

# North Pacific Fishery Management Council

James O. Campbell, Chairman  
Jim H. Branson, Executive Director

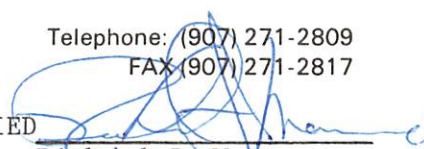
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CERTIFIED

  
Richard J. Marasco

DATE

1/20/88

## MINUTES

Scientific and Statistical Committee  
December 6-8, 1987  
Anchorage, Alaska

The Scientific and Statistical Committee met December 6, 7 and 8 at the Hilton Hotel in Anchorage, Alaska. Members present were:

Richard Marasco, Chairman	Doug Eggers, Vice-Chairman
Don Rosenberg	Robert Burgner
Larry Hreha	Bill Clark
Bill Aron	Don Bevan
Terry Quinn	John Burns

At the September meeting, the SSC considered MSY exploitation rates, as one of the options being evaluated for determining ABC. The table of ABC values issued for public review incorrectly suggested that the SSC recommended MSY rates. This is not in agreement with the SSC minutes. The SSC has devoted considerable effort during the past year to rigorously define terminology and methodology used in the determination of ABC.

The definition of ABC is:

A seasonally determined catch or range of catches that may differ from maximum sustainable yield (MSY) for biological reasons. Given suitable biological data and justification by the plan team and/or the SSC, ABC may be set anywhere between zero and the current biomass less the threshold value. The ABC may incorporate safety factors and risk assessment due to uncertainty. Lacking other biological justification, the ABC is defined as the MSY exploitation rate multiplied by the size of the biomass for the relevant time period. The ABC is defined as zero when the stock is at or below its threshold (December 1987, SSC Minutes).

The specification of ABC involves the determination of the current biomass level of a population and an appropriate exploitation rate. The SSC does not in general consider the MSY exploitation rate to be the best rate, but one of several to be considered based on available information. Setting ABC based on an MSY exploitation rate would be conservative when the stock is at low levels, because the exploitation rate would produce yield less than surplus production. At high stock levels, MSY exploitation rates would produce yield higher than surplus production to utilize excess reproductive capacity. Explicit in the definition of ABC is the consideration of uncertainty and

risk. The SSC considered these factors in the determination of both current biomass and appropriate exploitation rate.

One approach to determining the appropriate exploitation rate is described in the Bering Sea/Aleutians RAD. In that document, conservative exploitation rates are chosen when stock levels are low or when information is highly uncertain. For example, fishing mortality rates less than the value of natural mortality rates are considered conservative, although it may be difficult to estimate natural mortality rates. Less conservative approaches can be used when the biological information is good and stocks are at high levels. Approaches based on MSY or on maximum yield-per-recruit are thought to be less conservative. Current knowledge does not favor fishing at the rate that maximizes yield-per-recruit, because the impact on reproductive capacity is not considered in this approach.

The SSC review of the Teams ABC recommendations for the Bering Sea and Gulf of Alaska Groundfish, considered the changes in stock abundance due to a number of factors, including the recommended catch levels, growth, recruitment, and natural mortality. To the extent possible, we considered the implication of alternative ABC levels relative to projected changes in the biomass, age/size structure, and spawning stock thresholds. In the SSC's deliberations to specify ABC's, the health of the population and the quality of the scientific data were key elements of our considerations. In cases where the SSC felt uncertain about the information, recommended ABC's were somewhat lower than the Team's. The SSC would like to commend the teams for providing significant new information and analyses that greatly facilitated our deliberations, including population projections and alternate recruitment scenarios. The SSC recommends that the Teams work with the SSC to insure consistency in the definition and application of various biological reference points.

### D-3 Bering Sea/Aleutian Islands Groundfish

#### D-3(a) Bering Sea "Donut" fishery

The SSC received a report given by Dr. Jim Balsiger of the Northwest and Alaska Fisheries Center on this topic. The report summarized information that has been compiled from available sources. Information presented included observations on size ranges of pollock encountered in the Bering Sea tag recoveries, results of genetic studies, growth observations and limited observations on spawning locations. Several working hypotheses were suggested regarding the relationship of pollock in the international zone of the Bering Sea to pollock elsewhere including the U.S. FCZ Basin and shelf/slope areas. It was indicated that current data do not allow evaluation of the validity of the suggested hypotheses. Further, it was indicated that there is no conclusive information to provide any guidance about the long-term consequences of international zone harvests on the productivity of the eastern Bering Sea shelf area pollock.

The SSC encourages research on stock structure of Bering Sea pollock. Information and analyses of stock status, migration patterns, and fishery removals are necessary to understand the relationships among stocks caught in the U.S., international, and Soviet zones.

D-3(b) Bering Sea/Aleutian Islands ABC's

Pollock

The SSC endorses the Team's 1988 biomass estimate of 6.5 million mt for pollock in the eastern Bering Sea, based on cohort analysis adjusted to trawl-hydroacoustic survey estimates.

The Team recommends applying the  $F_{0.1}$  rate, which is 23%. The SSC concurs with this recommendation. Fishing at this rate would provide about 80% of MSY and maintain biomass at about twice the MSY level. It would probably reduce the relative frequency of older (larger) fish in the catch by about 10% relative to the present size composition.

Recent exploitation rates have been low. Only about one-half of MSY is being taken. Spawner-recruit data indicate that the MSY exploitation rate would be extremely high - on the order of 50% per year. Even if this rate were sustainable, it is considered undesirable because it would reduce biomass to a much lower level and annual catches could become highly variable. Applying the MSY rate now would provide a large short-term increase in catch while the stock was being fished down, but a much smaller long-term increase. Further, the MSY rate would probably reduce the relative frequency of older fish by 50%.

Switching from recent exploitation rates to  $F_{0.1}$  would produce an incremental gain in catch of about 300,000 mt. Biomass would be about 10% lower than the level associated with the present exploitation rate. Recruitment may be slightly higher.

With respect to the Aleutian Islands area, the SSC agrees with the Team's ABC recommendation.

In summary the SSC, and the Team, recommend that the ABC's for the eastern Bering Sea and Aleutian Islands be set at 1,500,000 mt and 160,000 mt, respectively. The SSC agrees with the Team that it is not possible at this time to incorporate catches in the donut into the calculation of ABC. Information and analyses on stock status, migration and fishery removals are necessary to understand the relationships among stocks caught in the U.S., the Soviet and international zones. The impact of the catches in the donut area on the Bering Sea/Aleutian Islands area is a complicated question to resolve. It will require stock assessment and stock structure analyses in addition to catch data and also will require an examination of biomass and catch in the Soviet zone.

Pacific cod

Biomass trends of cod presented to the SSC by the Team indicate that the cod biomass is at very high levels. While the very high 1977 and 1978 year classes are gradually disappearing from the fishery, there is evidence that the 1982 and 1985 year classes are strong. In the opinion of the Team, it is unlikely that these incoming year classes will have an impact equal to that of the 1977 year class. However, taken together the strength of these two year classes indicates that the stock should remain relatively healthy. Given the high level of abundance of this stock and the strength of recent recruitment,

the Team concluded that this stock could be exploited at a level which maximizes yield as determined by a cod population model (exploitation rate of 26%). Application of this exploitation rate to the projected 1988 biomass of 1.48 million mt for the combined area resulted in an ABC estimate of 385,300 mt. The SSC concurs with this recommendation.

#### Yellowfin sole

The abundance of the yellowfin sole stock remains high. Using the results of cohort analyses and assuming that recruitment will remain constant at the average for the 1977-85 period, the Team arrived at a projected biomass of 1,408,000 t for 1988. The SSC notes that the current biomass estimate is above the MSY biomass. However, since the biomass is expected to decline because the population appears to be entering a period of lower than average recruitment, the SSC feels that a conservative harvest policy is appropriate. The Team recommends use of a  $F_{0.1}$  exploitation rate (0.18) and an ABC of 254,000 mt. The SSC concurs with this recommendation.

#### Greenland turbot

There is considerable uncertainty associated with the status of this population. Two sources of data have been used to examine trends in relative abundance of this species: (1) NWAFC survey data and (2) catch-effort data collected by U.S. observers aboard Japanese small trawlers. CPUE data provided by the Team indicates that the survey conducted by the NWAFC experienced declining CPUE's from 1979 to 1985. In 1986, CPUE's were about the same as they were for 1985. CPUE's increased slightly from 1986 to 1987. For the Japanese small trawlers, CPUE's generally declined through the early 1980's, then increased sharply from about 1983 to 1986. When data for the small trawlers is disaggregated into immatures versus mature adults, the trend in CPUE's for immatures tracks those previously mentioned for aggregate CPUE's. CPUE's for the mature portion remains relatively constant between 1978 and 1984, then dropped significantly between 1984 and 1985. Due to uncertainties associated with the CPUE data, coupled with declining estimates of the shelf component of the stock and limited data on the slope portion of the stock it is suggested by the SSC that caution is warranted in the selection of exploitation rates for this stock. The  $F_{0.1}$  exploitation rate of 0.034 proposed by the Team is consistent with the need to be conservative. Applying this rate to the projected biomass for 1988, 414,000 mt, yields an ABC of 14,100 mt. The SSC concurs with this recommendation.

#### Arrowtooth flounder

In general, this species is in excellent condition and biomass is increasing. Using results of the surveys conducted by the NWAFC, the Team determined that the combined exploitable biomass for the three components of this stock--the EBS shelf, slope and Aleutian region--was 497,300 t. In the process of calculating ABC the team used the lower end of the confidence level for the combined exploitable biomass (377,700 mt) to calculate ABC. The SSC prefers that average exploitable biomass be used to determine ABC, since this species is in excellent condition. Further, it is suggested that deviation from the exploitation rate recommended by the Team is warranted. The Team recommends that an exploitation rate corresponding to the one that maximizes yield-per-recruit be used to determine ABC. Fishing at this rate over a

period of time may lead to overfishing. For this reason the SSC feels that an exploitation rate that approximates the  $F_{0.1}$  rate (0.20) is appropriate. Therefore, the SSC recommends that the ABC be set at 99,500 mt. During our discussions concern was expressed over the potential adverse impact a high arrowtooth flounder catch might have on Greenland turbot.

#### Other flatfish

In general, it is felt that species contained in this category are in good condition and at high levels of abundance. Therefore, the SSC supports the ABC recommended by the Team, 331,900 mt.

#### Sablefish

Biomass trends for this species are best determined by examining results of the U.S./Japan cooperative longline survey. Abundance indices for the eastern Bering Sea indicate that abundance declined between 1982 and 1983. Between 1983 and 1985 abundance increased, then it decreased from 1985 to 1986. Preliminary data indicate that abundance declined further in 1987. Abundance indices for the Aleutian Islands increased from 1981- 1985, and then decreased in 1986. Preliminary 1987 abundance indices (RPN's) show no change from 1986 levels. Since the longline survey does not provide an estimate of absolute abundance, results of the U.S./Japan cooperative trawl survey were used to estimate the current size of the exploitable biomass. For the eastern Bering Sea the biomass was obtained by summing the biomass estimates for northern portion of Area 1 and Area 2, 33,500 (This estimate was obtained by adjusting the 1985 biomass estimate for this area by the decline in RPW, 3.45%. This adjustment was necessary because a biomass estimate for this area is not available for 1986.) The biomass in the southern portion of Area 1 was 23,000 mt. Therefore, the combined biomass for the eastern Bering Sea was estimated to be 56,500 mt for 1986. The 1986 Aleutian Island biomass was estimated to be 96,300 mt. Given that the results of the 1987 longline survey are only preliminary and that trawl survey results are not available for 1987, the Team recommends that the 1986 biomass estimates be used to determine ABC. The SSC supports this recommendation: however, we note that caution is probably warranted given the behavior of the longline survey abundance indices the last couple of years.

The SSC had an extensive discussion regarding the determination of an appropriate exploitation rate. The Team recommended use of the MSY exploitation rate (0.08). This rate was obtained from Stock Reduction Analysis (SRA). The SRA approach requires specification of a spawner-recruit parameter, which in practice, is not known. Thus, results of SRA are subject to uncertainty from the lack of knowledge of this parameter. The uncertainty associated with recruitment led the Team to set the value of this parameter at a conservative level. Given uncertainty associated with recruitment and biomass size assumed for 1988, the SSC recommends that the  $F_{0.1}$  exploitation rate be used (0.06 was developed using a graphical approach by the SSC). This exploitation rate corresponds to historical levels. Therefore, the SSC recommends that the ABC's for the eastern Bering Sea and Aleutian Island be 3,400 mt and 5,800 mt, respectively.

### Pacific Ocean Perch

The POP complex population is at a low level compared to the early 1960's but appears to be increasing due to recent recruitment of strong year classes for the 1975, 1976 and 1977 year classes (See SRA analysis reported in the RAD). The SSC concurred with the Team's recommendation regarding the ABC for the POP complex. The ABC's, 6,000 mt for the eastern Bering Sea and 16,600 for the Aleutian Islands, were developed using an exploitation rate of 0.06.

The SSC notes that the Council has expressed a desire to rebuild the POP stock. Maximum rebuilding will occur by restricting catches to low levels.

The SSC requested that during the next year the Team assess the consequences of aging errors on results obtained from SRA analysis. An estimated natural mortality rate of 0.05 was based on the break-and-burn otolith aging technique, but the growth rates used were based on surface aging of otolith. This problem contributes to the uncertainty in the determination of ABC.

### Other rockfish

The status of "Other rockfish" is quite uncertain, because the trawl survey cannot estimate this category with great precision. The SSC concurred with the Team's recommendation regarding the ABC for other rockfish (400 mt for the eastern Bering Sea and 1,100 mt for the Aleutian Islands), based on applying the same  $F_{0.1}$  exploitation rate as used for POP.

### Atka Mackerel

The SSC concurs with the Team recommendation that the ABC for 1988 be set at 21,000 mt.

### Squid

The SSC concurs with the Team recommendation that the ABC be for 1988 be set at 10,000 mt.

The SSC reviewed a letter from Professors Ellen Pikitch and Donald Gunderson of the Fisheries Research Institute, University of Washington and public testimony and written report from Dr. Murray Hayes on the subject of the Bering Sea ABC's.

The SSC notes that Drs. Pikitch and Gunderson support the Team's pollock ABC recommendation. With respect to Dr. Hayes' report, we agree that recruitment, growth and natural mortality, in addition to fishery removals, must be considered in setting ABC. However, we find that Dr. Hayes is in error in his interpretation of the SSC's definition of ABC. The definition explicitly states that ABC may differ from MSY. The present methodology of setting ABC is not designed to fish a stock to low levels that will lead to a recruitment fishery. Further, we reject Dr. Hayes' notion that a constant harvest is preferable to a constant rate of exploitation in populations where we have little information to set a more biologically justifiable ABC. A constant exploitation rate policy will allow fishermen a greater harvest when the populations are large and provide greater protection if stocks are small than

is possible with a constant harvest policy. With pollock, where we have considerable information, we expect to use the best scientific information available to set ABC's rather than to blindly follow a constant harvest.

Dr. Hayes has attempted an evaluation of a variety of harvest strategies based on various biological reference points with respect to meeting objectives of conservation and maximization of yield. The SSC noted that there is controversy over the relative degrees to which these different strategies, in the long term, meet conservation objectives. The SSC further notes that there may be enormous differences in the magnitude of average sustained harvests expected under these alternative harvest policies. In a sense the setting of ABC is an objective process of establishing a harvest level that meets the objective of the plan. This is an adaptive process which must consider an expanding information base relating to the recruitment, growth, and natural mortality parameters of the stock of interest. No particular harvest policy is the best for all situations.

#### D-2(d) Gulf of Alaska Groundfish ABC's

##### Pollock

The Team proposes setting ABC so as to increase the spawning stock size to about 768,000 mt. Because of recruitment of the strong 1984 year class and the modest harvest in 1986, the Team estimated the 1987 biomass to be 687,000 mt. In 1988, the biomass was projected to increase to 1,033,000 mt if the 1985 year class is strong or 867,000 mt if the 1985 year class is average. As indicated in the RAD catches during 1988 in the range of 90,000 mt to 120,000 mt would allow the biomass to increase into 1989 for three of the four recruitment scenarios (A,B and C) and would keep the biomass stable for the more pessimistic scenario D. These results led the Team to recommend an ABC range of from 90,000 mt to 120,000 mt. The SSC wishes to note, as does the Team, that the projection model has had varied success in predicting the biomass which will return to Shelikof Strait. They point out in the RAD p.11 that, "The 1985 estimate projected from the 1984 H/A biomass estimate was 71% high. In contrast, the 1986 estimate projected from the 1985 H/A estimate was 14% low". Given the past performance of the projection model and the fact that the model must project for two years rather than one this year, the SSC feels that caution is warranted. Therefore, the SSC recommends that the ABC for 1988 be set at the lower end of the Team's range, 90,000 mt.

As in the past the SSC recommends that the Council continue to set a pollock TAC of 20,000 mt to be caught outside the Shelikof area during the January 10 - April 15 period. The purpose of this exploratory fishing is to encourage fisherman to fish other areas of the Gulf to determine if large concentrations of spawning pollock exist outside of Shelikof Strait. The SSC recommends that TAC's set for either inside Shelikof Strait or outside during the remainder of the year not be affected by catches taken by this exploratory fishery.

##### Pacific cod

Potential yields for this fishery were developed by the Team by applying exploitation rates of 0.384 (the exploitation rate that maximizes yield-per-recruit) and 0.206 ( $F_{0.1}$ ) to the 1987 survey biomass estimate (481,704 mt). Yields corresponding to these two exploitation rates are



185,000 mt and 99,000 mt, respectively. As has been previously point out, studies have shown that fishing a stock at the rate that maximizes yield-per-recruit over a period of time may lead to overfishing. For this reason the SSC feels that the more conservative  $F_{0.1}$  exploitation rate is appropriate. Therefore, the SSC recommends an ABC of 99,000 mt for this species.

#### Flatfish

The biomass estimate given in the RAD for this complex is 2,111,000 mt. This estimate is based on the 1987 bottom trawl survey, which provided separate estimates for the individual species contained in this complex.

The ABC of 767,000 mt proposed by the Team for the flatfish complex is based on a yield-per-recruit analysis conducted for four species (arrowtooth flounder, flathead sole, rocksole, and yellowfin sole). ABC was determined by applying the  $F_{0.1}$  exploitation rate obtained from the analysis to the biomass estimate. The SSC supports this approach and, therefore, concurs with the Team recommendation. Further, the SSC supports the Team's recommendation for the apportionment of the ABC by district.

The SSC would like to note that the present species harvest levels average only about 1% of ABC. As the Team points out, if catches of these species were to approach ABC levels, the bycatch of Pacific halibut would be high.

#### Sablefish

The SSC has concluded that the lower end of the 95% confidence interval for the 1984 biomass estimate updated by the RPW's to 1987 represents the best estimate of exploitable biomass (338,000 mt). The SSC opted for the lower end of the range because the 1987 biomass estimate is preliminary and is substantially below the updated 1984 estimate. The Team recommends an ABC of 35,000 mt. This ABC represents an exploitation rate of about 10%. The SSC considers this rate appropriate, since the stock is in good condition.

#### "Other rockfish" and Pelagic shelf rockfish

The SSC supports the teams recommendation of an ABC for "Other rockfish" (16,800 mt) and for Pelagic shelf rockfish (3,300 mt). The SSC notes that these ABC's are conservative and reflect a desire to maintain population levels under the most pessimistic recruitment assumption, conservative biomass estimate, and a concern that the fishery may target on individual rockfish species, exploiting them at unacceptable levels. These ABC's could also provide for the rebuilding of POP stocks.

The SSC also noted that in the pelagic shelf rockfish category, growth and natural mortality parameters tend to be higher, thus making the ABC recommendation for this group even more conservative than the one for the previous category.

#### Demersal Shelf Rockfish (in the Southern Outside District)

The SSC notes that the value proposed by the Team is not an ABC but instead a TAC recommendation from the Team and State of Alaska. The SSC does not have any information on which to develop an ABC.



### Thornyhead rockfish

The SSC concurs with the recommendation of the Team.

D-2(c) and D-2(d)

With respect to these two agenda items, the SSC is concerned over the adequacy of data that can be used to calculate halibut and fully utilized species bycatches. As foreign and joint venture fisheries are replaced with DAP fisheries the ability to collect bycatch data will all but disappear.

### C-4(a) Halibut Management

The Draft Environmental assessment and Regulatory Impact Review/Initial Regulatory Flexibility Analysis of Management Proposals for the Halibut Fishery off Alaska was provided to the SSC in the briefing book for the meeting. The critical nature of the Bering Sea and Gulf of Alaska RAD documents demanded the full time and attention of the SSC. Because inadequate time was available to permit review of the document, the SSC cannot provide advice on this issue at this time.

### Other Issues Discussed

#### 1) Crab FMP

Minutes of the November 24, 1987 will be circulated for review and comment. The draft of these minutes will be provided to the Plan Team to facilitate redrafting of the FMP.

#### 2) 603 Regulations

During the week of January 11, 1988 a meeting will be set up so that members of the SSC's 603 subgroup can discuss the proposed regulations with members of the Pacific Council SSC. Critical issues are: (1) the inclusion of socioeconomic considerations in development of ABC's, (2) the definition of ABC, and (3) the threshold, as well as, the procedure that must be followed if there is a need to seek secretarial exemption.

Table 1. Recommends Bering Sea and Gulf of Alaska ABC's and Exploitation Rate.

Species	SSC's ABC <sup>1/</sup>	Exploitation Rate
<u>Bering Sea</u>		
Pollock		
EBS	1,500,000	23.0%
ALU	160,000	23.0%
Pacific Cod	385,300	26.0%
Yellowfin Sole	254,000	18.0%
Greenland Turbot	14,100	3.4%
Arrowtooth Flounder	99,500	20.0%
Other Flatfish	331,900	15.5%
Sablefish		
EBS	3,400	6.0%
ALU	5,800	6.0%
POP		
EBS	6,000	6.0%
ALU	16,600	6.0%
Other Rockfish		
EBS	400	6.0%
ALU	1,100	6.0%
Atka Mackerel	21,000	----
Squid	10,000	----
Other Species	54,000	10.0%
TOTAL	2,863,100	
<u>Gulf of Alaska</u>		
Pollock	90,000	10.0%
Pacific Cod	99,000	20.6%
Flounder	767,000	36.4%
Sablefish	35,000	10.0%
Other Rockfish	16,800	2.0%
Pelagic Shelf Rockfish	3,300	2.0%
Demersal Shelf Rockfish	TAC = 660	----
Thornyhead Rockfish	3,750	3.8%
TOTAL	1,014,850	

<sup>1/</sup> The SSC points out that the various ABC's have been developed on the basis of single species considerations of stock status and trends. Allowance for marine mammals, seabirds and other components of the Bering Sea ecosystem have been considered as components of natural mortality.