as the population is decreasing in abundance.

In general, the data used for an estimate of trends in abundance or abundance should be from a representative sample of the entire population. Therefore, the estimates of abundance based on data from surveys that randomly sample the range of snow crab in the Bering Sea are likely to be more reliable than estimates of abundance based on commercial catch data, which are typically based on fishing effort from a relatively small portion of the population distribution.

Given the uneven distribution of fishing effort associated with commercial fisheries for crab in the Bering Sea and the short time involved in seasonal fisheries, CPUE has turned out to be an unreliable indicator of abundance in recent years. For example (data below), the 2004 snow crab fishery lasted 8 days 10 hours, over 40% of the catch came from a single statistical area (square ca 30 nautical miles on a side) and only four squares accounted for 66% of the live crab landed while a total 32 statistical areas were fished. By contrast survey data for 2003 (prior to 2004 fishing) showed that about 15 squares were required to account for 66% of the population while commercial-sized (102 mm or 4 inches) males occurred in 117 statistical areas. Similarly 2005 fishery lasted 5 days 12 hours but was spread a little more widely. Still, in 2005 the best statistical area accounted for 29% of all live landings and six squares accounted for over two-thirds of live landings while 39 statistical areas were fished. By contrast survey data for 2004 (prior to 2005 fishing) showed that about 12 squares were required to account for 66% of the population while commercial sized males occurred in 118 statistical areas. It is very unlikely that fishery CPUE is reflective of overall stock conditions and quite possible that CPUE is more an indication of the degree to which the stock is concentrated rather than its overall abundance.

2004 snow crab, top 15 statistical areas

Pounds	Area	No. of Areas	Cum. Pounds	Percent	CPUE	Rank of 32
8,974,151	735800	1	8,974,151	40.9%	158.73	14
2,664,500	735730	2	11,638,651	53.0%	151.33	17
1,777,024	735700	3	13,415,675	61.1%	139.96	19
1,210,980	735830	4	14,626,655	66.6%	160.46	13
993,330	786030	5	15,619,985	71.2%	170.52	12
737,606	775930	6	16,357,591	74.5%	374.79	1
651,423	745800	7	17,009,014	77.5%	177.58	10
639,054	725700	8	17,648,068	80.4%	115.72	25
624,058	725730	9	18,272,126	83.3%	134.44	21
573,132	725630	10	18,845,258	85.9%	109.99	27
399,093	715630	11	19,244,351	87.7%	172.70	11
355,368	745830	12	19,599,719	89.3%	186.13	9
323,804	776030	13	19,923,523	90.8%	211.61	6
323,619	725800	14	20,247,142	92.3%	136.27	20
271,761	786000	15	20,518,903	93.5%	152.99	16

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2005 snow crab

Pounds	Area	No. of	Cum.	Percent	CPUE	Rank of 39
		Areas	Pounds			
6,608,361	735800	1	6,608,361	29.0%	224.94	20
2,077,426	725700	2	8,685,787	38.1%	257.84	14
2,006,462	735730	3	10,692,249	46.9%	184.68	25
1,842,903	735830	4	12,535,152	54.9%	207.94	23
1,830,608	715630	5	14,365,760	63.0%	388.44	2
1,532,788	745830	6	15,898,548	69.7%	253.94	16
1,116,460	775930	7	17,015,008	74.6%	239.45	19
1,053,797	735700	8	18,068,805	79.2%	289.64	8
1,020,353	725730	9	19,089,158	83.7%	270.51	12
776,443	715600	10	19,865,601	87.1%	336.08	3
759,911	725630	11	20,625,512	90.4%	330.42	4
279,561	715700	12	20,905,073	91.6%	317.32	5
275,784	725800	13	21,180,857	92.8%	222.52	21
261,574	715730	14	21,442,431	94.0%	298.20	7
199,818	745800	15	21,642,249	94.9%	263.77	13

7. What is the best estimate of natural mortality of 4-inch male snow crab?

Summary:

A value of $M=0.23$ was recommended by the Crab Plan Team's Working Group, as a reasonable value for M for Bering Sea snow crab. The FMP currently uses a value of 0.3 for the rate of natural mortality in Bering Sea snow crab. It is recognized that the value of 0.3 for M in the FMP needs to be revised to reflect recently collected information on this parameter.

Detailed Response:

Radiometric aging of a small sample of 5 male snow crab collected during the early 1990s when exploitation rates were high, found a maximum post-terminal molt age of 7 years in this combined very old and very-very old shell condition class group [SC4 + SC5]. Because the mean age of male snow at their terminal molt to maturity is approximately 8-9 years, this would indicate a maximum age of about 15-16 years which would have resulted from the combined effects of natural mortality and high fishing mortality rates. Male snow crab have been recovered 8 years after tagging in studies conducted in eastern Canada in a lightly exploited population. Maximum ages of snow crab in eastern Canada have been estimated at about 18-20 years based on tag recoveries in this population. Neither of these estimates of oldest age is from an unexploited snow crab population from which, by definition, maximum lifespan under no fishing must be determined. Similar data are not available from snow crab in the Bering Sea. Further, at present the information to directly estimate M for snow crab in the Bering Sea is not available.

A value of $M=0.23$ was recommended by the Crab Plan Team's Working Group as a reasonable value for M for Bering Sea snow crab. Natural mortality can be inferred from the longevity of a species under the assumption that the annual time course of change in abundance in an unexploited population follows negative exponential

depletion. The decision that $M=0.23$, nonetheless, may tend to err on the side of less conservation as it assumes that these oldest 'observed' ages of 19 or 20 are valid estimates of the 99th percentile of the distribution of ages in a virgin population. Accordingly, these observed oldest ages must be assumed to be minimum estimates of the lifespan of snow crab since a truly virgin population has not been observed. That is, it is entirely reasonable to assume based on these findings that an unexploited population of snow crab living at long-term equilibrium would contain ages at least as old as these, and very likely older.

8. Is the estimate of snow crab abundance negatively biased? If so, to what extent?

Summary:

Results of the Somerton and Otto (1998) underbag experiment suggest that net selectivity of the 83-112 trawl may result in underestimating commercial-size male snow crab abundance by approximately 21%. The ad-hoc adjustment for net efficiency employed by NMFS tends to result in adjustments to the abundance estimates in the range of 10-20% for all sizes of both sexes.

Detailed Response:

Results of the Somerton and Otto (1998) underbag experiment suggest that net selectivity of the 83-112 trawl may result in underestimating commercial sized male abundance by approximately 21%. The ad-hoc adjustment for net efficiency employed by NMFS (*see* Question 4) tends to result in adjustments to the abundance estimates in the range of 10-20% for all sizes of both sexes. The magnitude of this ad-hoc correction in any year depends on the actual net width openings of each tow, and the distribution of catch by tow.

One critical assumption in interpreting and applying the results of the underbag experiment is that the grounds where the experiment was conducted were representative of the EBS in general. Net efficiency data (*see* Question 4) indicate that underestimation of abundance is a larger problem for smaller sized crabs.

9. Does the current procedure for estimating snow crab abundance appropriately account for any negative bias in the survey data?

Summary:

Results of the Somerton and Otto (1998) underbag experiment suggest that the survey area-swept estimates of abundance may be negatively biased by 21%. The ad-hoc adjustment may coincidentally account for most of this bias. As noted, the magnitude of this ad-hoc correction is not fixed and varies annually depending on actual net performance for each tow, the corresponding area swept, as well as the distribution of the catch by tow.

Detailed Response:

The uncorrected abundance estimate of commercial sized, male snow crab based on survey results is believed to be negatively biased by 10-20%. The ad hoc correction factor applied to the survey data is thought to account for most of this bias.

Nonetheless, because the magnitude of the correction factor is fixed (based on the characteristics of the trawl net and estimated area swept), the appropriateness of the correction factor varies annually (as noted above).

10. What is the fecundity of mature female snow crab? Does the fecundity rate of mature female snow crab vary by latitude (or by water temperature)?

Summary:

Fecundity ranges from about 11,000 eggs per female at 40 mm carapace width to 74,000 eggs per female at 80 mm.

Detailed Response:

Fecundity ranges from about 11,000 eggs per female at 40 mm carapace width to 74,000 eggs per female at 80 mm. In addition, there is considerable variation between individuals depending on their reproductive stage (i.e., primiparous [first time reproducers] versus multiparous individuals [individuals which have produced at least two clutches]), reproductive history and other factors. Primiparous females produce only about 70 to 80% of the number of eggs produced by a multiparous female; probably because the primiparous clutch size is conditioned on pre-molt carapace width while multiparous females do not molt.

Biennial spawning tends to be prevalent in cold northern waters both the Atlantic and the eastern Bering Sea. Colder environments seem to affect the frequency of spawning more than the number of eggs per female.

11. Can the 2004 survey data and commercial catch data be used to test the snow crab localized depletion hypothesis (as discussed by the CPT at the September 2004 meeting)?

Summary:

A localized depletion hypothesis was not proposed at the September, 2004 crab plan team meeting.

Detailed Response:

At its September 2004 meeting, the Crab Plan Team passed a motion concerning the differential harvest of snow crab in the southern portion of their range and the need to consider the spatial aspects of the removals, the effects on egg production, and the lower productivity of snow crab in the colder waters to the north. (See crab plan team minutes September, 2004 and snow crab stock assessment report.)

PLAN TEAM FOR THE KING AND TANNER CRAB FISHERIES
OF THE BERING SEA/ALEUTIAN ISLANDS

TERMS OF REFERENCE

(as revised by the Plan Team 5/18/05 changes from 9/04 are in **bold**)

1. Establishment. The North Pacific Fishery Management Council (Council) shall establish a Plan Team for the king and Tanner crab fisheries of the Bering Sea/Aleutian Islands (BS/AI) area. The Plan Team will provide the Council with advice in the areas of regulatory management, natural and social science, mathematics, and statistics as they relate to the king and Tanner crab fisheries of the BS/AI area.
2. Membership. Plan Team members will be appointed from government agencies, academic institutions, and organizations having expertise relating to the crab fisheries of the BS/AI. Normally, the Plan Team will consist of at least one member from the Council staff, the National Marine Fisheries Service (NMFS), the Alaska Department of Fish & Game, the University of Alaska, and other universities and institutions. Alternate members may be assigned to participate in case a member cannot attend a meeting. With the consent of the sponsoring agency or institution, nominations may be made by the Council, the Scientific and Statistical Committee (SSC), the Advisory Panel (AP), or the Plan Team. All nominations will be subject to approval by the SSC, with the Council retaining final appointment authority. Appointments should reflect the Plan Teams' responsibility to evaluate and make recommendations on management, biological, economic and social conditions of the fisheries.
3. Organization. The Plan Team will be directed by a chairperson, and may divide some of its responsibilities among work groups organized according to subject matter. A work group may also include members from the BS/AI groundfish Plan Team. Each work group will be directed by a work group leader.
 - (a) Rules of order. In general, rules of order will be informal. Plan Team decisions will be reached by consensus, whenever possible. If a decision is required and consensus cannot be reached, the opinion of the majority will prevail. In representing the Plan Team publicly, the spokesperson will take care to relate Plan Team opinions accurately, noting points of concern where consensus cannot be reached.
 - (b) Meetings. A minimum of two Plan Team meetings will be held annually in so far as practicable to discuss guideline harvest levels, status and management of the BSAI crab stocks. The timing and scope of meetings, in so far as practicable, will be as follows; a spring meeting will be held with the intention of reviewing the previous year's fishery catch data, the methodology for stock assessment modeling, preliminary stock assessment and any additional issues pertinent to the summer research schedule. A following summer/fall meeting will be held with the intention to discuss the status of stocks. This meeting would be intended to occur prior to the TAC determinations by the state. **The fall meeting shall be held at a time that ensures availability of TAC specifications for the allocation of crab resources under crab rationalization.** It is understood that this status of stocks meeting does not preclude additional Inter-agency meetings prior to TAC setting. The Plan Team chairperson may call other meetings as necessary. The Crab Plan Team may meet separately or jointly with the BSAI Groundfish Plan Team to discuss areas of joint concern. A draft agenda will be prepared in advance of each meeting by the Council staff in consultation with the chairperson, and may be revised by the Plan Team during the meeting. Minutes of each meeting will be prepared by the Council staff, distributed to Plan Team members, and revised as

necessary at or before the subsequent Plan Team meeting. The Chairperson (or designee) will report the Team's finding to the Council.

(c) Selection of officers. Officers (Plan Team Chair, Vice Chair and workgroup leaders) will be selected at the meeting preceding the annual Plan Team meeting or as vacancies arise. The Plan Team Chairperson and Vice Chair will be selected at the annual meeting for two-year terms. It is the intent of the Team that after two years the Vice Chair will succeed as Chair and the following election will be for the position of Vice Chair. This process will continue on a two-year cycle. Work group leaders will be selected for one-year terms. There will be no limit on the number of consecutive terms that officers may serve.

4. Functions. The Plan Teams' primary function is to provide the Council with the best available scientific information, including scientifically based recommendations regarding appropriate measures for the conservation and management of the BS/AI king and Tanner crab fisheries. All recommendations must be designed to prevent overfishing while achieving optimum yield (National Standard 1). All recommendations must also be scientifically based (National Standard 2), drawing upon the Plan Teams' expertise in the areas of regulatory management, natural and social science, mathematics, and statistics. Finally, uncertainty must be taken into account wherever possible (National Standard 6).

(a) SAFE report. The Plan Team compiles a SAFE report for the BS/AI king and Tanner crab fisheries on an annual basis. The SAFE report provides the Council with a summary of the most recent biological condition of the crab stocks and the social and economic condition of the fishing and processing industries. The SAFE report summarizes the best available scientific information concerning the past, present, and possible future condition of the crab stocks and fisheries, along with ecosystem concerns.

(b) Plan amendments. The Plan Team may also play a role in the development and evaluation of amendments to the BS/AI king and Tanner crab fishery management plan, as well as evaluate amendments to the groundfish fishery management plan that may affect the conservation and management of BS/AI crab resources.

(i) The Plan Team may evaluate amendment proposals and forward their recommendations to the Council.

(ii) In addition, the Plan Team may develop their own amendment proposals.

(iii) Once an amendment proposal has been accepted for consideration by the Council, an analytical team may be assembled by the responsible agencies. Every analytical team should include at least one member from the Plan Team, drawn from the appropriate working group(s), whenever possible.

(iii) Once an amendment analysis has been completed, it may be reviewed by the Plan Team. The Plan Team's comments, if any, are then forwarded to the SSC, AP, and Council.

(c) Peer Review. The plan team deliberations shall constitute part of the peer review process specified by current OMB policies provided that members directly involved in the production of a scientific product will recuse themselves from the review.

ALASKA DEPARTMENT OF
FISH & GAME
DIVISION OF COMMERCIAL FISHERIES
JUNEAU, ALASKA

NATIONAL MARINE FISHERIES
SERVICE
ALASKA REGION
JUNEAU, ALASKA

STATE/FEDERAL ACTION PLAN
FOR MANAGEMENT OF
COMMERCIAL KING AND TANNER CRAB FISHERIES
OCTOBER, 1993

PURPOSE: To foster improved coordination and communication between National Marine Fisheries Service (NMFS) and Alaska Department of Fish & Game (ADF&G) with respect to crab management under the Fishery Management Plan for the Commercial King and Tanner Crab Fisheries in the Bering Sea and Aleutian Islands Area (FMP). Interagency action groups will implement this coordination.

BACKGROUND: The FMP approved in 1989 establishes a State/Federal cooperative management regime that defers crab management to the State of Alaska with Federal oversight. The Secretary of Commerce defers to the State's regulatory regime providing it is consistent with the FMP, the Magnuson Fishery Conservation and Management Act (Magnuson Act) and other Federal law.

A management goal and specific objectives are identified in the FMP. ADF&G, in consultation with NMFS, recommends to the Alaska Board of Fisheries (Board) appropriate management measure(s) for a given year and geographical area to accomplish the objectives. Three categories of management measures are available for consideration: (1) those that are specifically fixed and require an FMP amendment to change, (2) those that are framework-type measures which the State can change without an FMP amendment but following specified criteria, and (3) measures that are neither rigidly specified nor frameworked in the FMP. The measures in categories (2) and (3) may be adopted as State laws subject to the appeals process outlined in the FMP.

The State is not limited to the measures outlined above. Any other management measures must be justified based upon consistency with the FMP objectives, the Magnuson Act, and other applicable Federal law.

Overall, the FMP has efficiently managed the crab fisheries. The framework approach has worked well for the majority of crab management issues. However, Category 2 management measures have been appealed to the Secretary (specifically, pot limits and registration areas). Members of the industry also have criticized Board actions with respect to Category 2 measures

(setting of guideline harvest levels). In order to avoid future contentious problems, NMFS and ADF&G will adopt this action plan to more formally implement State/Federal cooperation in crab management.

ACTION: Three action groups, described below, will facilitate this joint coordination.

- a) Research Planning Group
- b) Crab Plan Team
- c) State/Federal Policy Group

Research Planning Group

The purpose of this group will be to consider long-term crab research priorities, current research activities, and each agency's particular research interests. The group will include NMFS, ADF&G and university crab biologists as well as other representatives from NMFS/Fisheries Management Division; Alaska Fisheries Science Center and ADF&G/Division of Commercial Fisheries. Some of these individuals also may be members of the Crab Plan Team.

This group will work on the development of a long-term plan for applied crab research which will help foster a healthy exchange of ideas among fishery biologists and managers on particular needs. The plan will focus on development of optimal long-term harvest policies. The plan will be updated annually and will function as a vehicle to coordinate the expenditure of crab funds between ADF&G and NMFS and to seek additional funding for critical research.

The group will meet annually for a one- or two-day period at a time and place convenient for the majority of group members.

Crab Plan Team

The annual development of the preseason guideline harvest levels (GHLs) is a dynamic process dependent on using the most current information available and applying this information via analysis and statistical modeling. Scientists from NMFS and ADF&G are currently involved in this process.

Though individual members of the Plan Team have always participated in the development of GHLs, public perception is that this is an ad hoc process. Due to the timing of the Bering Sea surveys and the openings of the early fall fisheries, only a limited amount of time exists to analyze, discuss, amend and release the GHLs to the public in a timely fashion. To release preseason GHLs that have been reviewed using a Council process, such as that used to establish annual groundfish harvest specifications under the groundfish FMPs, would require that

current season opening dates for the fall fisheries be delayed and/or rescheduled, or the previous year's survey information would have to be used to set GHIs in the current year. The latter option could interfere with the FMP management objective of biological conservation. In addition, the Council would have to schedule a special meeting or allow time during the September meeting to address crab management after the survey information became available.

The purpose of a Plan Team review will be to formally incorporate its input in the GHL process. The FMP calls for Plan Team input in the preparation of an annual area management report to the Board. This report includes a discussion of the current status of GHIs and support for different management decisions. This report is reviewed by the State, NMFS, and the Council, and available for public comment on an annual basis.

The Plan Team will meet annually to review GHIs in a session that is open to the public.

State/Federal Policy Group

The purpose of the State/Federal Policy Group will be to review and discuss crab management issues prior to Board and/or Council review. This group will include senior staff and legal counsel and will meet annually, or more often if necessary. Many issues may be resolved through interagency agreement. For instance, prior to final Board action, this Policy Group could review whether crab management proposals and petitions are consistent with the FMP and reflect an appropriate and desired management strategy. Also, this group will review FMP amendment proposals. Their recommendations will be forwarded to the Board and the Council, providing guidance as the Board establishes management regulations.

OTHER ACTION:


In addition to the above action groups, NMFS and ADF&G will meet annually with crab industry representatives to discuss crab management issues such as, but not limited to, setting of GHIs, stock analysis, current research, and harvest strategies. The location of meetings will alternate between Washington and Alaska. These meetings will provide an opportunity for review of crab management issues and industry input to management agencies.

Council and Board members have agreed to form a Consultation Group composed of a subcommittee of Council and Board members that will meet publicly on an annual basis to focus on crab issues. (These meetings could occur at one of the regularly scheduled Council or Board meetings.) This joint subcommittee could review staff data on the status of crab stocks and fisheries and both public and staff information regarding crab


management and then provide guidance to the respective Council and Board on pertinent crab issues. Council and Board representatives would benefit by meeting for the sole purpose of discussing crab-related issues.

Both NMFS and ADF&G agree to jointly request Council and Board concurrence on these action groups and their role in the cooperative management of the king and Tanner crab fisheries in the Bering Sea and Aleutian Islands.

This State/Federal Action Plan for Management of Commercial King and Tanner Crab Fisheries has been approved by:


Steven Pennoyer
Director, Alaska Region
National Marine Fisheries
Service

10/12/93
Date


Carl L. Rosier
Commissioner
Alaska Department of
Fish & Game

10/15/93
Date