SSC Report on the Salmon Bycatch Research Workshop
April 4th, 2006

D-1 (c,d) Progress Report on BSAI salmon bycatch amendment and Salmon Research Workshop

Diana Stram (NPFMC staff) provided an overview of the problem statement and suite of alternatives for amendment package 84B. Public testimony was received by Karl Haflinger (SeaState), Jennifer Hooper (Association of Village Council Presidents), Mike Smith (Tanana Chiefs Conference), and Becca Robbins (Yukon River Drainage Fisheries Association).

Analysis and refinement of the current salmon savings areas may be necessary in the event pollock vessels either surrender or lose their exemption and return to fishing under the regulatory salmon bycatch program. There is a need for development of more effective alternatives to the voluntary rolling hot spot system (VRHS). Amendment packages B-1 and B-2 are intended to provide those additional alternatives. Amendment package B-1 would be to establish new regulatory salmon savings systems that take into account the most recent available salmon bycatch data. Amendment package B-2 would be to develop a regulatory individual vessel salmon bycatch accountability program.

The salmon research workshop that followed was intended to aid in the discussion and development of alternatives for these packages. The objectives of this workshop were to review the information on salmon bycatch patterns, existing research on stock-origins of incidentally caught salmon species in the BSAI trawl fisheries, assessment information for Pacific Rim stocks and other research relevant to the Council's continued activities with salmon bycatch reduction measures. An additional purpose was to evaluate information availability for B-1 analysis such as biomass-based caps, updated salmon savings areas, and analysis of the current system under VRHS.

Workshop Summary
The workshop agenda, abstracts and Powerpoint presentations will be made available on the Council website. The following is a brief synopsis of the presentations, which included information on salmon catch in the pollock fishery, juvenile salmon distributions during summer BASIS surveys over the whole Bering Sea, several talks on research progress on genetics to determine stock origins, salmon stock status in the AYK region, and economic incentives for bycatch avoidance.

Jim Ianelli (AFSC) provided a report on salmon bycatch patterns in the Bering Sea pollock fishery. Catches of salmon in this fishery have increased over time. Salmon bycatch rates have increased (numerically and by incidence). Major conclusions were that the spatial pattern of salmon bycatch in the pollock fishery is variable but shows little trend, some diurnal patterns are evident, and spatial patterns of salmon bycatch are difficult to predict.

Jim Murphy (AFSC) presented BASIS survey results on distribution and abundance of salmon in the Bering Sea. Fall distributions of chum salmon were presented – most chum during this time are immature and are distributed primarily in the Bering Sea basin area. The survey was expanded in fall 2004 and 2005 in the chum salmon savings area to better track salmon abundance in that area. There appears to be temporal variability in chum salmon in this area. Eddy dynamics are being examined particularly around Pribilof canyon and may influence salmon abundance in the area. Most chum salmon in the basin in the fall are age 2 or 3. During fall, the Asian coast has primarily age 2 chum, the basin and EBS shelf break have primarily age

3, while the EBS shelf might be mostly age 4. Chum size distribution from the B-season pollock fishery seems to be primarily age 4 fish that are maturing and returning to the rivers. Looking at stock continent of origin by age is informative. Most chum on the shelf are of North American origin while there are a variety of stock origins in the Basin and western shelf. Fall 2005 Yukon chum runs are at record highs and the distributions of these can be seen in the BASIS shelf survey in 2002 and 2003. Chum bycatch in 2005 might be composed primarily of this record run. Chum salmon populations on the shelf do not have the same stock origin composition as those in the basin.

Richard Wilmot (AFSC) presented information on the stock origins of salmon caught in the Bering Sea groundfish fishery. Chum salmon bycatch increased dramatically in the last 2 years. Chinook catch has been increasing in the A season. Chum catch has been primarily in the B season. He delineated eight regions for reporting chum salmon stock identification from allozymes. Asian and western Alaska stocks comprised most of the fish sampled by observers from groundfish fishery samples in B-season pollock fishery. Genetic baselines for genetic analysis are being prepared and stock origin analysis will follow.

Jim and Lisa Seeb (ADF&G) presented work on development of standardized DNA baselines for identifying mixtures of salmon stocks. They reviewed three types of genetic markers, allozymes, microsatellites, and single nucleotide polymorphisms (SNPs) that could be used for this work. A database of microsatellite markers and single nucleotide polymorphisms (SNPSs) is virtually complete and now analysis of samples will be done. ADF&G has been working with microsatellite markers for stock identification of Chinook salmon, but these are difficult to standardize across laboratories, they are relatively expensive, and the baselines are difficult to maintain. SNPs offer greater potential to differentiate stocks because they can be part of an adaptive sequence subject to natural selection factors while microsatellites are neutral markers. Based on an expert panel opinion that SNPs will likely replace microsatellites, ADF&G is developing SNP markers for Chinook salmon and is using SNPs exclusively for chum salmon. The Seebs anticipate development of over 100 SNPs each for Chinook and chum salmon with high throughput screening to develop targeted SNPs to differentiate W. Alaska stocks. Research efforts include the Western Alaska salmon stock identification program (WASSIP) and AYKSSI project to address Chinook salmon. A run reconstruction model for Chinook will be developed. Baselines for Chinook are almost complete and samples will be run soon. Chum baselines need further enhancement in the coming year and AFSC is seeking funding to analyze chum samples once the baselines are completed.

Tony Gharrett (UAF) reported on genetic methods for determining salmon stock origins. He also confirmed that DNA-based methods (microsatellite and SNPs) are the preferred method at present. There are some biases associated with using microsatellites. There are also potential problems with SNPs. More methods for detecting SNPs are being developed. Haplotypes need to be differentiated. Preliminary results on SNP sites for chum salmon were shown. SE AK/BC and Upper Yukon came out clearly but Lower Yukon and some others were still not easily separated. Bycatch sample from B-season pollock fishery showed a mixture of stock origins from chum: Asian, Upper Yukon, SE AK/BC, Bristol Bay and Kuskokwim.

Gene Sandone and Dan Bergstrom (ADF&G) presented information on Chinook and chum salmon stock status in the AYK region. There is a large reliance by residents on salmon for subsistence (500K-800K salmon) and about 3 million salmon in commercial harvest. Subsistence and commercial fishing are intertwined. AYK management is based on abundance, local managers, and public process. Some AYK stocks have been designated as stocks of concern. Weir counts are preferred over aerial counts. Escapements of chum and Chinook in Kuskokwim

Bay have been good since the 1990s. Kuskokwim River chum have had good escapement since about 2000. The outlook for 2006 is for a large run with no commercial harvest. Chinook have had good escapements since 1999 and subsistence harvest is dominant. Continued strong production is anticipated. The Yukon River drainage is very large; about half of the Chinook run is of Canadian origin. Exploitation was high from 1980 to 1986 with no commercial harvest since 2001. Yukon River chum run size and escapement have been increasing since 2002. The outlook is for continued improvement in run size. There has not been a lot of production in the lower river, however. Yukon River fall chum has been classified as a yield concern since 2000 by the Alaska Board of Fisheries. A record run in 2005 followed several years of low production. Most of the run has ended up on the spawning grounds. The outlook is optimistic for subsistence harvests and a small commercial harvest. The Norton Sound and Port Clarence areas have some yield and management concerns for chum. Escapement and harvest has declined in district 2. Chinook escapement goals have been difficult to attain. Kuskokwim area chum stocks appear to be rebuilt. Northern Norton Sound chum continue to be a concern. There are also continued yield concerns for Chinook in Northern Norton Sound.

Alan Haynie (AFSC) presented information on incentives for bycatch avoidance. Chinook vessel bycatch rates per vessel in 2005 show a wide range of catch rates. Inshore cooperative bycatch rates in recent years have been fairly constant. Response of the fleet to the hotspot rolling closures shows some vessels staying out of the hotspot closure areas after the closure is rescinded. Vessels in different tiers provide some information about fishing conditions inside the hotspot closures, however, all vessels are avoiding these closures so some additional incentive may be needed to encourage "clean" vessels to later fish inside. Present incentives need further consideration – if a vessel is clean early in the week there is no incentive to remain clean, similarly if the vessel was dirty at the beginning and destined for a certain tier then there is no incentive to get clean. If pollock are highly mobile there is little cost or benefit to closing areas. A system of tradable individual bycatch quotas (IBQs) might be considered. Such a system would not address the fundamental issue of how large the salmon bycatch limit should be or whether a bycatch limit should float with estimates of salmon run strength. However, if bycatches could be precisely monitored, tradable IBQs could provide incentives for bycatch avoidance. The EPA's SO_2 cap and trade system provides a useful example of how a market for IBQs might be structured to allow for cost recovery and long term reductions in the level of bycatches. Other systems that could be considered include programs for direct compensation of commercial or community salmon fisheries for the value of foregone catches, imposition of fees or penalties for each salmon intercepted as bycatch, or systems that involve vessels contributing fees into a pool that is returned to the vessels with the lowest levels of bycatch—a dirty pays clean approach. Continued heterogeneity of bycatch rates suggests there could be significant benefits from trading.

SSC Discussion

The ensuing SSC discussion focused on attempting to address the following questions:
1) How to craft biomass-based caps?
2) What are innovative ideas for salmon savings systems and how to craft them to be more responsive to changing conditions?
3) What are appropriate milestones and standards for effective bycatch reduction?

Given the recent bycatch rates and presentations at the workshop, it is clear that the current state of knowledge is in flux so the Council should anticipate that additional changes may be required as research projects are completed.

How should we craft biomass based caps?

The SSC notes that developing a basis to establish biomass-based caps will be difficult and perhaps years away. Improved escapement enumeration and identification of salmon to stock of origin are required. Progress is being made in these areas.

To establish an abundance index, time trends of average run size from regions that correspond to the origins of salmon in the bycatch would be needed. This would allow analysts to assess whether increases in the encounter rate of salmon in the pollock fishery are a function of population trends. If an index of this type could be developed, then bycatch caps could include adjustments for the status of salmon runs likely to be contributing to bycatch.

In addition to run size indicators by stock, it may be possible to utilize the BASIS survey to infer future returns of Alaskan origin salmon in the EBS. If the survey is used in this manner, NMFS should attempt to standardize the start date and station grid used for the BASIS survey to reduce the potential for missing out-migrations of salmon in some years. Such projections would need to adjust for natural mortality rate and migration. NMFS should also review the station spacing to assess whether the station allocation is appropriate for a comparative analysis of distribution and abundance of chum and Chinook salmon.

Genetic analyses indicate that salmon from a broad geographic range of stocks contribute to salmon bycatch in pollock fisheries. Future cap calculations should reflect the likelihood that the origin of salmon captured as bycatch varies with season and location over the EBS shelf and slope. The SSC commends the collaboration of state, federal and academic geneticists and encourages these scientists to continue to work together to develop SNPs and microsatellite markers to assess home stream origin of salmon captured as bycatch. It is also recommended that geneticists work together with the industry on a sampling plan that will provide a reasonable representation of the annual bycatch. Given the apparent dependence of home stream origin on age, and the potential for shifts in the spatial distribution of pollock fishing, this study should include multiple years of sampling. The investigators should also determine the desired sample size necessary to assess home stream origin of schools encountered by commercial groundfish fisheries.

The SSC recommends devoting research to oceanographic factors influencing the spatial and temporal distribution and concentration of salmon. This includes an investigation of prey distributions relative to spatial distribution of salmon over the EBS shelf.

Other research should be devoted to examining vessels with a history of low bycatch rates. Factors such as gear configuration, deployment procedures or other fishing methods might be important determinants of salmon bycatch rates. If such factors can be associated with "clean" fishing then those might be more broadly applied to the fleet.

Dr. Ianelli recommended that a robust cap linked to an index of the catch rate in the pollock fishery could be considered. The SSC also considered the possibility of using in-season bycatch rates to establish in-season caps. Several problems with this approach were noted including: the lack of evidence that bycatch rates are an indicator of abundance and the possibility that the bycatch rate could be intentionally influenced to inflate the cap. The SSC noted that bycatch rates may vary with changes in abundance or density or both.

Given the current state of knowledge and potential difficulties in achieving research results in the near-term, the SSC discussed the possibility of setting an interim precautionary – arbitrary cap.

The SSC concluded that setting an arbitrary cap was not a scientific issue but something that the Council would need to negotiate among the interested parties.

Innovative ideas for a salmon savings area

The SSC noted that the existing rolling hotspot approach is a logical way to attempt to control bycatch at the current time. A problem with the current situation is that the base rate continues to change. **Incentives should be considered to get fishers to move back into closed areas after they are reopened to collect post-closure bycatch rates in those areas.** It was noted that both bycatch rate of salmon and catch rate of pollock decrease at night but the drop in salmon bycatch is greater than the drop in pollock catch. However, it is not clear that a shift to night-time fishing is practical.

Historical salmon spatial bycatch patterns should be analyzed to determine if there are coherent shifts that might allow for periodic adjustment of closure areas. The Council may wish to consider techniques, including whether shifts in the A and B fishing season apportionments can yield additional salmon savings.

Individual vessel accountability programs

The SSC briefly discussed individual bycatch quotas. One idea put forward, given the lack of data, would be to put the fleet in competition to reduce salmon bycatch by posting a bond that would be distributed back to a portion of the fleet with the lowest bycatch rates of the end of the season (and perhaps affected Alaska communities). Any individual vessel accountability strategy would put a focus on getting good counts of salmon in the catch, which might put additional pressure on observers. Any vessel accountability program would also require a mechanism to limit catch and the identification of a target cap.

SSC Comments on Workshop

The SSC appreciates the efforts of the Council staff to organize the workshop, and extends thanks to all the presenters for providing us with the most up to date information on their research efforts. It is clear that the combined efforts of the several research programs are leading us towards a much better understanding of the origins of salmon taken as bycatch and their distribution in the Bering Sea. The information on the stock origin by age was informative, and the SSC recommends that the data collected from the EBS shelf be re-evaluated to assess the potential impact of age on the composition of home stream origin.