North Pacific Fishery Management Council

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

Telephone: (907) 271-2809

605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

Fax: (907) 271-2817

Certified: Gail Bendixen
Date: 2/3/00

MINUTES
Scientific Statistical Committee
December 6-8, 1999

The Scientific Statistical Committee met December 6-8, 1999 at the Hilton Hotel in Anchorage, Alaska. All members were present :

Richard Marasco, Chair	Jack Tagart, Vice Chair	Keith Criddle
Steve Hare	Sue Hills	Dan Kimura
Doug Larson	Seth Macinko	Terry Quinn
Doug Eggers	Al Tyler	Hal Weeks

C-3 HALIBUT CHARTER GHL ANALYSIS

The Council staff provided an overview of the draft EA/RIR/IRFA for a halibut charter GHL. Dr. Mark Herrmann (University of Alaska Fairbanks) and ADF&G staff provided insight into information and analyses that Council staff used in the preparation of the draft EA/RIR/IRFA. Public testimony was received from Gerry Merrigan (Petersburg Vessel Owners Association), Bruce Gabrys, Gale Vic (Kodiak Native Tourism Association and several other entities), Jim Preston (Juneau Charter Boat Owners Association), Mike Bethers (Alaska Sportfish Council), Tomm Gemmell (Halibut Coalition), John Burns, and Tim Henkle (Deep Sea Fishemen's Union).

The SSC cannot recommend for or against releasing the document for public review because of the limited time it had to review the document. However, the SSC can offer the following comments based on an abbreviated review of the document.

1. The document does not provide definitive evidence on the net benefits of different options for halibut charterboat management. While it does provide some new information on the levels of net economic benefits, it does not provide a comprehensive look at the changes in net economic benefits with different policies. The document would benefit from a brief discussion of the analytical framework that is appropriate for consideration of the allocation decision that is before the Council. However, it is important that all participants in the Council process understand that even if a comprehensive set of studies were available, such models have limited ability to predict the consequences of major changes in the regulatory structure or management strategy. It will inevitably fall to the Council to decide who should gain at whose expense.

2. It is fortuitous that Council staff was able to draw on preliminary reports of research projects funded by Alaska Sea Grant, the University of Alaska Fairbanks, and the Coastal Marine Institute (University of Alaska/Minerals Management Service). These projects provided information that helped to characterize the commercial fishery (a model of the exvessel demand for halibut), and the halibut sport fishery (angler expenditures, angler effort, marine sport fishing participation rate model, compensating variation to anglers, and a sport fishing economic impact model). The sport fishing studies address marine fisheries off the Kenai Peninsula. Differences in clientele, travel-related costs, and purpose of visit limit, to some degree, the appropriateness of using these studies to characterize angler characteristics and behaviors in other regions within Area 3A and Area 2C. Nevertheless, because estimates of compensating variation are a product of the demand for charter fishing services, it does not seem unreasonable that the demand function, and hence compensating variation and expenditure estimates for the rest of area 3A and area 2C would closely resemble those in the Kenai Peninsula. The SSC encourages the authors to examine the Jones and Stokes reports for Southeast and South-Central sport fishing in the mid-1980s to see if the estimates of marine sport fisheries values are comparable.

3. In any allocation decision, the action will serve to advantage one sector relative to another. Consequently, it is incumbent on the EA/RIR/IRFA authors to provide as balanced a treatment as possible of the impacts on each party. The Executive Summary should be reviewed to ensure a more balanced tone. For example, the first paragraph of Section 1, p. xix of the Executive Summary, fails to be balanced because it mentions only the costs to the commercial sector of recreational growth, without mentioning the benefits of recreational growth. Overall, the analysis does not provide as comprehensive an evaluation of the commercial sector. It would have been helpful to have current information on the cost structure and expenditure patterns of commercial halibut harvesters and processors. In addition to facilitating the estimation of net benefits to halibut consumers, halibut processors, and quota share-holders, this information could have contributed to the development of a regional model of the economic impact of commercial fishing. Where it is not possible to quantify these impacts, it is critical that the authors provide a thorough qualitative discussion of the probable impacts.

4. The EA/RIR/IRFA makes a generally persuasive case that most of the management measures under consideration for implementing the GHL will not be effective in constraining and reducing sport halibut harvest. The possible exception is a reduction in the daily bag limit of halibut from 2 fish to 1. The EA/RIR/IRFA makes an interesting attempt to link the bag limit reduction to changes in participation and expenditures, but it is unclear exactly what the magnitude of these effects will be. The SSC has some skepticism about the model's prediction of large reductions in participation. In particular, the results reported in Table 6.9 are difficult to reconcile with demand elasticity information provided in Table 4.9. The discussion on the expected economic consequences of a bag-limit restriction needs to be reviewed and clarified. Because bag limits have been identified as the primary tool for constraining sport catches, it is critical to understand the likely effect that bag limit changes would have on angler participation and total retained catch.

5. The evaluation of Issue 1, Option 2 (GHL as a fixed range of numbers of fish) could benefit from a greater elaboration of the potential allocative effects. The SSC encourages staff to more fully address the potential effects of applying a GHL determined during a period of high abundance and relatively small fish to a future halibut stock that might be comprised of a substantially smaller number of larger fish. For example, a 12% GHL expressed in numbers of fish and based on the current size-

at-age structure of the halibut stock could be a much larger share of the halibut biomass if the biomass dropped 25% and halibut size-at-age increased by 25%.

6. The SSC is doubtful about the assertions in item (9) in the Conclusions on p. 148, and recommends these be deleted.

7. In Table 6.11, p. 163, the authors should also calculate and include changes in recreational consumer's surplus.

8. Tables 6.8 and 6.9, p. 161, are confusing. It should be clarified that "Halibut Total" in 6.8 is the average catch (kept plus released) and the specific changes in catch should be listed for each of the cases in 6.9.

9. In Table 6.1, p. 154, the column labeling should be edited to make it clear that both fish ranges and pounds ranges from 100-125% are being presented.

10. We note that although the problem statement identifies a suite of social and economic issues, the analysis provides very limited discussion of social impacts.

11. The SSC does not believe that in-season management of the halibut charter fishery should be summarily dismissed. While we acknowledge that in-season management requires close monitoring of catches, we note that in-season management has proven feasible and effective in numerous sport fisheries, e.g. the Southeast Alaska chinook salmon marine sport fishery. In-season management minimizes carryover type problems that could have undesirable effects on stock assessment and management.

In several respects, the EA/RIR/IRFA represents a significant improvement in the analysis of economic effects of allocation decisions. For example, a serious effort is made to examine the recreational demand for charter halibut trips and the associated consumer's surplus. Similarly, attempts are made to consider the producer's surplus, quota rents, and consumer's surplus associated with commercial fishing.

Finally, the SSC would be negligent if it failed to warn the Council that the preponderance of evidence from fisheries in the North Pacific and other regions suggests that allocations between user groups are unlikely to be definitively settled by any single allocation decision. Instead, these allocation battles are reopened whenever a set of stakeholders believes that their negotiating position has improved. As noted in our previous minutes, IFQs are a mechanism that would shift this burdensome reallocation battle out of the Council chambers and into the marketplace. While development of an IFQ is no simple matter, there are ways that it could be simplified: create new QS equivalent to the proposed GHLs; select a minimum QS size (1,000 lbs?) and allocate the QS by lottery or some similar mechanism; and, let the recipients buy and sell to each other and any other would be charter operators, and let them buy and sell in the commercial IFQ market.

C-2 ESSENTIAL FISH HABITAT

The SSC received a report from Jon Kurland (NMFS-AKRO) on NMFS request for additional public comment to assist in developing final regulations for implementing essential fish habitat measures.

D-1 GROUNDFISH ENVIRONMENTAL ASSESSMENT

The SAFE documents are being incorporated into Environmental Assessment documents as appendices to improve NEPA compliance on the specifications setting process. The SSC received a report from Tom Pearson (NMFS-AKRO) on this topic, but we did not have adequate time to throughly review and critique the document.

GENERAL SAFE CONSIDERATIONS

1. Modeling considerations—The difficulty in modeling populations is that while fishing removals are observable, environmental factors are measurable, and biomass and age(size)-structure can be sampled, the mechanisms of growth, predation, natural mortality, and recruitment can only be indirectly measured. Moreover, the role of environmental factors in determination of these unobserved processes is also unknown. There are two approaches to formally treat these latent processes: they can be specified as known functions of observable variables (structural modeling), or they can be modeled using procedures based on the stationarity of the primary series (time series analysis). Structural models require prior specification of causal relationships and dynamic linkages. Time series models provide forecasts that are conditional on the assumed stationarity of the forecasted time series but do not require prior specification of the form of dynamic linkages. When causal relationships are uncertain and dynamic linkages are important, time series procedures often provide superior forecasts. Mixed models share the advantages and disadvantages of both modeling approaches.

For structural models, the problem of forecasting changes in biomass 10-12 years out is that such forecasts are conditioned on the quality of forecasts of the input data series. For time series models, the problem is that the dynamics evident in the state variables attenuate for stationary time series. The selection of a model for long-range forecasts should consider the length of dynamics in the series to be modeled, and the reliability of forecasts of the input data series. It is unlikely that one modeling approach, no matter how well suited to one species, will be the best modeling approach for all species. If a species is characterized by important long-period dynamics, those dynamics will be conserved over a relatively long forecast horizon and it will be important to base the forecasts on a time series that is at least twice as long as the longest significant lagged effect. In contrast, less information is lost when the forecasts of biomass for a species with relatively short dynamics are based on a short time series. Other factors related to biological processes are also likely to be important in determining optimal time series length. For example, the decision to base the NEPA compliance forecasts on post-1976 recruitments requires the assumption that the environment underwent a state shift in 1976 and that it will not revert or move to a new state over the forecast horizon.

Representing recruitment as a sequence of independent random draws from an inverse Gaussian distribution, implies that there is no confidence in estimated stock-recruit relationships, and dampens the dynamic variation of biomass that is driven by such stock-recruitment processes. Suppressing these lagged effects will result in a model that may over- or understate changes in stock biomass. While this approach may be appropriate for a stock that lacks a significant spawner-recruit relationship and is characterized by short period dynamics, it is clearly inappropriate for species with pronounced spawner-recruit relationships and long-period dynamics. Therefore, the SSC requests that analysts also consider alternate models for forecasting that consider density dependence and autocorrelation.

2. Data truncation considerations—While there are many rules of thumb for the rejection of outlying observations, researchers are generally reluctant to discard unusual observations unless it is known that the

observation was improperly generated or recorded. The decision to truncate a data series should be based on a similar criterion: discard the data if and only if a suspect process generated it. If it is believed that the dynamics of a particular stock have undergone a fundamental shift through time, then it would be best to incorporate a variable (or an instrument or proxy) that caused (or is closely correlated with) the shift in productivity. To truncate the data series is tantamount to arguing that there is no information in the omitted observations. It is addressing the symptoms rather than the problem. The problem is that the model was mispecified, that one or more significant explanatory variables was omitted, and as a consequence, the estimated coefficients will be biased, inconsistent, and inefficient. It is generally better to weight observations according to estimates of their reliability (using a measure or variability or a prior) than to discard them.

Consistency in ABC recommendations

As we noted last year, the Teams and SSC have recommended ABCs that are lower than the maximum permissible for a variety of stocks. The SSC continues to be interested in the topic of whether these downward adjustments are made in a consistent manner. In examining where these adjustments are made, the SSC notes some of the situations that could trigger the adjustment: (1) low stock size relative to the historical record or a long decline in biomass over time, (2) a persistently decreasing recruitment trend, (3) uncertainty in recent data (such as high variability in the most recent survey biomass estimate), (4) lack of essential data in the stock assessment (e.g., the lack of a valid biomass estimate for GOA Atka mackerel), and (5) ecosystem concerns, such as sufficient long-term availability of food for sea lions or birds. For any particular stock, one or more of these situations might be operative. The SSC notes that the Teams and SSC are fairly consistent in making reductions when these situations occur, but that the magnitude of the reduction tends to vary. This is not necessarily a concern because each stock's condition is unique and the rationale for the reduction is usually different. Nevertheless, the SSC recommends that when adjustments are made, that the rationale for the reduction be carefully explained (and it usually is). Furthermore, the SSC will work with the Plan Teams in the next year to craft a new overfishing definition amendment that hopefully will strive for additional consistency in formulating ABC and OFL recommendations.

One interesting situation this year occurred with the sablefish stock assessment. A reduction from the maximum permissible was not made, despite a low stock size and a long period of low recruitment. In this case, the new assessment provided new information that suggested that while the stock was low, it was stable rather than declining. In addition, a decision analysis suggested that there was a low probability (20%) that biomass would decline in the next 5 years with a harvest at this maximum permissible level (about 17,000 mt). Therefore, the Plan Team decided and the SSC concurred that there was no need to make a downward adjustment.

Using Fishery CPUE

Statistically designed surveys have advantages over fishery CPUE for inferring the behavior of fish populations because they are synoptic in time, and provide uniform area coverage. Generally CPUE is to be used in lieu of survey data, gear must be standardized for all relevant factors, and the CPUE data analyzed to compensate for non-uniformity in time and area sampling. If the CPUE data are not adjusted for these factors, the potential for bias exists. Also, if CPUE data is to be combined with survey data, it should be clearly demonstrated statistically or otherwise, that real gains will be made.

Survey Randomization

Currently bottom trawl surveys are designed using a random stratified approach, where stations are randomly selected within depths along selected transects. However, once selected the survey stations have been fixed over time. Fixing stations provides logistical efficiencies for subsequent surveys, known untrawlable stations having been identified; however there is a question of whether the repeated surveys meet the independence assumption for samples within strata. Re-numbering the survey annually would assure independence of samples, and over time provide more detailed information regarding spatial variability in species population density. The SSC recommends that the Plan Team request a statistical review of survey strategies to throughly evaluate the pros and cons of annually re-randomizing survey stations.

Averaging

The problem of averaging survey biomass to arrive at area distribution of biomass which could be used to allocate ABC to EBS and GOA subareas was notable in this year's SAFE. In general, recent years of survey data can be combined using unweighted averages, weighting by inverse variance, or exponential weighting described in the sablefish and POP SAFE documents in the GOA SAFE. The averaging method (and weighting by inverse variance) essentially assume measurement error only, and are most appropriate when it can be assumed that measurement error predominates. The exponential weighting can be viewed as coming from the state space model where the true state or process can be viewed as evolving with a certain variance structures and sampled with an additive component of measurement error.

In cases where the exponential model is appropriate, the rate of exponential decay needs to be determined. The SSC suggests that analysis be performed through the direct analysis of data, or simulation, which would estimate or provide clear principles on which the decay coefficient can be determined.

Status Determination Criteria

The SSC reiterates its discomfort with these criteria, which purport to define when overfishing is occurring and which stock stocks are overfished. As mentioned elsewhere in the minutes, the values of the various biomass reference points (MSST, B35%) that trigger decision points about overfished condition are highly dependent on the length of the recruitment series used and assumptions about the joint recruitment distribution. Furthermore, the projections into the future are based on fishing at the overfishing level, which is substantially higher than ABC and TAC. A credible determination should be based on these lower values, but are apparently not allowed by NMFS rules.

One positive feature resulting from the status determination process is that 10-year projections are now done for all Tier 1, 2, and 3 stocks in a consistent manner.

D-1 (b) BERING SEA ALEUTIAN ISLAND SAFE

WALLEYE POLLOCK

Eastern Bering Sea (EBS) stock

The EBS stock assessment is based on an age-structured model that assimilates the suite of data sets that provide information about this stock. It is a state-of-the-art assessment and properly accounts for uncertainties in the data sets and in the population dynamics. The SSC focused its review on Models 2 and 5 in the stock assessment. The only difference between them is that Model 2 estimates a Ricker spawner-recruit relationship using data after 1976, while Model 5 uses data from the entire series dating back to 1964.

Both models provide similar estimates of most population parameters with Model 5 providing slightly higher estimates of recent biomass . Thus, Model 2 provides more conservative estimates of biomass (Year 2000 age 3+ B = 7.7 million mt; 2000 female spawning biomass B_{Sp} = 2.2 million mt; B_{MSY} = 1.8 million t; $B_{40\%}$ = 2.3 million mt; MSY = 1.5 million mt). The major difference between the two models is in the estimates of spawner-recruit parameters: Model 5 gives a more dome-shaped relationship between recruits and spawners than does Model 2. Surprisingly, Model 2 with the shorter data series gives a more similar spawner-recruit relationship to that obtained in last year's assessment (which used the entire data series) than does Model 5.

The choice of the better model depends on understanding of both biological processes affecting recruitment and statistical processes affecting estimation of parameters. Our current understanding of pollock recruitment is that there are two major factors: (1) interannual variability, which is related to the environment and (2) density-dependence, which is related to cannibalism and possibly other mechanisms. While there has been a "regime shift" in environmental conditions after 1976, this does not seem to have directly affected pollock recruitment. There have never been two strong year-classes in a row, suggesting potential interactions in these processes. Furthermore, there is interannual variability in environmental conditions in the Bering Sea (witness the extremely high water temperatures in 1998 related to El Nino versus the extremely cold water temperatures in 1999 related to La Nina). Consequently, the SSC suggests that use of the entire data series to determine the pollock spawner-recruit relationship would normally be desirable in order to increase sample size in determining the spawner-recruit relationship, unless it is shown that there has been a shift in the relationship or its variance.

There are two major mitigating factors that alter our advice with respect to the current assessment. The first is that data quality and availability are poorer in the earlier period. There is no survey information from the period before 1977 and the age-structured information is derived from length frequencies and an old age-length key. The SSC suggests that the analyst consider the use of Japan CPUE data as auxiliary information to stabilize parameter estimates for the earlier period, because overparameterization may be an issue. Secondly, the remarkable change in the spawner-recruit relationship from the 1998 to 1999 assessments is indicative of potential estimation problems in the model that must be resolved before Model 5 can be used with confidence. Problems with Model 5 include: (1) Model 5 suggests that current biomass is well above B_{MSY} contrary to previous information, (2) B_{MSY} in Model 5 is lower than has been consistently obtained in the past by a variety of authors, (3) Model 5 results suggest that extremely high fishing mortalities can be tolerated on the stock without affecting long-term yield or population sustainability, and (4) the productivity of the stock is substantially higher at low population sizes than previously thought. Therefore, the SSC is unwilling to accept Model 5 at this point, pending resolution of the issues of parameter estimability and plausibility of the model results. Consequently, the SSC agreed with the Plan Team to use Model 2 as the basis of its ABC determination.

The results from Model 2 suggest that the 1996 year-class is fairly strong and will lead to an increase of biomass in year 2000 and shortly thereafter. In last year's assessment, the population was slightly below the B_{MSY} level and this year's assessment suggests that current biomass has increased slightly beyond it. The MSY and its related parameters are estimated in accord with previous assessments, and so the SSC recommends keeping pollock in Tier 1, wherein a valid probability distribution for fishing mortality F_{MSY} is thought to be available. The maximum ABC under the overfishing definition is determined from the harmonic mean of the distribution, giving an F_{MSY} of 0.50 and maximum ABC of 1.2 million tons. In the past, the Plan Team and SSC have recommended the use of a lower fishing mortality $F_{40\%}$ to account for uncertainties in recruitment and other information and because there is not a broad range of age-classes supporting the fishery. The SSC recommends that $F_{40\%} = 0.48$ be used this year for the same reasons, which gives an ABC of 1.139 million tons. The Plan Team recommends a further reduction tied to the ratio of the current population to the target biomass level associated with $F_{40\%}$. The SSC does not support this further reduction, because the current population is above the B_{MSY} level, which is a more appropriate target under Tier 1 than $B_{40\%}$ (which is appropriate when a spawner-recruit relationship has not been determined). The SSC agrees with the Team's recommended OFL of 1.680 million mt from the arithmetic mean value of F_{MSY} under Tier 1a ($F_{OFL} = 0.8$).

Aleutian Islands

There is no new information for this area. The SSC concurs with the Team's recommendations for ABC (23,800 mt) and OFL (31,700 mt), obtained as the product of 1997 trawl survey biomass and the recommended F under Tier 5 (0.75M for ABC and M for OFL, where M = 0.3).

Bogoslof

The SSC agrees with the Team that Bogoslof more appropriately belongs in Tier 5 than in Tier 3, because the only real information for this stock includes a natural mortality value and biomass estimates from hydroacoustic surveys. Previously, the Team and SSC had used surrogates for $B_{40\%}$ and $F_{40\%}$, but under Amendment 56, it is important to be precise in the use of definitions, because of the importance of overfishing concerns. The SSC agrees that the maximum permissible ABC under Tier 5 is 71,300 mt (biomass of 475,000 mt × 0.75M) and the OFL is 95,000 mt (biomass of 475,000 mt × M), where M = 0.2. In concurring with the Plan Team, the SSC is accepting two changes over past practice: (1) current biomass is set equal to the most recent survey biomass estimate rather than decaying it for natural mortality (to be consistent with what is done for other stocks) and (2) using the entire hydroacoustic biomass estimate rather than that contained only in area 518 (because the entire estimate is a better estimate of this stock and pollock outside area 518 have the ability to readily move inside 518).

The SSC has had a long history of recommending lower ABCs based on consideration of the entire Aleutian Basin stock; see Appendix 1 (thanks to Grant Thompson for compiling this history). While the names of the reference points have changed over time, the SSC has been remarkably consistent in reducing fishing mortality based on the ratio of current biomass to a target biomass of about 2 million mt. This target is based on consideration of a reasonable target level (a surrogate for B_{MSY}, $B_{40\%}$, etc.) for a stock that is estimated to have been as large as 5 million mt or greater before the heavy exploitation of the 1980s. The SSC recommends that the same procedure be used to reduce ABC this year. This results in an ABC of 22,300 mt, based on an F of 0.053, a corresponding exploitation rate of 0.047, and a current biomass of 475,000 mt.

The SAFE contains an interesting age-structured model for this stock using only data from the Bogoslof surveys. If we were willing to ignore the connection of Bogoslof pollock to the Aleutian Basin, then this model could provide a basis for determining ABC. However, we continue to believe that Bogoslof pollock are related to the Aleutian Basin stock, and therefore, ignoring data from the entire stock does not constitute use of best available information for this stock.

PACIFIC COD

Biological Reference Points

B spawning = B_{ABC} = 357,000
B_{3+} = 1,300 ,000
Catch ABC = 193,000
Catch OFL = 240,000
F_{abc} = F40 = 0.26
F_{ofl} = F35 = 0.33

The SSC endorses the recommendation of the Plan Team to set the ABC of Pacific cod in the BS/AI region at 193,000 mt and the OFL at 240,000. The level is based on a risk-averse optimization procedure that adjusts for uncertainty in the selectivity coefficients and natural mortality rate in the computation of ABC. The SSC notes that the estimated spawning biomass has declined gradually during the decade of the 1990s. Still, biomass is much higher than it was in the 1970s.

The SSC commends the analyst for expanding his examination of the statistics of the sampling program and providing several tables showing the intensity of sampling across the many sectors of the fishery. The Committee recommends that these analyses continue in the direction described in the October 1999 SSC minutes, and cited in the Plan Team's SAFE document for November 1999.

YELLOWFIN SOLE

The SSC concurs with the Plan Team's recommendation for ABC (191,000 mt; $F_{40\%}$ = 0.11; Tier 3a) and OFL (226,000 mt; $F_{35\%}$ = 0.13). The modeling approach is the same as used last year. There was a 44% decrease in the EBS bottom trawl survey estimate of biomass, a result the authors tentatively attribute to record cold bottom temperatures at the time of the survey. The stock assessment showed a more modest decrease in age 2+ biomass (11%) and the recommended ABC mirrors that decrease.

GREENLAND TURBOT

The SSC concurs with the Plan Team's recommendation for ABC (9,300 mt; .25 x $F_{40\%}$ = 0.065; Tier 3a) and OFL (42,000 mt; $F_{35\%}$ = 0.32). The situation for Greenland turbot does not appear to have substantially improved the past several years. The shelf trawl survey continues to show low biomass estimates; there is no indication of incoming strong recruitment, and the model estimates of age 1+ biomass continue their 25 year downward trend. One change from last year is that the ratio of spawning biomass to $B_{40\%}$ increased substantially. This change derives from the use this year of only post 1977 year class recruits to estimate $B_{40\%}$. The max F_{ABC} ($F_{40\%}$ = 0.26) leads to an ABC of 34,700. Both the assessment authors and the Plan Team recommend a conservative ABC based on 25% of max F_{ABC}. The SSC supports this recommendation recognizing that the ABC recommendation is based on a harvest rate – as opposed to a constant catch – and therefore fluctuates with the biomass. Finally, there are other reasons to wait until next year before suggesting a more aggressive ABC. In 2000, the slope survey which covers the adult grounds will be conducted for the first time since 1991. Secondly, there is a possibility that a method for accurately aging turbot otoliths will be found. The present model uses a length-age transition matrix.

ARROWTOOTH FLOUNDER

The SSC concurs with the Plan Team's recommendation for ABC (131,000 mt; $F_{40\%}$ = 0.22; Tier 3A) and OFL (160,000 mt; $F_{35\%}$ = 0.27.) The 1999 EBS bottom trawl survey showed a 29% decrease in biomass relative to 1998, the second consecutive year of sharp decline. This assessment was conducted using stock synthesis and the authors noted limitations in the software to modeling an unequal sex ratio. The SSC urges development of an assessment in AD Model Builder to permit calculations with an unequal sex ratio..

ROCK SOLE

The SSC concurs with the Plan Team's recommendation for ABC (230,000 mt; $F_{40\%}$ = 0.15; Tier 3a) and OFL (273,000 mt; $F_{35\%}$ = 0.19). The 1999 EBS bottom trawl survey showed a 22% decline in biomass, the second consecutive year of sharp decline. The modeling approach is unchanged for this species. The assessment authors note a change in research trawls in 1982 and, therefore, do not use CPUE and biomass estimates from the 1975-81 surveys. The SSC suggests this issue be revisited – these earlier surveys could be used by either incorporating a "break" in the catchability coefficient or using the time series as a separate relative index of biomass.

FLATHEAD SOLE

The SSC concurs with the Plan Team's recommendation for ABC (73,500 mt; $F_{40\%}$=0.28; Tier 3a) and OFL (90,000 mt; $F_{35\%}$ = 0.35). The model used for this species is the same as last year. The 1999 EBS bottom trawl survey showed a 43% decline in biomass relative to 1998.

OTHER FLATFISH

The SSC concurs with the Plan Team's recommendation for ABC (117,000 mt; $F_{40\%}$ = 0.28; Tier 3a) and OFL (141,000 mt; $F_{35\%}$ = 0.35.) Alaska plaice, which forms the bulk of the Other Flatfish category, was the only flatfish that showed an increase in biomass in the 1999 EBS bottom trawl survey. A new AD Model Builder stock assessment model was presented for Alaska plaice. The SSC recommends that Alaska plaice be taken out of the Other Flatfish category, and assessed in the same manner as the other major flatfish species.

General Comments - Bering Sea Flatfish

1. The SSC supports the increasingly consistent modeling approach and presentation of results for the flatfish assessments. Four of the six assessed species (yellowfin sole, Greenland turbot, rock sole, Alaska plaice) are now modeled using AD model builder. The SSC encourages development of AD models for arrowtooth flounder and flathead sole.

2. The BSAI flatfish appear to share a number of similar characteristics, including sustained high biomass levels since the mid-1980s (except for Greenland turbot which has had a sustained low biomass in that time period). This is at least partly due to the fact that among BSAI groundfish, flatfish show the strongest recruitment response to the 1976-77 climate shift.

   a. The estimated 1999 biomass in the trawl survey decreased sharply. The yellowfin sole authors advance a hypothesis that abnormally cold bottom temperatures at the time of the survey may have shifted the distribution out of the survey area resulting in the low biomass estimate. This hypothesis is feasible for the other flatfish species as well. The SSC encourages the flatfish assessment authors to pursue this line of inquiry as a means of incorporating environmental data into the assessment models. One suggestion is to link catchability to a water temperature index.

b. Several of the age-structured models (Greenland turbot, arrowtooth flounder, flathead sole) make use of a length-age transition matrix. As currently used, these matrices are static in time and assume therefore that size-at-age is constant. This assumption can have serious consequences on the assessment as was demonstrated with Pacific halibut. The SSC recommends that the assumption of constant size-at-age be tested with data from time periods at least a decade apart. Because of the number of age-classes in flatfish stocks, it would be useful to explore the level of error introduced in the assessments by using age-length keys. The alternative, of course, is the development of direct age determinations from ageing structures.

c. Many of the flatfish species have stock recruitment data of 30-40 years duration, longer in some cases than walleye pollock. Further, the stock recruitment plots are quite similar and indicate a density dependent response at high biomass levels. While the stock assessment authors have indicated that they don't believe a stock recruitment relationship is evident from the data, the SSC finds them at least as convincing as walleye pollock, which is currently the only Tier 1 managed stock. We recommend that, for those assessments with lengthy stock recruitment time series, management under Tier 1 status be explored.

3. Survey biomass estimates and stock recruitment plots are provided for each analysis and constitute some of the most important information about the stock. The SSC suggests these plots be standardized and include the following features

a. Plot survey biomass estimates with their 95% C. I.s

b. Plot stock recruitment data showing the year class (rather than points) which would allow one to visually assess the temporal distribution of these data in stock-recruitment space.

4. The authors were instructed to conduct a set of standard harvest scenarios that encouraged them to use recruitment data for the post 1976 purpose of determining harvest guidelines. If they elected to use the whole recruitment time series or truncated the series in an alternative manner, then they were asked to justify the usage. The SSC urges the analysts to conduct these other projections and explicitly illustrate the impact of selectively truncating the recruitment time series.

<u>SABLEFISH</u>

<u>Biological Reference Points</u>

Sub-tier 3a Max $F_{ABC} = F_{40\%\ adjusted} = 0.109$

EBS

Exploitable 2000 biomass = 18,000 t

$F_{ABC} = 0.109$

ABC = ,410 t

$F_{OFL} = F_{35\%\ adjusted} = 0.136$

OFS = 1,750 t

Aleutian Islands
Exploitable 2000 biomass = 33,000 t
$F_{ABC} = 0.109$
ABC = 2,490 t
$F_{OFL} = F_{35\%\ adjusted} = 0.136$
OFS = 3,090 t

The SSC concurs with the Team's recommended ABC and OFL for this species.

EBS/AI PACIFIC OCEAN PERCH COMPLEX

General Rockfish Comments

As the POP complex assessment moves from Stock Synthesis to AD Model Builder an opportunity exists to re-examine the best way to model the EBS/AI POP populations. The difficulty in estimating an EBS survey time series for POP suggests that the best modeling method might be to combine the two areas into a single model.

The SSC supports recommendations 1-3 (p23) made by the Plan Team for next year's POP complex stock assessment. However, the SSC questions whether recommendation 4, tallying catch and survey biomass for the other red rockfish species will provide meaningful harvest rates. This difficulty is due to problems in surveying rockfish and the small numbers involved in both the survey and catch estimates.

True Pacific Ocean Perch

The SSC concurs with the Plan Team's ABC's and OFL's for the EBS/AI Pacific Ocean Perch. The current assessment updates last years assessment with new catch information. F_{ABC} was calculated using an adjusted $F_{40\%}$ strategy and F_{OFL} was calculated using an adjusted $F_{35\%}$ strategy. For the EBS an adjusted $F_{40\%} = 0.054$ gives an ABC = 2,600 mt, and an adjusted $F_{35\%} = 0.065$ gives an OFL of 3,100 mt. For the Aleutian Islands the adjusted $F_{40\%} = 0.070$ gives an ABC = 12,300 mt, an adjusted $F_{35\%} = 0.083$ gives an OFL = 14,400 mt. The AI ABC is apportioned among AI subareas based on surveys as Western AI = 46.1%, Central AI = 28.5% and Eastern AI = 25.4%.

EBS - Other Red Rockfish (Northern/Sharpchin/Shortraker/Rougheye)

The SSC concurs with the Plan Team's ABC's and OFL's for other red rockfish in the EBS. The present assessment differs from last years in that only domestic trawl surveys (1988-1997) are used. The ABC's were set using Tier 5 with $F_{abc} = 0.75M$ and $F_{OFL} = M$. The M values used were rougheye (0.025), shortraker (0.030), and northern (0.060), results were then summed over species.

AI - Other Red Rockfish (Northern/Sharpchin)

The SSC concurs with the Plan Team's ABC (5,150 mt) and OFL (6,870 mt) for Northern/Sharpchin in the AI. Tier 5 calculations were used as described for the EBS.

AI - Other Red Rockfish (Shortraker/Rougheye)

The SSC concurs with the Plan Team's ABC (885 mt) and OFL (1,180 mt) for Shortraker/Rougheye in the AI. Tier 5 calculations were used as described for the EBS.

OTHER ROCKFISH COMPLEX

The SSC concurs with the Plan Team's ABC and OFL for other rockfish in the EBS (369 and 492) and the AI (685 and 913). Tier 5 was used with $F_{abc} = 0.75M$ and $F_{OFL} = M$, where M = 0.07.

ATKA MACKEREL

Biological Reference Points
Sub-tier 3a Max $F_{ABC} = F_{40\%} = 0.35$
Age 3+ 2000 biomass = 536,000 t
$F_{ABC} = 0.23$
ABC = 70,800 t
$F_{OFl} = 0.42$
OFS = 119,000 t

The SSC concurs with the Team's recommended ABC and OFL for this species. The Team set the 2000 ABC fishing rate to that of last year. This fishing rate was set substantially less than the maximum because of the continuous decline in abundance since 1991, the low abundance in the 1997 survey, and the uncertainty in survey abundance estimates due the difficulty in sampling with standard trawl survey gear.

The SSC also concurs with the Team's subarea-specific ABCs

Eastern (541)	= 16.400 mt
Central (542)	= 24,700 mt
Western (532)	= 29,700 mt

SQUID AND OTHER SPECIES

Squid and other species includes a group of otherwise unrelated species receiving little directed fishing effort in the BSAI region at this time. The SSC concurs with the Plan Team recommendation for the squid ABC. There is no population information for squid other than catch history. ABC follows a Tier 6 strategy in which OFL (2,620 mt) is equal to mean catch from 1978 to 1995. The ABC is set at 75% of OFL. The recommended year 2000 ABC is 1,970 mt and is unchanged from the 1999 level.

The SSC disagrees with the Plan Team on the ABC for other species. The Plan Team chose an ABC equal to mean catch since 1977, or 26,800 mt. In 1999 the SSC set a constant value for M, recommended following a Tier 5 ABC determination process and stepping up to the new ABC over 10 years. This year the Plan Team revised the SSC recommendation for other species M, providing species specific mortality rates for the main components of the complex (Sculpins, M = .15; Skates, M = .10; Sharks, M = .09; and Octupus, M = .30). The result and maximum permissible ABC for the total complex was 53,600 mt, and OFL is 71,500 mt. OFL is M * biomass, and maximum permissible ABC is .75 M * Biomass. Using the revised maximum permissible ABC and following the SSC's 10 year stair step strategy begun in 1999, the SSC's recommended year 2000 other species ABC is 31,360 mt [(Year 2000 max ABC - 1999 ABC) * 2/10 + 1999 ABC] or [((53,600 - 25,800) * 2/10 +25,800) = 31,360].

D-1(d) GULF OF ALASKA SAFE

WALLEYE POLLOCK

Gulf of Alaska pollock are divided into two populations, one west of 140° W long., the other east. The extension of the western population to 140° W is a new feature of the assessment, and responds to a comment provided by the SSC in previous assessment cycle.

Population abundance for the eastern population is derived from trawl survey biomass and estimate of natural mortality. The western population abundance is estimated from a statistical age structured model. Assessment authors present two models for consideration, a base case which incorporates ADFG trawl survey data from 1989 to 1999, and an alternative configuration which excludes the ADFG trawl survey data. The stock assessment authors, Plan Team and SSC all agree that the base case model including ADFG trawl survey data is the preferred model configuration.

The recommended ABC for the eastern Gulf is 6,460 mt based on a trawl survey biomass of 28,709 mt and a natural mortality rate of 0.30 (ABC= 0.75*0.30*28,709). The corresponding overfishing level is 8,613 mt (OFL=0.30*28,709). **The SSC concurs with the recommended ABC and OFL for the eastern Gulf.**

Stock assessment authors recommended a western Gulf ABC of 113,306mtbased on an adjusted F40% harvest strategy (Tier 3b) and a projected year 2000 exploitable biomass of 588,000 mt. This represents a 28% increase in the projected year 2000 catch from the previous assessment due to an overall increase in the historical estimates of abundance. The Plan Team expressed several concerns regarding stock condition, noting in particular that: 1) stock biomass continues it's downward trend, 2) projected year 2000 biomass will be at an all time low, and 3) high variability about the 1999 trawl survey abundance estimate. The Plan Team recommended reducing the ABC from the maximum permissible level to an amount equivalent to the recommended 1999 ABC of 94,560 t. The Plan Team's rationale in part is based on the notion that because of the depressed condition of the stock the year 2000 ABC should not exceed current ABC.

While the SSC agrees with the Plan Team's recommendation in principal, we disagree with the roll-over of the previous year's ABC. The SSC prefers that year 2000 ABC be conditional on the current stock assessment explicitly. Therefore, **the SSC recommends setting the year 2000 ABC for the western population using an adjusted F45% exploitation strategy (F_{ABC}=0.28). This results in an ABC of 94,962 t.** Overfishing level is estimated from the adjusted F35% fishing mortality rate (F_{OFL}=0.40) and is 130,758 t.

The SSC concurs with the regional apportionment schedule recommended by the Plan Team: W(61)=41%, W(62)=24.4%, C(63)=32.1% and WYAK=2.5%. Before the apportionment can be calculated it is necessary to subtract the Prince William Sound GHL from the total ABC for the western population. ADFG has recommended a year 2000 PWS pollock GHL of 1420 t. The resultant regional distribution of ABC is as follows:

Total ABC		94,962
PWS		1,420
ABC-PWS		93,542
W(61)	41.0%	38,352
W(62)	24.4%	22,824
C(63)	32.1%	30,027
WYAK	2.5%	2,339

PACIFIC COD

Biological Reference points
B spawning = B_{ABC} = 111, 000
$B_{35\%}$ = 86,000 mt
B_{3+} = 567,000
Catch ABC = 76,400
Catch OFL = 102 ,000
F_{ABC} = F40 = 0.33
F_{OFL} = F35 = 0.46

The SSC recommends acceptance of the ABC level endorsed by the Plan Team (76,400 mt). Again this year the analyst has conducted a Bayesian analysis to formally account for risk, which makes the calculated ABC more conservative, lowers the recommended fishing rate, and lowers the ABC from last year. Unless changes in productivity occur in the next two years, the ABC should stop the decline in the spawning stock size.

The SSC has concerns about this stock because the spawning biomass has been decreasing since the late 1980s despite adherence to conservative management. This consistent downward slide is somewhat surprising, because recruitment during the 1990s has experienced only a small reduction from recruitment of the previous decade. Also, there does not seem to be a trend in recruitment during the 1990s. Yet the spawning biomass is now at its historic low, last seen in 1978. The stock should be watched carefully. While the biomass has not yet gone so low that it is between the high risk levels $B_{35\%}$ and ½ $B_{30\%}$, it is getting close to this zone (within 24, 600 mt). ($B_{35\%}$ is a proxy for B_{MSY} for projections of whether the stock is approaching an overfished condition of F_{OFL}).

The management action from the assessment work of the past few years has apparently not been sufficient to stop the decline, though the assessment model is one of the best that the Plan Team has among its assessments. It is possible that the source of the mis-match between ABC and stock decline comes from biases in the available data and from the sampling program. The Plan Team and the analyst have begun a comprehensive look at the sampling program, as stated in the SAFE and as requested by the SSC during the past two years.

FLATFISH

The SSC concurs with the Plan Team's recommendations for ABC and OFL levels for deepwater, rex sole, shallow water and flathead sole groups.

Species Group	ABC	F_{ABC}	OFL	F_{OFL}	Tier
Deep water	5,300	0.075	6,980	0.10	5,6
Rex sole	9,440	0.15	12,300	0.20	5
Shallow water	37,860	0.15-0.17	45,320	0.209-0.25	4,5
Flathead sole	26,270	0.15	34,210	0.20	5
TOTAL	78,870				

The regulatory area apportionments of ABC are based only on biomass distributions from the 1999 triennial survey, unlike most other species for which a weighted combination of the past several surveys is used. The SSC agrees with this apportionment method.

Species Group	Western	Central	WYAK	EYAK/SEO	Total
Deep water	280	2,710	1,240	1,070	5,300
Rex sole	1,230	5,660	1,540	1,010	9,440
Shallow water	19,510	16,400	790	1,160	37,860
Flathead sole	8,490	15,720	1,440	620	26,270
TOTAL	29,510	40,490	5,010	3,860	78,870

ARROWTOOTH FLOUNDER

The SSC concurs with the Plan Team's recommendation for ABC (145,360 mt; $F_{40\%}$ = 0.134; Tier 3a) and OFL (173,910 mt; $F_{35\%}$ = 0.159.) This year – for the first time – arrowtooth flounder biomass estimates were based on an AD Model Builder stock assessment model. The 2000 estimate of exploitable biomass represents a 30% decrease from the 1999 estimate. While it is unstated how much of this decrease is due to the switch in models, most is likely due to a change in how the higher proportion of females at larger size intervals is modeled. In the stock synthesis model, unequal sex ratio was accomplished through lower selectivities for males. In the new assessment, differential natural mortality rates were used: 0.2 for females, 0.35 for males. These rates were determined through some modeling work such that survey selectivity reached 1.0 for both sexes. There is, of course confounding between selectivity and natural mortality; the BS/AI arrowtooth model continues to use differential selectivities to achieve the unequal sex ratio. No biological rational was offered for the higher natural mortality rates for males and it is certainly feasible that older males may be hidden from the gear. The analysts have explored a range of M values for males between 0.2 and 0.35. The SSC suggests that a Bayesian exploration of male natural mortality rate be conducted. A prior distribution could be constructed on the basis of independent estimates of natural mortality (Hoenig's method, Pauly's method, etc.).
The ABC apportionment is distributed among regulatory areas in proportion to biomass distributions in the 1999 survey:

Species Group	Western	Central	WYAK	EYAK/SEO	Total
Arrowtooth	16,160	97,710	23,770	7,720	145,360

SABLEFISH

Biological Reference Points
Sub-tier 3a Max $F_{ABC} = F_{40\% \text{ adjusted}} = 0.109$
Exploitable 2000 biomass = 169,000 t
$F_{ABC} = 0.109$
ABC = 13,400 t
$F_{OFL} = F_{35\% \text{ adjusted}} = 0.136$
OFS = 16,700 t

The SSC concurs with the Team's recommended ABC and OFL for this species. The SSC notes that the current stock assessment for sablefish is much improved. The current assessment includes the 1960 – 1978 fishery data, improved ageing data, and 1990 – 1998 longline fishery CPUE from logbook data. The current assessment has better estimates of recruitment, a greatly extended time series of biomass estimates, generally consistent trends in fishery and survey indicators of abundance. The abundance of sablefish is low and stable, with a stable or increasing recruitment trend.

The SSC also concurs with the Team's method of computing area apportionment for sablefish. The Team examined different methods for area apportionment, including combining survey and fishery data. The area apportionments based on fishery data are more variable, and potentially biased due to changing fishery catchebility and non-random distribution of fishing effort. Because of the potential bias the team used the area apportionments based on 5-year weighted average of longline survey relative abundance.

Western	1,960 t
Central	6,030 t
West Yakutat	1,920 t
E. Yakutat/SE	3,490 t

SLOPE ROCKFISH COMPLEX

General Rockfish Comments

For the next cycle it is expected the Pacific ocean perch assessment model will move from Stock Synthesis to AD Model Builder. If this occurs, the SSC requests that detailed information be given comparing modeling results from the two models. Also, it is expected that a northern rockfish age-structured model will be available for next year.

Pacific Ocean Perch (POP)

The SSC concurs with the Plan Team's ABC and OFL for GOA POP. The current assessment was updated to include 1999 size composition and survey biomass, and 1999 fishery catches. The trawl survey biomass was greatly influenced by one haul (nearly 16 mt) which is the largest ever. Tier 3b was used estimate ABC and OFL.

Adjusted $F_{40\%} = 0.065$ and adjusted $F_{35\%} = 0.078$ giving an ABC = 13,020 mt and an OFL = 15,390 mt. ABC and OFL are apportioned into GOA subareas using an exponential weighting and the 1993, 1996 and 1999 surveys. The ABC and OFL in the Eastern area was further partitioned into WYAK and EYAK/SEO to account for Amendment 41 which prohibits trawling east of 140°W longitude.

Shortraker/Rougheye

The SSC concurs with the Plan Team's ABC and OFL for shortraker/rougheye. The average exploitable biomass from the 1993, 1996 and 1999 surveys were used in the calculations. Shortraker are in Tier 5 with $F_{ABC} = 0.75M$ and Rougheye are in Tier 4 which allows an $F_{ABC} = M$. For shortraker $F_{ABC} = 0.023$ and for rougheye $F_{ABC} = 0.025$. These result in an ABC = 1,730 mt for this subgroup. The method used for POP was also applied to shortraker/rougheye to apportion ABC to GOA subareas. $F_{OFL} = M = 0.03$ and $F_{OFL} = F_{35\%} = 0.038$ for rougheye. This results in an OFL of 2,510 mt for this subgroup.

Northern Rockfish

The SSC concurs with the Plan Team's ABC and OFL for northern rockfish. The average exploitable biomass for the 1993, 1996 and 1999 surveys were used in the calculations. The 1999 survey for northern rockfish was also influenced by one very large haul. Northern rockfish are in Tier 4 allowing an $F_{ABC} = M = 0.06$ and an $F_{ABC} = F_{35\%} = 0.088$. These values result in an ABC = 5,120 mt and an OFL = 7,510 mt. ABC was apportioned to GOA subareas using the method applied to POP.

Other Slope Rockfish

The SSC concurs with the Plan Team's ABC and OFL for other slope rockfish. The average exploitable biomases for the 1993, 1996, and 1999 surveys were used in the calculations. Sharpchin falls in Tier 4 which allows $F_{ABC} = M = 0.05$, and for other species $F_{ABC} = 0.75$ M. Total ABC = 4,900 mt for this subgroup. For sharpchin $F_{OFL} = F_{35\%} = 0.064$ and $F_{OFL} = M$ for the other species. Total OFL = 6,390 mt for this subgroup. ABC was apportioned to GOA subareas using the method applied to POP.

PELAGIC SHELF ROCKFISH (PSR)

The SSC concurs with the Plan Team's ABC and OFL for pelagic shelf rockfish. The average exploitable biomass for the 1993, 1996 and 1999 surveys were used in the calculations. The PSR assemblage consists of dusky, widow, and yellowtail rockfishes, but nearly all of the biomass is dusky rockfish. Dusky falls in Tier 4 which allows $F_{ABC} = M = 0.09$ and $F_{OFL} = F_{35\%} = 0.136$. Total ABC = 5,980 mt and total OFL = 9,036 mt. ABC was apportioned to GOA subareas using the method applied to POP.

DEMERSAL SHELF ROCKFISH (DSR)

The SSC concurs with the Plan Team's ABC and OFL for demersal shelf rockfish. New estimates of available rockfish habitat were 46% lower than previous estimates. Under Tier 4, $F_{ABC} = M = 0.02$ and $F_{OFL} = F_{35\%} = 0.0279$. Resulting ABC = 340 mt and OFL = 420 mt are significantly lower that previous estimates.

THORNYHEAD ROCKFISH

The SSC concurs with the Plan Team's ABC and OFL for thornyhead rockfish. The age-structured model was updated with a new catch data and 1999 survey estimates. Under Tier 3a, $F_{ABC} = F_{40\%} = 0.077$, and OFL $= F_{35\%} = 0.092$, resulting in ABC = 2,360 mt and OFL = 2,830 mt.

ATKA MACKEREL

Biological Reference Points
Tier 6 OFL = 1978-1995 average catch = 6,200 t
ABC = 600 mt (bycatch only)

The SSC concurs with the Team's recommended ABC and OFL for this species.

OTHER SPECIES

There is no ABC at the present time for the Other Species category, because TAC is set at 5% of the sum of TAC for the main species. With the hope that a better biological basis can be found, the SSC supports the Plan Team's recommendation to initiate a plan amendment to attempt to define ABC's by individual species in this group.

HALIBUT DISCARD MORTALITY RATES

The SSC received a report from Gregg Williams (IPHC) on this topic. We suggest the IPHC investigate how it might evaluate methodology to determine when changes in recommended DMRs are warranted.

ECOSYSTEM CONSIDERATIONS

Dave Witherell presented this chapter which represents a new phase in the Council's documentation of ecosystem oriented research and understandings. This document was previously prepared by the Plan Teams as summary of information and specific concerns for the specifications setting process. It is now evolving into an AFSC document as a means to document trends and indicators of ecosystem health.

The SSC appreciates the evolving and progressive nature of this effort. It is important that the Plan Team remain involved in this effort. For example formal Plan Team comments on this chapter should be included as they are for the rest of the SAFE. It is essential that the Council and the public know when and how broader concerns are addressed in the specification process. Some sections, for example the multispecies modeling efforts could be incorporated into the species chapters after a more complete review of the methods.

MISCELLANEOUS

Team Appointments: The SSC recommends that appointment of Ms. Kristin Mabry (ADF&G) to the Bering Sea/Aleutian Islands Groundfish Plan Team and Dr. Shareef Siddeck (ADF&G) to the Crab Plan Team.

APPENDIX 1

Excerpts From SSC Minutes Pertaining to
Relative Abundance of Walleye Pollock in the Bogoslof District, 1991-1997
(Compiled by SSC historian Grant Thompson)

9/91: "The estimate of Bogoslof biomass in February 1991 from the hyroacoustic surveys was 600,000 mt. To obtain a preliminary 1992 estimate, the 1991 estimate should be adjusted to account for natural mortality. This results in a biomass estimate of 445,000 mt.... To determine an upper limit for ABC the SSC applied the $F_{0.1}$ rate used in the EBS to the projected 1992 biomass. This results in an ABC of 102,000 mt. There are many reasons why this ABC may be too high.... There has been a three-to-five-fold decrease in catch levels from 1989-1991. Over the same period, survey biomass in the Bogoslof district has declined from 2.1 mmt in 1989 to 0.6 mmt in 1991.... Modeling studies of EBS pollock suggest that thresholds in the range of 20% to 40% of unfished biomass are desirable to maintain high sustainable catches with low variability, and would be desirable to rebuild the stock if it were depleted. The Basin pollock stock is most likely below these threshold levels, which would suggest an ABC of zero."

12/91: " The SAFE indicates that the current Basin biomass as predicted by the preliminary Aleutian Basin stock cohort analysis is only about 10% of the largest observed biomass and well below B_{msy}. A precise estimate of the ratio B/B_{msy} is impossible, but its is probably on the order of 1/4. Given the low level of abundance, the SSC believes that under the Council's overfishing definition an exploitation rate of 1/4 of the natural mortality (F = 1/4*0.20) is appropriate. In developing its estimate of ABC, the SSC applied this rate (M/4) to the 1992 biomass (491 thousand tons) estimated based on the Team's method of projecting the 1991 Bogoslof survey but used the revised rate of natural mortality."

9/92: "Assuming that little or no recruitment has occurred recently, the best estimate of 1993 biomass is obtained from the 1992 survey decayed by natural mortality, which is 655,000 mt. The SAFE indicates that the current Basin biomass as predicted by the preliminary Aleutian Basin stock cohort analysis is only about 10% of the largest observed biomass and well below B_{msy}. A precise estimate of the ratio B/B_{msy} is impossible, but it is probably on the order of 1/4. Given the low level of abundance, the SSC believes that under the Council's overfishing definition an exploitation rate of 1/4 of the natural mortality (F = 1/4*0.20) is appropriate."

12/92: "Assuming that little of no recruitment has occurred recently, the best estimate of 1993 biomass is obtained from the 1992 survey decayed by natural mortality, which is 650,000 mt. The SAFE indicated that the current Basin biomass as predicted by the preliminary Aleutian Basin stock cohort analysis is only about 10% of the largest observed biomass and well below B_{MSY}. A precise estimate of the ratio B/B_{msy} is impossible, but it is probably on the order of 1/4. Given the low level of abundance, the SSC believes that under the Council's overfishing definition an exploitation rate of 1/4 of $F_{35\%}$ is appropriate."

9/93: "The projected biomass in 1994 using M = 0.2 is then 491,000 mt. As it has done in the past, the SSC then calculated the $F_{35\%}$ exploitation rate of 0.26 and adjusted this rate downward by the factor 1/4 to reflect the ratio of current biomass to optimal biomass."

12/93: "The SSC agrees with the Team that the best estimate of biomass in 1994 is 0.49 million mt.... As is 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."

9/94: "The SSC believes that the best estimate of 1995 biomass is 400 thousand mt... As done in the past, the SSC recommends that the ABC be calculated by applying the natural mortality exploitation rate ($M = 0.2$) divided by 4 to the projected 1995 biomass. The factor 1/4 is the OFL adjustment, equal to the ratio of the current population biomass in relation to that which would produce MSY."

12/94: "The value is based on an estimated stock abundance of 442,000 mt... Following principles to reduce exploitation rates in proportion to the ratio of current stock size to B_{msy}, the SSC has previously advised using an exploitation rate of $M/4$ (0.05) which results in an ABC of 22,100 mt. We continue to support this more conservative ABC."

9/95: "Estimated biomass is 1,020,000 mt. The new biomass estimate represents a doubling in biomass over the 1994 estimate.... The SSC recommends setting an ABC for the Bogoslof area based on $M/2$ exploitation rate. The SSC's 1995 ABC recommendation was based on an $M/4$ exploitation rate.... Because the stock has doubled, the OFL adjustment is now ½."

12/95: "The SSC recommends setting an ABC for the Bogoslof area = 121,000 mt and is based on an $F_{40\%}/2$ exploitation rate (0.11) applied to the current biomass (1.1 million mt).... The adjustment applied to the $F_{40\%}$ rate to calculate the ABC was consistent with the adjustment used in 1995 and based on the ratio of the current biomass to the appropriate level which we believe produces MSY (about ½). "

9/96: " The 1996 Bogoslof survey estimates a biomass of 680,000 mt contrasted with the 1995 estimate of 1.1 million mt.... The SSC believes the Bogoslof ABC should be reduced by the ratio of current biomass to target biomass, where target biomass is assumed to be 2 million mt."

12/96": The Plan Team has recommended an ABC of 115,000 mt based on $F_{40\%}$ applied to a projected 1997 biomass of 558,000 mt. The SSC believes the Bogoslof ABC should be reduced by the ratio of current biomass (B_{97}) to target biomass, where target biomass is assumed to be 2 million mt.

9/97: "Specifically, the ABC should be reduced by the ratio of current biomass to target biomass, where target biomass is taken to be the biomass required to open a directed fishery. Based on that adjustment, the SSC recommends an ABC of 8,400 mt ($F_{40\%} = 0.27$, $M = 0.20$, $\mu = 0.2154$, $B_{98} = 280{,}000$ mt, $B_{target} = 2{,}000{,}000$ mt, ABC = $\mu \times B_{98} \times (B_{98}/B_{target})$."

12/97: "The 1998 biomass was projected using a natural mortality rate of 0.2 applied to current year biomass (324,000 mt) based on the Bogoslof area hydroacoustic survey. Since estimates of B (current biomass), $B_{40\%}$ (2,000,000 mt), $F_{40\%}$ (0.27), and $F_{30\%}$ (0.37) exist and $\alpha < B/B_{40\%} < 1$, F_{ABC} was computed under tier 3b."

History of SSC Determinations Regarding the Relative Abundance of Walleye Pollock in the Bogoslof District, 1991-1997

Year	Month	Projected Stock Size	Reference Stock Size	Referenc e Name	Ratio
1991	September	445,000	n/a	n/a	n/a
1991	December	491,000	1,964,000	B_{msy}	0.25
1992	September	655,000	2,620,000	B_{msy}	0.25
1992	December	650,000	2,600,000	B_{msy}	0.25
1993	September	491,000	1,964,000	B_{msy}	0.25
1993	December	490,000	1,960,000	B_{msy}	0.25
1994	September	400,000	1,600,000	B_{msy}	0.25
1994	December	442,000	1,768,000	B_{msy}	0.25
1995	September	1,020,000	2,040,000	B_{msy}	0.50
1995	December	1,100,000	2,200.000	B_{msy}	0.50
1996	September	680,000	2,000,000	B_{target}	0.34
1996	December	558,000	2,000,000	B_{target}	0.28
1997	September	280,000	2,000,000	B_{target}	0.14
1997	December	324,000	2,000,000	$B_{40\%}$	0.16