North Pacific Fishery Management Council

Richard B. Lauber, Chairman
Clarence G. Pautzke, Executive Director

605 West 4th Avenue
Anchorage, Alaska 99501

Mailing Address: P.O. Box 103136
Anchorage, Alaska 99510

Telephone: (907) 271-2809
FAX: (907) 271-2817

Certified: Jane Benedixen
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MINUTES
Scientific & Statistical Committee
December 6-8, 1993

The Scientific and Statistical Committee of the North Pacific Fishery Management Council met December 6-8, 1993 at the Hilton Hotel in Seattle. All members were present:

Terrance Quinn, Chair	Doug Eggers	Jack Tagart
William Clark, Co-chair	Dan Huppert	Harold Weeks
William Aron	Richard Marasco	Marc Miller
Keith Criddle	Phil Rigby	F.H. Bud Fay

The SSC notes that this is Bill Clark's last meeting on the SSC. A member since January 1987 and SSC chair since May 1991, Bill has been instrumental in developing sound scientific advice for the Council and in providing solid leadership and organization. Bill will be deeply missed not only for sensible advice but also for his spirit of camaraderie.

C-4 HALIBUT MANAGEMENT

The Committee reviewed the EA/RIR of a trip limit and reserve proposal for the halibut fishery in IPHC Area 4B (Western Aleutians), which was submitted by the Atka Fishermen's Association. The alternatives considered are various combinations of quota set-asides and trip limits to provide fishing opportunity for local boats and discourage fishing by non-local boats in Area 4B prior to the general Bering Sea opening in August.

At present the IPHC, at Council request, has a series of 12-hour openings (separated by 36-hour closures) beginning in early June and continuing until 10% of the 4B quota has been taken or until the general August opening, whichever comes first. This has provided about five weeks of fishing and a closure in mid-July. Local boats have fished consistently when a buyer was available, but non-local boats have taken the bulk of the catch.

It is uncertain what regulations the Commission will adopt for 1994 in the absence of further guidance from the Council.

Beginning in 1995, there will be a CDQ allocation of 20% of the 4B quota.

The alternatives considered include:

(1) Status quo (10% set-aside and no trip limits for early 4B openings);
(2) 20% set-aside and 5,000 lb trip limits.
(3) 10% set-aside and 5,000 lb trip limits.

The analysis indicates that allowing the local boats to fish through to the August opening could increase the local boats' catch from about 50K lbs to as much as 100K lbs, its estimated capacity. This is about 5% of the 4B quota. On the other hand, there is no assurance that non-local boats would not continue to fish in the early openings and close the fishery early, even with trip limits.

As in the case of IPHC Area 4C (Pribilof Islands), it is very difficult to design a set of regulations to achieve an allocation objective. It would be much simpler and much more effective to simply allocate a certain amount to local boats. Of course, after 1994 the CDQ program will do that.

The SSC approves the analysis for public review.

C-5 COMPREHENSIVE RATIONALIZATION PLANNING (CRP)

The SSC has received a tremendous amount of new information regarding comprehensive rationalization during the past week. Due to the quantity and complexity of materials submitted, the SSC statement on CRP is divided into four sections:

(1) Review of Council staff's progress report on the social and economic research plan and related documents in the December briefing book;

(2) Review of specific draft and intermediate products from researchers whose work is for the Council or coordinated by the Council staff;

(3) Review of the Social Impact Assessment expert working group actions and contract proposal; and

(4) Review of spontaneous submissions from other interested parties.

(1) Review of Council staff's progress report on the social and economic research plan and related documents in the December briefing book;

With Council Staff assistance, the SSC reviewed progress on the research and analysis tasks to support Council decisions in the CRP effort including briefing book items pertaining to the analysis of bycatch rates and the timeline for CRP economic analysis.

Regarding the Analysis of 1992 Weekly Processor Report Data in Terms of Retained Catch, Total Reported Catch, and Estimated Total Catch, the SSC notes that the main issue was how to calculate the bycatch rates which might be used in allocating bundles of ITQs for groundfish species. Our discussion of the information resulted in the following observations:

(a) Some false impressions might be conveyed by the report's rating of data sources. For example, the fish ticket data base has been designed to document landed catch. This data base does contain weights of fish discarded after receipt by processors. The notion that fish tickets are of "poor" quality refers only to the ability of fish tickets to record at-sea discards.

(b) The document describes ways to allocate bundles of ITQs for all groundfish species (including target and non-target catches) based upon estimated average non-target bycatch rate vectors rather than actual bycatch rates of individual vessels. This is deemed necessary because the tow-by-tow and vessel-by-vessel information is not directly available. However, bycatch data, particularly for discarded fish, is not accurately recorded for all fleet segments under the current data collection and reporting system. The reported bycatch rates for catcher-processors, for example, differed markedly between the weekly processor report data and observer data. Any practical approach to including discarded bycatches in the ITQ system will have to accept some rough-and-ready computations based upon available data systems.

(c) Allocation of bycatch ITQs for all identified groundfish species may lead to very formidable at-sea enforcement problems, similar to those raised by the VIP program (i.e. un-monitored discards). The current observer system does not call for accurate weighing of all fish before discarding, and non-observed vessels would have little incentive to stay within bycatch allocations.

In reviewing the Outline and Timeline for the Economic Analysis of the Comprehensive Rationalization Program [item C-5(c)(2)] the SSC notes that this ambitious program of data collection, analysis, and reporting is very unlikely to be completed with adequate accuracy and review by the existing staff in time for the April 1994 Council meeting. If additional IQ/license limitation alternatives are added to the analytical task, it may be impossible to finish the analysis by June. We reiterate our previous suggestion that the Council try to narrow the range of alternatives that need to be evaluated.

(2) Review of specific draft and intermediate products from researchers working for the Council or coordinated by the Council staff;

The SSC received partial documentation for some components of the economics research plan, including:

Draft Documentation for the North Pacific Fisheries Optimization Model (Matt Berman)

A "preliminary draft" paper by Matt Berman and Marcus Hartley entitled "Open Access, IFQs, and the Domino Effect: Diverse Management of Multiple Species Fisheries"

A memo from Lee Huskey concerning the Economic Base Model of support sector growth in coastal Alaska communities; and

Partial documentation for Fishery Economic Assessment Models (i.e. input-output models) from Bill Jensen

These submissions respond to previous SSC requests for documentation of the economics research effort and to SSC and other review comments on earlier versions. The SSC will ask its economics subcommittee to begin reviewing these documents with priority in the order listed. We hope to distribute SSC comments to the drafters of those documents before the January, 1994 meeting.

(3) Review of the Social Impact Assessment expert working group actions and contract proposal

Over the last two years the SSC has had frequent discussions of the proper content of a social impact assessment. At its April 1993 meeting, the Committee recommended that the Council form an expert working group including Dr. Miller to define the task, and this was done. Over the summer the

working group drafted a request for proposals and the SSC reviewed the draft at its September meeting. The revised request for proposals was issued in October, and the working group reviewed the responses and recommended a contractor in November.

At this meeting the SSC reviewed the preferred proposal and the working group's report. The Committee did not undertake to review the competing proposals because Dr. Miller is the Committee's only expert in this area and he had already done so as a member of the working group.

The SSC accepted the working group's recommendation.

(4) Review of spontaneous submission from other interested parties.

During past months, the SSC has received un-solicited proposals, papers, and reports which pertain to management options or to analyses of options that the Council may wish to consider. Two items of this sort were received before this meeting:

> Scott Matulich's revised paper "Reconsidering Equity and Efficiency Implication of Individual Transferable Quotas (ITQs) in North Pacific Fisheries".
>
> A letter from Joe Blum of AFTA asking that the SSC "evaluate the potential use of General Equilibrium models for economic impact analyses".

The first paper is a substantial revision of an earlier draft paper which some SSC members reviewed last August. Because it contains a variety of new material and attempts to establish some very broad theoretical propositions, full review will require significant new effort by the economic subcommittee. This effort will have to await the high priority review of Council submitted documents, but the subcommittee hopes to have its review done for the January Council meeting. The second item proposes use of a particular empirical approach to applied welfare analysis which was well known to all members of the SSC's economics subcommittee. Consequently, we are able to provide a quick response as follows:

Comments on General Equilibrium Models

Use of general equilibrium model (GEM) as the basis for benefit-cost analysis is not "new". The technique and assumptions on which it is based are described in Just, Hueth, and Schmitz (1982). It is a "methodologically correct" technique for addressing some types of management action if the strict assumptions on which it is based are met.

When plans were formulated for the CRP analysis, several analytical approached were considered. Time constraints and data limitations weighed heavily in the selection of the technique of choice.

The AFTA letter suggests that the general equilibrium model (GEM) approach is less data demanding and requires fewer assumptions than available alternatives. These conclusions are valid only for the simplest GEM.

Application of GEM to North Pacific fishery management decisions will require resolution of problems associated with:

1. short data series,

2. lack of exvessel observations for much of the catch because of vertically integrated harvesting and processing operations, and

3. structural change due to technological change and modification of regulations.

Non-competitive market structure, market interdependencies and market diversity also will contribute to the complexity of any such analysis.

The following features characterize fisheries managed by the North Pacific Fishery Management Council: (1) there is substantial foreign investment in domestic harvesting sector and processing facilities; (2) much of the groundfish and crab catch is exported for reprocessing; and (3) much of the final consumption of fish and shellfish harvested off Alaska occurs abroad. Therefore, to estimate the change in benefits to the Nation, it would be necessary to subtract from the GEM estimate the changes in producer and consumer surpluses received by foreign entities. Such and exercise would be difficult. As noted in the letter from AFTA, this would be a very intensive activity.

In conclusion, policy analysis necessitates careful evaluation of the strengths and weaknesses of various analytical techniques, data availability, and time constraints. All of these issues were considered in the selection of the methods currently being used in the CRP analysis.

Policy on Public Submissions

As noted above, the SSC has received several requests from the public for reviews of submitted material. The SSC is concerned about becoming overwhelmed in this regard and how best to ensure equitable and timely treatment of the material. Dan Huppert of the SSC has agreed to prepare a draft policy statement which will be sent to SSC members and considered at the January meeting.

D-1(b) NORTON SOUND CRAB

The SSC reviewed an initial draft EA/RIR/IRFA for area registration in the Norton Sound red king crab fishery and heard testimony from Arni Tompson. The Committee determined that the analysis should be released for public review and comment once the following issues have been addressed. First, the data sources used to describe the operating costs for small and large vessels need to be more clearly described. Second, sensitivity of the results to the assumed costs and productivity rates should be examined over a range of possible values, including the case where small and large vessels are assumed to have identical soak times and face identical exvessel prices. Third, the social analysis should discuss the effects of incremental removals of harvest opportunity on the various sectors of the fleet.

The Committee is concerned that the statement of the purpose of and need for area registration in the Norton Sound red king crab fishery focuses on management problems associated with the current open-access nature of the fishery, while the bulk of the analysis addresses socioeconomic issues. If the Council is satisfied with the existing purpose and need statement, the analysts need to provide estimates of management and enforcement costs under each of the three alternatives. If the intent of the proposed amendment is in part, to promote economic development in the Norton Sound region, this intent should be addressed in the problem statement.

D-2(b) REVIEW OF RESEARCH PROPOSALS SUBMITTED TO THE SALMON RESEARCH FOUNDATION

The SSC heard a report by Joe Sullivan summarizing several proposals submitted to the Salmon Research Foundation. Three proposals related to in-season reporting of salmon bycatch patterns, and one proposal related to stock identification of salmon bycatch. The SSC is supportive of the Foundation's efforts and believes that the Council will benefit by the information obtained.

The SSC did not review in detail the proposals relating to in-season reporting of salmon bycatch. The SSC notes that the scientific advice that it could provide, regarding such an in-season reporting system, would be limited to statistical properties such as accuracy and precision of the information provided by the system. The SSC has little experience and expertise with implementation of real time information systems.

The SSC did discuss the proposal relating to stock identification of salmon bycatch. The proposal objectives are to develop estimates of the stock of origin for chinook and chum salmon bycatches. Completion of this task requires scientific resources and funding beyond those identified by the Salmon Research Foundation. Three approaches were proposed: protein electrophoresis, scale pattern analysis, and DNA. There are many factors that must be considered before a decision can be made to proceed with a particular approach. The SSC has identified the following issues that relate to the proposed work on salmon bycatch stock identification:

1. Scale pattern analysis is not feasible for chum salmon because standards must be collected every year. Because of the vast number of river systems in Alaska and Russia that potentially contribute to bycatches it is not feasible to collect a comprehensive scale collection on an annual time frame.

2. Scale patterns might be feasible for Bering Sea chinook bycatches, because the number of potential Asian stocks is limited to a few river systems. However, the implementation of a scale pattern analysis study would probably require expansion of current agency scale collection programs for North American chinook stocks.

3. Protein electrophoresis is feasible for chum salmon bycatch stock identification, with some additional baseline work on the Russian stocks. However, implementation would require agencies to complete analysis of existing baseline collections.

4. Protein electrophoresis might be feasible for chinook salmon stock identification. Demonstration of feasibility requires substantial investment in collection and analysis of baseline samples. Committing resources to collection and analysis of fishery samples would be premature until feasibility is demonstrated.

5. DNA methods for salmon stock identification are not well developed. The processing of samples is relatively expensive, number of markers limited, and baseline collections and analysis, to date, very limited. Although DNA methods offer great promise, it is very unlikely that DNA techniques will provide stock composition estimates in the time frame of the proposal.

The methods proposed, with the exception of protein electrophoresis applied to chum salmon, will not provide estimates of origin of salmon bycatch in the short term.

The SSC recommends that an interagency research group be set up to develop a stock identification proposal. This group should develop consensus on approach, strategy and priority of work, and identify the areas that require cooperation of outside agencies. A list of potential cooperating agencies includes: Washington Department of Fisheries, Canadian agencies and universities, University of Washington, University of Alaska, NMFS, USFWS, Alaska Department of Fish and Game, Russian and Japanese agencies. The SSC is willing to participate in that activity, but because of the range of stocks and the range of the species distribution, it is appropriate that the coordination group have broad participation outside the Council jurisdiction.

D-3 ABC DEFINITION

Both Teams adopted a set of rules for determining ABC so as to maintain a difference between the ABC and overfishing levels. Their rules were proposed by the Teams after their November 1992 meeting and rejected by the SSC at its January 1993 meeting, for reasons detailed in the minutes.

The SSC shares the Team's aim of providing a margin between ABC and overfishing, and for most stocks there is no practical difference between the policies presently advocated by the Teams and that advocated by the SSC. The NMFS overfishing review, now nearing completion, will most likely provide a new standard definition of overfishing that will far exceed any of the ABC definitions used by this Council. After this report is available, the SSC wishes to work with the Team on ABC and OFL definitions.

D-3 GENERAL

The SSC appreciates the efforts of the analysts in improving the content, organization, and format of the SAFE chapters. In particular, the summary boxes containing information about ABC's, OFL's, and the basis for their calculations were quite helpful to the SSC.

The AFSC presented preliminary results of the 1993 GOA trawl survey. Since data editing, standardization and Plan Team review have not been completed, the SSC recommends that these data not be used at this time.

FINAL GROUNDFISH SPECIFICATIONS FOR 1994

Gulf of Alaska - Pollock

The SSC reviewed an updated stock assessment for GOA pollock. New information provided in this analysis include (1) egg-production estimates of spawning biomass, (2) 1993 Shelikof Strait hydroacoustic survey biomass estimate, (3) length frequency data from the 1992-93 acoustic surveys, (4) length frequency data from the 1992 and last quarter 1993 fisheries, (5) catch-at-age from the 1992 fisheries, and (6) updated catch and discard.

The analysis used 3 model scenarios, with the preferred scenario being Model C. This model incorporates the egg-production biomass estimates as a new likelihood component and reduces the number of years for which year-specific fishery selectivity parameters are estimated. The latter

adjustment addresses the SSC's previous concern about excessive parameterization of the model by reducing the number of model parameters. The SSC concurred with the authors and Plan Team that Model C was the preferred model.

Projected stock biomass in 1994 is 726,000 mt and regarded as healthy. The 1994 spawning biomass is projected to be 719,000 mt, a level of biomass which has produced strong year classes in the past, and well above the smallest spawning biomass ever observed in this population (528,000 mt).

There were five exploitation strategies evaluated in the current analyses; each with a different estimate of the preferred fishing mortality for 1994. Strategy one, supported by the stock assessment authors, estimates an optimal fishing mortality rate, F=0.36, based on a simulation of projected stock size derived from a probabilistic recruitment model with low probability of strong recruitment, and an optimization function evaluating yield against the risk of spawning biomass falling below a designated threshold (368,000 mt). Strategy two, preferred by the Plan team, using the same probabilistic model, estimates the fishing mortality rate (F=0.20) consistent with a 5% probability that spawning biomass will fall below threshold. Strategy three, the preferred strategy of the SSC during the September preliminary evaluation of the stock, estimates the fishing mortality which results in a yield to biomass ratio of 10%. The final two strategies, estimate the fishing mortality which results in a 5% yield to biomass ratio, and the rate which maintains the 1996 pollock spawning biomass above the lowest level ever observed (528,000 mt). The 10% exploitation rate reflects a previous calculation of the 1975-79 yield to biomass ratio, a rate reflecting exploitation during a time period which proceeded the development of a series of good year classes. The 5% exploitation rate was derived from revised estimates of the 1972-79 yield to biomass ratio using biomass estimates from the current assessment.

The SSC notes that each of the evaluated exploitation strategies results in a conservative fishing mortality rate being less than either $F_{0.1}$ or $F_{35\%}$. After a substantive discussion, the SSC supports the Plan Team's recommended strategy, i.e., the fishing mortality rate consistent with a 5% probability of spawning biomass falling below threshold. The SSC supports this strategy despite the fact that its derivation depends in part on selection of a threshold spawning biomass.

Choice of threshold biomass has typically troubled stock assessment scientists. While the spawning biomass threshold chosen in this analysis, 20% of the pristine spawning biomass, can be supported by theoretical analysis, it is nonetheless controversial. There is debate within the scientific community on whether a threshold spawning biomass can be reasonably estimated.

Still, the SSC believes that this preferred strategy provides a rational basis for conservative exploitation of this stock. We remained concerned over the continuing decline in overall stock biomass, a decline unabated for the past 10 years. Although 1994 spawning biomass is regarded as healthy, it is projected to fall below historic lows by 1996. Moreover, the current fishery is largely supported by a single dominant 1988 year class with no signs of incoming strong year classes in the immediate future. In light of these trends, the SSC believes a conservative harvest strategy is warranted.

The Plan Team's recommended harvest strategy results in a 1994 ABC of 102,000 mt for the Western and Central Gulf. Eastern Gulf ABC is scaled proportionate to the Western/Central Gulf with a resulting ABC of 7,300 mt. Overfishing levels are derived from the $F_{30\%}$ rule and are 230,000 mt for the Western/Central Gulf and 16,400 mt for the Eastern Gulf.

Gulf of Alaska - Pacific Cod

The SSC endorses the recommendations of the analysts and the Team, which are a straight-forward update of last year's procedure. (Biomass is estimated by SRA with an assumed Beverton-Holt S-R relationship having a shape parameter A=0.9. The SRA is run through the 1984, 1987, and 1990 trawl survey estimates, taken as absolute.) Estimated biomass is 296,000 mt and ABC is 50,400 mt at $F_{0.1}$=0.17. OFL is 71,100 mt at $F_{30\%}$=0.24.

An appendix to the SAFE chapter reports preliminary work on applying the length-based stock synthesis model in place of SRA. The SSC favors this change. We note that the results are strongly influenced by the decision to set a lower constraint on the selectivity of large, old fish. This decision needs better justification. Also, in a full report the SSC would like to see graphs of the observations to which the model is fitted and the corresponding model predictions.

Gulf of Alaska - Flatfish

The plan team presented ABC's based on 1990 trawl survey estimated biomasses. The 1993 trawl survey data were unavailable to the analysts. 1987 survey data were used for Greenland turbot and for the Dover sole deepwater component. Differing from the $F_{0.1}$ used in September, $F_{35\%}$ was applied to the biomass estimates making use of age at entry and maturity data. This exploitation rate is particularly appropriate because flatfish species typically recruit to the trawl fishery several years before maturity. Using $F_{35\%}$ reduced the ABC's from those presented in September for all flatfish species. Overfishing levels were calculated using $F_{30\%}$. Rex sole was separated from the deepwater flatfish to provide greater flexibility in managing the bycatch of rockfish in the deepwater flatfish fishery.

Because of the expanding catches of yellowfin sole within the Central Area (approximately 6,000 mt in 1993), area specific ABC's rather than a Gulf-wide ABC may be needed if this trend continues. The SSC also discussed the very high relative flatfish biomass within the groundfish complex and the unknown ecological changes which may be occurring. In particular, arrowtooth flounder is 46% of the Gulf-wide biomass.

Gulf of Alaska - Sablefish

The SSC agrees with the Plan Team recommendation for sablefish ABC in the Gulf of Alaska, 25,500 mt and the OFL of 31,700 mt. We also concur with the recommended apportionment among management areas.

Gulf of Alaska - Pacific Ocean Perch

The SSC recommends that the 1994 ABC for POP be set at 3,943 mt. This recommendation differs from the Team's (3,030 mt). The SSC calculated its ABC by applying a fishing mortality, F=0.08, that would reduce the spawning biomass per recruit ratio to 44% to its pristine level and further reducing F to 0.04 based on the ratio of current female spawner biomass to the optimal level. This rate was then applied to the 1994 exploitable biomass, 101,800 mt. The Team reduced this value further by the ratio, $F_{35\%}/F_{30\%}$ to ensure that the ABC was less than the overfishing level of 3,943 mt. The SSC considers this adjustment inappropriate since it arbitrarily forgoes catch without providing biological justification. Downward adjustment of TAC to create the desired buffer is one approach, which is already mandated by the Rockfish Rebuilding Plan. The recommended distribution of ABC by regulatory area is: 883 mt - Western, 1,104 mt -Central, and 1,956 mt - Eastern.

Gulf of Alaska -Shortraker/rougheye

The SSC agrees with the Team's recommended ABC for shortraker/rougheye, 1,960 mt (100 mt - Western, 1,290 mt - Central and 570 mt - Eastern). This estimate was obtained by applying an F=M strategy to the average of the 1987 and 1990 trawl survey biomass estimates. We also agree with the recommended overfishing level, 2,900 mt, that was calculated by applying $F_{30\%}$=0.036 and F=M=O.030 to the 1994 shortraker and rougheye biomasses, respectively.

Gulf of Alaska - Other Slope Rockfish

The SSC concurs with the Team's recommendation for northern rockfish and other species in this complex. The ABC for northern rockfish is 5,760 mt (1,000 mt, 4,720 mt and 40 mt for the western, central and eastern areas, respectively). The overfishing level is based on $F_{30\%}$ and is equal to 10,360 mt. The ABC for the remaining slope rockfish is obtained by applying F=M fishing rates to the biomass estimates for each species and summing to obtain a value of 8,300 mt (330 mt - Western, 1,640 mt - Central and 6,330 mt - Eastern). The overfishing level for these species (9,850 mt) was obtained by applying $F_{30\%}$=0.080 for sharpchin and natural mortality rates for the remaining species.

Gulf of Alaska - Pelagic Shelf Rockfish

The SSC agrees with the team's ABC recommendation for this complex, 6,890 mt. The exploitable biomass was calculated by averaging 1984, 1987 and 1990 trawl survey biomass estimates. The natural mortality of dusky rockfish, 0.090, was used as the ABC exploitation rate.

The recommended distribution of ABC by regulatory area is: 1,030 mt - Western, 4,550 mt - Central, and 1,310 mt - Eastern.

The overfishing level for this complex is 11,550 mt. The $F_{30\%}$=0.151 for dusky rockfish was used to calculate this value.

Gulf of Alaska - Demersal Shelf Rockfish

The SSC agrees with the Team's ABC recommended for this complex, 960 mt. The ABC for the assemblage is based on the yelloweye ABC, 842 mt, adjusted by the fraction of the total assemblage catch accounted for by yelloweye, 0.88 (ABC = 842 mt/0.88 = 960 mt).

Gulf of Alaska - Thornyheads

The SSC concurs with the Team's recommended ABC for thornyheads, 1,180 mt. Based on results of the 1990 trawl survey, the current exploitable biomass is 26,207 mt. Applying the $F_{35\%}$=0.045 exploitation strategy provided the ABC estimate for 1994. The overfishing rate and level are $F_{30\%}$=0.055 and 1,441 mt, respectively.

The SSC shares the Team's concern over unreported mortality and the possibility for the catch of thornyheads to exceed the overfishing level. This issue should be explored further.

Gulf of Alaska - Atka Mackerel

Between 1988 and 1993 Atka mackerel was included in the "other species" category. Because of an apparent increase in biomass and the development of a target fishery for this species, an ABC has

been developed by the Plan Team. A biomass of 32,100 mt was estimated from the 1990 Gulf of Alaska trawl survey. The ABC of 4,800 mt was calculated by applying the ratio (0.15) of the recommended 1994 ABC for the Aleutian area to the Aleutian area biomass. The Gulf-wide OFL of 19,044 mt was similarly calculated. The ABC was considered by the Plan Team and SSC to be conservative. However, this ABC has been greatly exceeded by 1992 and 1993 harvests of 14,000 mt and 8,000 mt, respectively. The impacts of these harvests are unknown. Also of concern, the Plan Team reported that almost half the 1993 catch came from the Central area, although the greater portion of the GOA biomass is found within the Western area. Next year's determination should be substantially improved with the use of the 1993 trawl survey data.

New studies have demonstrated a high frequency of occurrence of Atka mackerel in the diet of Steller sea lions. As a result, it is hypothesized that availability of Atka mackerel may be limiting survival of Steller sea lions. This hypothesis has not been validated at this time. Nevertheless, due to potential dependence of sea lions on Atka mackerel, the Council may wish to apply conservative TACs.

Gulf of Alaska - Lingcod

The Plan Team reported its discussions concerning the management of lingcod in the Gulf of Alaska. This species is currently managed by the State as a groundfish in territorial and Federal waters under State FMPs. It is not classified as a groundfish species by the Council; as a non-specified species no reports on catch are required. It is, however, managed as a target groundfish species by the Pacific Fishery Management Council.

The SSC agrees with the Plan Team that there are outstanding management questions regarding this species. Specifically, whether the State has authority to manage lingcod beyond territorial water absent Federal management, and whether Federal management is needed or desirable are germane to the Council's consideration of comprehensive rationalization schemes.

The SSC notes that an amendment to the groundfish FMP - or a separate Federal FMP - would be required to bring lingcod under Council jurisdiction. The SSC does not have a recommendation on what action, if any, should be taken on this issue, except to advise against simply adding lingcod to the "other species" category. Likewise, the SSC has no specific comment regarding where this question should be placed on the list of Council priorities. The SSC recommends, however, that information on abundance and distribution collected through surveys and catch reports be examined before the Council considers management of lingcod as a target groundfish species.

Bering Sea/Aleutian Islands - Pollock

Eastern Bering Sea

The assessment is most similar to those of previous years, except that a correction is made for the strength of the 1989 year-class. In prior years, cohort analysis was tuned by assuming that abundance at age 3 was linearly related to age 1 abundance in the bottom trawl survey. In this year's assessment, this results in an age 4 biomass projection of 2.618 million mt for the 1989 year-class. Results from the 1993 winter hydroacoustic survey and the 1993 summer bottom trawl survey suggest that this is an underestimate, as explained on page 1-7 of the SAFE. Correcting the bottom trawl survey with a 45% selectivity factor, the analyst arrives at a projection of 5.437 million mt, more than double the uncorrected value. This makes the projection of the 1989 year-class stronger than the 1982 and 1984

year-classes and perhaps as strong as the 1978 year-class. Depending on which of these two values is used, the starting biomass in 1994 of age 3+ pollock ranges from 5.617 to 8.022 million mt (Table 1.9).

The SSC was concerned that the projected biomass of the 1989 year-class was at the extreme end of previously observed recruitment values and was based on a new forecasting procedure. The SSC asked analysts Vidar Wespestad and Rick Methot for further clarification and justification, which they provided. The correction factor appears to be consistent with results from previous triennial surveys and the new correction factor is derived from a more recent observation of the year-class than the previous approach. Thus, the SSC accepted the analysts' estimate of 8.022 million mt for the starting biomass of age 3+ pollock in 1994.

Nevertheless, the corrected year-class strength is at the extreme end of the distribution of observed recruitments and current biomass is strongly dependent on this strong year-class. The SSC agrees with the Team that a cautious approach should be used in setting ABC. The $F_{0.1}$ rate is considered to be conservative, being less than F_{msy} and $F_{35\%}$, and the SSC recommends its use in this case, as has usually been done in the past. Applied to the biomass estimate, this results in an ABC of 1.326 million mt. (This numerically agrees with the Team's recommendation, although their value was obtained by scaling down F_{msy} by the ratio of $F_{35\%}$ to $F_{30\%}$, which the SSC does not agree with.) The OFL is obtained by applying the F_{msy} rate directly, which results in 1.590 million mt.

The SSC heard a presentation from Dr. Keith Jefferts, who suggested that it may be possible to estimate the year-class strength of pollock by tagging age 2 pollock with coded-wire tags and recovering tags with automated detection at processing plants. The SSC notes that this approach has many problems to overcome, which is typical of application of mark-recapture techniques to marine fish populations. Nevertheless, the SSC is strongly supportive of research efforts in this direction, particularly in light of the uncertainty in recruitment brought to light in this year's assessment. The SSC also notes that tagging the preferable method for determining the migration and distribution of a species. The CWT method may allow the determination of the extent of the interaction of pollock among the Western, Central and Eastern Bering Sea areas, if the typical sign issues of ensuring random marketing, random capture, and adequate sample size can be addressed.

Aleutian Islands

The Aleutian Islands assessment is based on scanty data; next year the analyst hopes to provide an age-structured assessment based on better data and methods. Biomass was based on the 1991 bottom trawl survey estimates expanded for the off-bottom component and projected to the recent time based on relative population change observed in the EBS stock. Given the scanty data, the SSC accepts the Team's recommendations for ABC and OFL, which are based on the $F_{35\%}$ and $F_{30\%}$ estimates. The ABC is based on the most conservative of the exploitation rates available.

Bogoslof Area

Reassessment of the Bogoslof Islands hydroacoustic survey with new threshold levels has not changed previous conclusions that this stock has declined precipitously since 1988. Estimated biomass declined from 1.3 million mt in 1991 to 1.1 million t in 1992 to 0.6 million mt in 1993. The SSC agrees with the Team that the best estimate of biomass in 1994 is 0.49 million mt, assuming that no recruitment to the stock has occurred and that natural mortality is 0.2. This year there is now available a value of $F_{35\%}$, which the SSC agrees is preferable to natural mortality for calculating ABC. As it has done in the past, the SSC recommends dividing the exploitation rate by 4 to adjust for the current level

of the population in relation to that which would produce MSY. This leads to an ABC of 31,750 mt, which is also the OFL. This approach has been accepted by the Council in the past.

Because of the current status of the Bogoslof population, the importance of supporting international efforts to curtail fishing on the Basin population, and the potential impacts on marine mammals and seabirds, the SSC agrees with the Team that the TAC be set at a level to provide for bycatch only. This recommendation was also made last year and accepted by the Council.

Bering Sea/Aleutian Islands - Pacific cod

The biomass of this stock is estimated by fitting the length-based stock synthesis model to trawl survey biomass estimates and to survey and fishery size compositions. Natural mortality is also estimated internally (M=.37).

Exploitable biomass in 1994 is estimated to be 446K mt. The SSC supports the Team selection of the $F_{35\%}$ exploitation strategy, ABC is 191K mt. The overfishing level is 228,000 mt, based on $F_{30\%}$=0.43.

Bering Sea/Aleutian Islands - Flatfish

As in the Gulf, Bering Sea flatfish populations are at high levels. Assessment methods are continuing to improve and the synthesis model, which can include a wide variety of data, has been applied to several species. The lack of a deepwater survey does limit the ability to assess fish abundance on the Bering Sea slope.

Bering Sea/Aleutian Islands - Yellowfin sole

The synthesis model was again chosen by the analysts and Plan Team over cohort analysis and trawl survey as the preferred assessment method because its makes use of many types of data. $F_{35\%}$ (0.12) was selected because it considers age-specific selectivities and maturities. The ABC equals 230,000 mt. OFL equals 269,000 mt as computed with $F_{30\%}$=0.14.

Bering Sea/Aleutian Islands - Greenland Turbot

The new length-based synthesis approach presented in September was updated with catch data through October 1993 and 1993 Bering Sea shelf trawl survey information. Also, rather than $F_{35\%}$, a more conservative $F_{40\%}$ exploitation rate and an increased slope survey catchability coefficient (Q) of 0.75 was selected as more appropriate parameters. These adjustments resulted in a slightly reduced conservative Plan Team ABC of 17,200 mt compared to September. The Plan Team further recommended a TAC of 7,000 mt because of continuing poor recruitment. In September the SSC chose to include conservation concerns in determining the ABC. The SSC continues to recommend an ABC of 7,000 mt. No substantial increases in recruitment were indicated by the 1993 trawl survey and the synthesis model is being used for the first time for this species. The SSC commends the analysts for their efforts and urges further simulation work which will account for potential future recruitment under differing fishing strategies.

Bering Sea/Aleutian Islands - Arrowtooth Flounder

A mid-year exploitable biomass of 518,550 mt was derived from age-specific 1993 shelf and 1991 slope and Aleutian area survey estimates. Applying an $F_{35\%}$ of 0.18 provides an ABC of 93,350 mt. The

OFL of 130,000 mt is based on $F_{30\%}$ of 0.25. Arrowtooth flounder remains at a high level of abundance, although approximately 86% of all arrowtooth caught are discarded.

Bering Sea/Aleutian Islands - Rock sole

For the second year the synthesis model was used to derive exploitable biomass. Updated by 1993 survey biomass estimates and catch data through April 1993, the model provided a estimated exploitable biomass of 1,739,100 mt. An ABC including both the Bering Sea and Aleutians of 313,000 mt was calculated using $F_{35\%}$ (0.18). The OFL equals 363,000 mt based on $F_{30\%}$ (0.22). The analysis differed somewhat from the prior year by applying age-specific fishery selectivities to an age-specific total biomass. The SSC concurs with this approach.

Bering Sea/Aleutian Islands - Other Flatfish

Exploitable biomass was directly estimated from the trawl survey. This biomass is the highest observed. $F_{35\%}$ for flathead sole and miscellaneous species of 0.19 and Alaska Plaice of 0.17 were applied to the appropriate biomass estimates to obtain the ABC of 225,000 mt. The OFL of 270,000 mt was based on $F_{30\%}$ for the combined species subgroups.

Bering Sea/Aleutian Islands - Sablefish

The SSC concurs with the Plan Team's recommended ABCs for EBS and AI sablefish, 540 mt and 2,800 mt respectively. The EBS ABC is a significant reduction from 1993 and reflects a sharp decline in the relative population weight from the cooperative U.S.-Japan longline survey.

The SSC heard public testimony from Mr. Bob Smith of the F/V Thor, a longliner for sablefish and halibut. Mr. Smith remarked on the apparent substantive predation of longline caught sablefish by killer whales. He protested that the survey data could not be representative of sablefish abundance. Dr. Low, NMFS, advised the SSC that there was no evidence from cruise reports, that the killer whale-longline interactions had changed since 1988 when predation was an acknowledged problem. Consequently, the relative index of abundance is unlikely to be compromised by this acknowledged interaction.

The SSC suggests that the NMFS attempt to experiment with alternative survey methods, for example, pot surveys, which may allow validation of the relative longline index. The SSC, also suggests that alternative apportionment schemes be evaluated by the analysts and Teams similar to what is done in the Gulf.

Bering Sea/Aleutian Islands - POP Complex
True POP

The SSC accepts the Team's ABC's. For the Eastern Bering Sea and Aleutian Islands areas the ABCs are 1,910 mt and 10,900 mt, respectively. An $F_{44\%}=0.06$ harvesting strategy was applied to the 1994 exploitable biomasses (48,400 mt for the Eastern Bering Sea and 244,00 mt for the Aleutian Islands) to obtain these values. The overfishing level was calculated by applying $F_{30\%}=0.10$ to the exploitable biomasses, 2,920 mt for the Eastern Bering Sea and 16,600 mt for the Aleutian Islands.

Other Red Rockfish

The Eastern Bering Sea ABC for the complex is 1,400 mt. This value is identical to the value recommended by the Team. It was determined by using F=M for exploitation rates and average biomass estimates from bottom trawl surveys. Natural mortalities used were 0.06 for northern and sharpchin, 0.025 for rougheye and 0.03 for shortraker. Biomass estimates used were: northern/sharpchin - 17,300 mt, rougheye - 3,000 mt, and shortraker -9,200 mt.

In the Aleutian Islands area the complex is divided into two groups, northern/sharpchin and shortraker/rougheye. The SSC agrees with the ABC's recommended by the Team, 5,670 mt for northern/sharpchin and 1,220 mt for shortraker/rougheye. An F=M harvesting strategy was used. Exploitable biomasses used in the calculation were northern - 94,599 mt, rougheye - 25,300 mt, and shortraker -19,700 mt.

The F=M criterion was used to define overfishing (ABC=OFL).

Bering Sea/Aleutian Islands - Other Rockfish

The SSC accepts the Team's ABC recommendation for this complex. ABC's (365 mt for the eastern Bering Sea and 770 mt for the Aleutian Islands) were calculated by multiplying the current estimates of exploitable biomass (7,300 mt - eastern Bering Sea and 15,450 mt - Aleutian Islands) by the natural mortality for POP (F=M=0.05). The OFL's are equal to ABC's for this species group.

Since September the analysis was updated with the 1993 trawl survey biomass and 1992 survey and fishery age composition.

Bering Sea/Aleutian Island - Atka mackerel

This year's assessment using the synthesis model was based on the 1991 trawl survey biomass estimate with updated 1992 and 1993 catch data and 1992 commercial fishery length frequencies. The exploitable biomass of 816,000 mt is lower than in prior estimates because of a significant downward revision in the estimated strength of the 1989 year class. Commonly-used $F_{0.1}$ and $F_{35\%}$ were considered too aggressive for Atka mackerel and F=M=0.3 was selected as a more appropriate exploitation rate. By applying this rate to the estimated biomass, the Plan Team generated an ABC for 1994 of 245,000. For the 1992 fishing year the SSC recommended reducing the calculated ABC by 5/6 with subsequent annual increases of 1/6 (stair-stepping), this was done because of survey variability and concern for northern fur seals and Steller sea lions which feed heavily on Atka mackerel. Continuing with the SSC's procedure, the SSC recommends a 1994 ABC for the Aleutian Subarea based on M/2 or 122,500 mt. As in September, the SSC recommends that the ABC be distributed among the Western, Central, and Eastern subareas relative to survey biomass estimates. Amendment 28, once approved, will require this approach. Even greater caution may be warranted next year in setting ABC, if the Aleutian area is not surveyed in 1994 as previously planned.

D-3 HALIBUT DISCARD MORTALITY RATES

The question here is what estimates of halibut discard mortality rates to apply to 1994 halibut bycatch in order to calculate halibut bycatch mortality in the 1994 trawl and hook-and-line fisheries.

The Teams received a set of recommendations on the last day of their meeting and did not have time

to reach agreement on a procedure. They did agree that the 1993 observer data on discard mortality were too preliminary to use, and for the trawl fisheries they favored averaging the estimated rates from either the last two years available (1991 and 1992) or the last three years available (1990-92). The hook-and-line fisheries present a different problem because the careful release requirement went into effect in 1993 and data from previous years are therefore not regarded as representative.

Gregg Williams presented the recommendations of the IPHC staff. For the trawl fisheries, he proposed averaging the estimated rates from the last three years, noting some large differences among years in sample size and some years with sparse data in some fisheries. For the hook-and-line fisheries he proposed an initial, assumed rate of 15%, to be replaced in advance of the spring longline fishery with an estimate based on 1993 observer data.

The SSC had previously recommended pooling all data, absent any indication of a trend. We note, however, that the trawl sample sizes are all quite large, and that it is desirable to use the most recent data where possible. We also note that there is hardly any difference between the results of averaging the last two years and the last three years. We therefore favor using the average of the estimates from the last two years for the trawl fisheries.

For the hook-and-line fisheries we endorse the plan which starts with an assumed 15% rate and then uses new estimates from in-season data. In some cases, observer coverage in these fisheries has been very low, and expanded coverage is needed for some segments of the longline fleet (e.g. Bering Sea sablefish, rockfish and Greenland turbot). There is also the insoluble problem of how to estimate the effect of the careful release requirement on unobserved vessels when all the data come from observed vessels. There is no scientific way to do this.

TABLE 1. GULF OF ALASKA GROUNDFISH
Final 1994 Plan Team, SSC, and AP recommendations and apportionments (metric tons)

Species	Area	1993 ABC	1993 TAC	1993 Catch*	Plan Team 1994 ABC	SSC 1994 ABC	Advisory Panel 1994 TAC
Pollock	W (61)	34,068	24,087	20,274	22,130	22,130	22,130
	C (62)	36,737	25,974	23,452	23,870	23,870	23,870
	C (63)	86,195	60,939	61,990	56,000	56,000	56,000
	E	3,400	3,400	689	7,300	7,300	7,300
	Total	160,400	114,400	106,405	109,300	109,300	109,300
Pacific Cod	W	18,700	18,700	18,398	16,630	16,630	16,630
	C	35,200	35,200	35,029	31,250	31,250	31,250
	E	2,800	2,800	1,621	2,520	2,520	2,520
	Total	56,700	56,700	55,048	50,400	50,400	50,400
Flatfish, Deep	W	2,020	1,740	371	460	460	460
	C	35,580	15,000	5,612	12,930	12,930	7,500
	E	7,930	3,000	126	3,120	3,120	3,120
	Total	45,530	19,740	6,109	16,510	16,510	11,080
Rex sole	W				800	800	800
	C	included in deepwater flatfish			9,310	9,310	7,500
	E				1,840	1,840	1,840
	Total				11,950	11,950	10,140
Flathead sole	W	12,580	2000	581	9,120	9,120	2,000
	C	31,830	5,000	1,864	23,080	23,080	5,000
	E	5,040	3,000	8	3,650	3,650	3,000
	Total	49,450	10,000	2,453	35,850	35,850	10,000
Flatfish, Shallow	W	27,480	4,500	378	20,290	20,290	4,500
	C	21,260	10,000	6,302	12,950	12,950	12,950
	E	1,740	1,740	6	1,180	1,180	1,180
	Total	50,480	16,240	6,686	34,420	34,420	18,630
Arrowtooth	W	38,880	5,000	1,790	28,590	28,590	5,000
	C	253,330	20,000	15,663	186,270	186,270	20,000
	E	29,080	5,000	957	21,380	21,380	5,000
	Total	321,290	30,000	18,410	236,240	236,240	30,000
Sablefish	W	2,030	2,030	740	2,290	2,290	2,290
	C	9,610	9,610	11,877	11,220	11,220	11,220
	W. Yakutat	3,830	3,830	4,441	4,850	4,850	4,850
	E. Yak./SEO	5,430	5,430	5,357	7,140	7,140	7,140
	Total	20,900	20,900	22,415	25,500	25,500	25,500
Pacific Ocean	W	753	341	474	680	883	571
Perch	C	949	949	1,078	850	1,104	714
	E	1,676	1,270	283	1,500	1,956	1,265
	Total	3,378	2,560	1,835	3,030	3,943	2,550
Shortraker /	W	100	90	84	100	100	100
Rougheye	C	1,290	1,161	1,169	1,290	1,290	1,290
	E	570	513	609	570	570	570
	Total	1,960	1,764	1,862	1,960	1,960	1,960
Rockfish	W	330	214	313	330	330	199
(Other Slope)	C	1,640	1,064	1,493	1,640	1,640	988
	E	6,330	4,105	1,003	6,330	6,330	3,813
	Total	8,300	5,383	2,809	8,300	8,300	5,000
Northern Rockfish	W	1,000	1,000	902	1,000	1,000	1,000
	C	4,720	4,720	3,862	4,720	4,720	4,720
	E	40	40	115	40	40	40
	Total	5,760	5,760	4,879	5,760	5,760	5,760
Rockfish	W	1,010	1,010	231	1,030	1,030	1,030
(Pelagic Shelf)	C	4,450	4,450	2,081	4,550	4,550	4,550
	E	1,280	1,280	824	1,310	1,310	1,310
	Total	6,740	6,740	3,136	6,890	6,890	6,890
DSR	S.E. Out.	800	800	671	960	960	960
Thornyhead	Gulfwide	1,180	1,062	1,348	1,180	1,180	1,180
Atka mackerel	Gulfwide	with other species		6,993	4,800	4,800	3,500
Other Species	Gulfwide	NA	14,602	11,821	NA	NA	14,643
GULF OF ALASKA TOTAL		**732,868**	**306,651**	**252,880**	**553,050**	**553,963**	**307,493**

* Catch through October 30, 1993

FINAL BERING SEA/ALEUTIAN ISLANDS GROUNDFISH WORKSHEET (December 1994)

1994 Plan Team, SSC and AP Recommendations and Apportionments (mt)

Species	Area	Seasons	Council ABC 1993	Plan Team ABC 1994	ABC 1994	Seasonal Allowance	TAC	ITAC	CDQ
Pollock	EBS		1,340,000	1,330,000	1,330,000		1,330,000	1,130,500	99,750
		Roe				45% of ITAC		508,725	
		Non-Roe				55% of ITAC		621,775	
	AI		58,700	56,600	56,600		56,600	48,110	4,245
(Bogoslof)	518		42,000	127,000	31,750	*	1,000	850	75
Pacific cod	BS/AI		164,500	191,000	191,000		191,000	162,350	
Yellowfin sole	BS/AI		238,000	230,000	230,000		150,325	127,776	
Greenland turbot	BS/AI		7,000	17,200	7,000		7,000	5,950	
Arrowtooth flounder	BS/AI		72,000	93,400	93,400		10,000	8,500	
Rock sole	BS/AI		185,000	313,000	313,000		75,000	63,750	
Other flatfish	BS/AI		191,000	225,000	225,000		56,000	47,600	
Sablefish	EBS		1,500	540	540		540	459	
	AI		2,600	2,800	2,800		2,800	2,380	
POP complex									
True POP	EBS		3,330	1,910	1,910		1,910	1,624	
Other POP complex	EBS		1,400	1,400	1,400	*	1,400	1,190	
True POP	AI		13,900	10,900	10,900		10,900	9,265	
Sharp/Northern	AI		5,670	5,670	5,670		5,670	4,820	
Short/Rougheye	AI		1,220	1,220	1,220	*	1,220	1,037	
Other rockfish	EBS		400	365	365	*	365	310	
	AI		925	770	770	*	770	655	
Atka mackerel	BS/AI		117,100	245,000	122,500		68,000	57,800	
	W			109,000	53,900		10,000	8,500	
	C			109,000	55,125		44,525	37,846	
	E			27,000	13,475		13,475	11,454	
Squid	BS/AI		3,400	3,110	3,110		3,110	2,644	
Other species	BS/AI		26,600	27,500	27,500		26,390	22,432	
BS/AI TOTAL			2,476,245	2,884,385	2,656,435		2,000,000	1,700,000	

* AP recommends bycatch only.

FINAL BERING SEA/ALEUTIAN ISLANDS GROUNDFISH WORKSHEET (December 1994)

1994 Plan Team, SSC and AP Recommendations and Apportionments (mt)

Species	Area	Seasons	Council ABC 1993	Plan Team ABC 1994	SSC ABC 1994	Seasonal Allowance	Advisory Panel TAC	Advisory Panel ITAC	CDQ
Pollock	EBS		1,340,000	1,330,000	1,330,000		1,330,000	1,130,500	99,750
		Roe				45% of ITAC		508,725	
		Non-Roe				55% of ITAC		621,775	
	AI		58,700	56,600	56,600		56,600	48,110	4,245
(Bogoslof)	518		42,000	127,000	31,750	*	1,000	850	75
Pacific cod	BS/AI		164,500	191,000	191,000		191,000	162,350	
Yellowfin sole	BS/AI		238,000	230,000	230,000		150,325	127,776	
Greenland turbot	BS/AI		7,000	17,200	7,000		7,000	5,950	
Arrowtooth flounder	BS/AI		72,000	93,400	93,400		10,000	8,500	
Rock sole	BS/AI		185,000	313,000	313,000		75,000	63,750	
Other flatfish	BS/AI		191,000	225,000	225,000		56,000	47,600	
Sablefish	EBS		1,500	540	540		540	459	
	AI		2,600	2,800	2,800		2,800	2,380	
POP complex									
True POP	EBS		3,330	1,910	1,910		1,910	1,624	
Other POP complex	EBS		1,400	1,400	1,400	*	1,400	1,190	
True POP	AI		13,900	10,900	10,900		10,900	9,265	
Sharp/Northern	AI		5,670	5,670	5,670		5,670	4,820	
Short/Rougheye	AI		1,220	1,220	1,220	*	1,220	1,037	
Other rockfish	EBS		400	365	365	*	365	310	
	AI		925	770	770	*	770	655	
Atka mackerel	BS/AI		117,100	245,000	122,500		68,000	57,800	
	W			109,000	53,900		10,000	8,500	
	C			109,000	55,125		44,525	37,846	
	E			27,000	13,475		13,475	11,454	
Squid	BS/AI		3,400	3,110	3,110		3,110	2,644	
Other species	BS/AI		26,600	27,500	27,500		26,390	22,432	
BS/AI TOTAL			2,476,245	2,884,385	2,656,435		2,000,000	1,700,000	

* AP recommends bycatch only.