

North Pacific Fishery Management Council

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Date *5/20/99*

MINUTES

Scientific and Statistical Committee

April 19-21, 1999

The Scientific and Statistical Committee of the North Pacific Fishery Management Council met April 19-21 1999 at the Anchorage Hilton Hotel in Anchorage, AK. All members were present except Doug Larson, Al Tyler:

Richard Marasco, Chair
Doug Eggers
Seth Macinko
Steve Klosiewski

Jack Tagart, Vice-Chair
Steve Hare
Terry Quinn
Sue Hills

Keith Criddle
Dan Kimura (Alt.)
Harold Weeks

C-1 HALIBUT CHARTER LOGBOOKS

Jane DiCosimo (NPFMC), Rob Bentz (ADF&G) and Al Howe (ADF&G) presented the staff report on the use of charterboat logbooks for estimating guided recreational catch. The SSC supports postponement of initial review and action by the Council (to December 1999-February 2000 from October-December 1999) on this item as recommended by staff. It was indicated that the revised schedule would not impede the ability of NMFS to implement the necessary regulations for 2001. Postponing action would make it possible to compare 1998 logbook and SWHS results (available in September). Since the logbook program is new, the comparison would be of value.

C-2 STELLER SEA LIONS

Due to some problem with the NMFS mailing, many SSC members did not receive the EA/RIR document until Monday morning. Therefore, SSC review of this document was decidedly limited. Tim Ragen, Lowell Fritz, and Kent Lind (NMFS) provided an in-depth overview of the document, and public testimony was given by Glenn Merrill (Aleutian East Borough), Ken Stump (Greenpeace), Chris Blackburn (Alaska Groundfish Data Bank), Donna Parker (Arctic Storm), and Ed Richardson (At-Sea Processors).

The SSC found that the analysts were generally responsive to SSC comments from February (see our comments below) in developing the document. The SSC was impressed by the wealth of information about the 1999 A season, a fishery that has only been over about a month. The SSC commends the Observer Program and the analysts for their diligent efforts in this regard. In addition, the document contains useful information about historical spatial and seasonal distributions from both the fishery and from surveys, as well as other pertinent information about Steller sea lions and pollock.

The SSC believes that the following changes should be made to the document.

1. **Overall Tenor.** The overall tenor of the document presupposes that regulation of the pollock fishery through spatial and temporal dispersal will improve the condition of the Steller sea lion population, and parenthetically, the Bering Sea and Gulf of Alaska ecosystems. This point of view further assumes that the fishery impacts Steller sea lions through local depletion of food sources or some other mechanism. As noted in the past, the SSC found no compelling scientific information to support either of these two assumptions. The SSC acknowledges that actions are being taken in the spirit of precautionary management and the overriding context of the Endangered Species Act. It should be stated in the Executive Summary and the Introduction of the document that the “principles” that underlie what NMFS considers as “reasonable and prudent” measures are, in reality, management directives whose efficacy is either unknown or untestable.

In addition, the SSC recommends that some statements in the document, which are stated as facts, be relaxed to convey the uncertainty of the state of knowledge. The SSC requests that the analysts review the entire document in order to remove instances of subjectivity. A few examples of this subjective point-of-view are:

(a) p. 9. “However, this single-species approach and these stock-wide measures may not be consistent with ecosystem management and may have serious ecosystem effects.” The SSC notes that the opposite is also true and so questions why the negative inference is made.

(b) p.11. “Further dispersal of fishing effort and catch is necessary to prevent detrimental ecosystem effects and, specifically, to prevent detrimental effects on Steller sea lions.” The SSC notes that there is no evidence to support this statement; the word “is” should be changed to “may be”.

(c) p.35. “This midpoint estimate... suggests that the harvest rate is excessive in the winter period.” The SSC notes that the word “excessive” is subjective and the information used to come to this conclusion is highly uncertain. A possible rewording would be “ This midpoint estimate... suggests that the catch proportion from the CH/CVOA in winter may be higher than that indicated by relative biomass distributions.

2. **Range of alternatives.** The SSC notes the range of alternatives considered is governed primarily by the Biological Opinion. The analysts have clearly indicated which alternatives NMFS believes are consistent with RPA principles. The SSC suggests that meeting with interested parties might be of assistance in fine tuning the alternatives to meet ESA requirements at minimum cost. With respect to B/C seasonal apportionment, the SSC believes that analysts have overlooked an important data set (fishery catch per unit effort) which may provide additional insight. Accordingly, the SSC recommends additional analyses, as described below.

Spatial dispersal in B/C seasons. The EA/RIR provides a much-improved analysis of the seasonal and temporal pollock distribution on the EBS shelf. This analysis was largely based on the summer EBS shelf bottom trawl, summer EBS shelf hydroacoustic survey and limited winter hydroacoustic surveys of the EBS shelf. Comparison of the summer and winter surveys clearly demonstrates that pollock undergo significant seasonal feeding and spawning migrations, with the pollock more concentrated in the CH/CVOA during the winter period. The authors develop a conceptual model of the seasonal increase in the proportion of the stock occurring in the CH/CVOA. Here the summertime portion (15% based on the 1991-1998 average stock biomass proportion in the CH/CVOA) was increased through the season based on 3 scenarios of migration (late summer, linear, and winter

migration) and three scenarios of spawning concentrations (25%, 40%, and 63%) in the CH/CVOA. The SSC notes that the estimates of spawning concentrations in the CH/CVOA based on winter hydroacoustic survey were very sensitive to assumptions of maturity and selectivity for the winter hydroacoustic surveys.

Because the SSC does not believe the distribution of biomass based on the migration conceptual model reflects the B and C seasonal biomass distributions, we suggest that additional alternatives might in fact be consistent with the RPA principle of distributing catch in proportion to biomass.

The seasonal and the spatial distributions of catch and effort of the pollock fishery may provide useful information on temporal distribution of pollock on the EBS shelf. The foreign fishery consistently operated over large areas of the EBS shelf (including large areas of the CH/CVOA, and areas outside the CH/CVOA) during the June - December period for the years 1982 – 1985. Although the fishery was restricted from certain areas of the CH/CVOA these restrictions were consistent over the period. The SSC notes also that stock assessment surveys were conducted during this period and were concurrent with foreign fishery operations, and that summertime spatial distribution of pollock based on the assessment surveys during the period of the foreign fishery operations was consistent with those in recent years. Seasonal estimates of relative distribution of pollock in the EBS, for years of the foreign fishery operations can be estimated as follows: (1) Determine the area in the EBS where the operations of foreign fishery consistently occurred during June – December period and 1982-1985. (2) Stratify the foreign fishing area into CH/CVOA and outside CVOA subareas. (3) Develop estimates of distribution of pollock within the foreign fishery subareas based on summertime surveys. (4) Develop seasonal estimates of distribution within the foreign fishery subareas from foreign fishery CPUE data. Note that the first time period should conform with the time of the summer assessment surveys. (5) Use seasonal trends in the foreign fishery data to scale the summer survey distributions.

The SSC recommends that these estimates of seasonal changes in pollock distribution based on the foreign fishery performance be used along with other available information to evaluate consistency of proposed alternatives of spatial apportionment of B and C season quotas with the RPA.

3. The EA/RIR addresses the SSC request from February for a discussion of critical habitat and its designation. Critical habitat is defined in law as those areas essential to the conservation of the species and which may require special consideration or protection. Critical habitat for Steller sea lions was established in 1993 by NMFS based on recommendations of the SSL Recovery Team. Designation of aquatic critical habitat areas was based on foraging studies, at-sea observations, and observed locations of incidental take in fisheries. The SSC continues to believe that there is a need for an examination of critical habitat designations.
4. **The 170° line.** The proposed spatial distribution of catch East and West of 170° needs further elaboration and clarification. Does NMFS believe this division is necessary or not? Could such a division have negative impacts due to a greater presence of small fish West of 170°? Discussion of the advantages and disadvantages of this division should be enhanced.
5. **AI Closures.** Further discussion of the biological effects of the options should be included. For example, how do the options affect different stocks of walleye pollock in the area? Could the closures in Option 2 have negative effects due to concentrating the fishery in small areas where local depletion is more likely to occur?

6. **Economic and Management Effects.** The draft RIR/IRFA provides a limited discussion of the potential social and economic impacts of the proposed measures. These impacts are difficult to predict because of the wide variety of measures under consideration and because of changes associated with AFA and other recent management actions. While the analysis was able to provide an estimate of the magnitude of foregone revenues associated with a closure of the Aleutian Islands, no attempt was made to estimate the change in net national benefits attributable to the proposed actions, because cost data are lacking. Analysis of regional economic impacts and community impacts was also considered to be intractable.

The chapter on economic impacts uses predictions from industry, for example, CPUE declines and fish size reductions, which were not borne out by the limited experience of the 1999 fisheries under the emergency measures adopted by the Council. While the 1999 season is only a single data point, the chapter should be revised to balance industry predictions against actual experience.

The discussion of trip limits in GOA fisheries needs to be expanded to acknowledge their well known shortcomings. Trip limits as a tool of effort control are classically ineffective, routinely providing only short-term relief and requiring frequent revision. Beside deliberately encouraging discards, they confound time series from the fishery by capping fishery catch per unit effort. Under a trip limit management regime, accurate effort and catch monitoring requires 100% observer coverage.

7. **Table 3-4 clarification:** Further explanation should be given on how this table was constructed. The equation and data sources should be provided, and further information about likely values for catchability and proportion mature would be helpful. The analysts should consider a complete Bayesian analysis (with appropriate priors) to quantify their beliefs.

Adaptive management. The SSC reiterates its support for this management approach. Learning about the reasons for the Steller sea lion decline and the efficacy of management measures to mitigate this decline are of paramount concern. The document explains that such an adaptive approach cannot be considered in the short term, but that AFSC has developed a research plan to test the efficacy of no-trawl zones. The SSC received this plan and strongly endorses the studies contained therein. The SSC urges the Council to support these studies and to encourage NMFS and Congress to provide funding so that these studies can be carried out.

Research. Tim Ragen (NMFS-AKR) presented an outline of long term efforts to coordinate research and management activities which will provide a context for revisions to the Steller sea lion recovery plan. The revised plan is expected in the fall of 1999. The SSC acknowledges the significance of a long-term perspective on these activities. The estimated cost of the activities discussed is in the range of \$10-14 million annually, but there is no identified source for these funds. The SSC encourages ongoing efforts by NMFS to improve communications, so that inter-disciplinary and multi-institutional research efforts may emerge. Consistent with our prior statements, the SSC strongly urges that revisions to the recovery plan and future research and management efforts include a re-evaluation of critical habitat designations.

C-3 AFA SIDEBOARDS

The SSC received a presentation from Chris Oliver and Darrell Brannan (NPFMC), John Sproul (NMFS), and Scott Matulich (WSU). Public testimony was received from Joe Plesha (Trident Seafoods).

While the document presented by staff is generally complete and provides the Council with abundant descriptive statistics regarding the sideboard options being contemplated by the Council, several issues should

be addressed before the EA/RIR/IRFA is released for public review. Chapter 10 is largely unrelated to the rest of the document and is addressed separately below. The remainder of the document suffers from two omissions that should be addressed.

First, Chapter 11 does not provide a thorough summary of RIR/IRFA findings regarding the costs and the benefits associated with the various options examined. The SSC notes that whereas in the past the IRFA has received relatively little attention, the present analysis appears to devote undue attention to the IRFA and insufficient attention to the broader social and economic impacts of the proposed actions. The underlying assumption that there will be little to no impacts associated with measures designed to preserve the “status quo” is questionable. Even if in the aggregate net impacts are judged to be zero, there will clearly be distributional aspects that should be identified and brought to the Council’s attention. The discussion of costs should also include costs of implementation.

Second, the document currently employs a haul-by-haul determination of “target” fishery. The SSC requests that this be replaced or augmented by a weekly determination of target fishery as this is consistent with existing practices that may influence industry behavior. Use of the haul-by-haul target determination generates a bias in the estimate of bycatch rates by target fishery and is likely to become an issue in setting PSC caps for AFA vessels.

Finally, the SSC highlights notes that the uncertainty associate with both the level and species composition of discards by CV it will be difficult to determine appropriate caps.

Comments Specific to Chapter 10

Chapter 10 does not relate to the remainder of the document which deals with sideboard options that were identified for analysis by the Council. Nor does Chapter 10 capture the full scope of the discussion paper requested by the Council at their February 1999 meeting. Chapter 10 most closely resembles a truncated analysis of a specific portion of the AFA itself. The SSC recommends that Chapter 10 be excised from the EA/RIR/IRFA.

As an analysis, Chapter 10 is inadequate and unsound. Some examples of the shortcomings of the analysis in Chapter 10 are:

1. The conclusions reached are speculative and unsupported by analysis (e.g., “independent catcher vessels could be expected to be worse off under the AFA cooperative structure than compared with their experience under the open-access fishery of recent years”(p.257)).
2. The analytical perspective is inexplicably restricted to that provided by the RFA. It is inappropriate to analyze any program/proposal/measure/option solely from the perspective of the RFA. The recent elevation of attention to the RFA does not diminish the necessity of considering potential benefits and costs from a broad perspective and in terms of all potentially affected parties. The SSC notes that an excerpt from a well-rounded, balanced, analysis could satisfy the RFA’s compulsory focus on small entities, but, by definition, an analysis focused solely on the RFA is neither thorough nor balanced.
3. Chapter 10 features incautious and inconsistent arguments. For example, the text notes (p. 247) that “insufficient data exists to substantiate any quantitative discussion on the impact AFA fishery cooperatives would have on small non-profit organizations that may be present in these neighboring communities” but then concludes that “for these reasons, fishery cooperatives are not expected to create a negative economic impact. . .”

4. The “data” presented in Chapter 10 have not been ground-truthed with the companies involved or verified with available confidential data. In the specific context of the RFA, the identification of “small” entities should not be done by assumption as occurs in the current Chapter 10 (e.g., “Given their expected annual gross revenues less than \$3 million, most persons operating in the fishery impacted by the proposed action are small entities. For many of the catcher vessels operating in the inshore component of the directed pollock fishery, it may be assumed that these entities are independently owned and operated.”).
5. There is no reference to the literature on pollock price formation (e.g., Herrmann et. al), market structure (Matulich et. al), or related markets such as whiting (Sylvia et. al). Similarly, there is no reference to the abundant literature on cooperative structures in agriculture and other resource industries. Future analyses/discussions should reflect an awareness of these literatures.
6. The analysis employs unrealistic assumptions about the price formation/negotiation processes. These processes are more likely to resemble bilateral monopoly.

C-6 SEABIRD AVOIDANCE

Jane DiCosimo (NPFMC) and Kim Rivera (NMFS-AKR) presented the staff report. Thorn Smith gave public testimony.

The SSC appreciates that the analysts have attempted to address our comments from February 1999 meeting; in some cases successfully and in other cases not.

The Council should note that seabird bycatch reduction measures were implemented early in 1997 and we do not yet have an evaluation of the efficacy of these measures. Consequently, we do not have a basis to estimate potential further reductions. Further, data are not yet available to decide which of the proposed seabird avoidance measures provide the most reductions in bycatch.

The SSC also reviewed a briefing from Ed Melvin (UW Sea Grant) on two experimental fishing permit applications to test seabird bycatch avoidance measures. The SSC endorses the issuance of EFPs for this important research. However, we note that a consequence of funding limitations will be a small expected take in the control segment of the IFQ portion of the study. As a result, it will be difficult to establish statistical significance of any reduction due to bycatch avoidance measures in this portion of the study unless the reduction in bycatch is large. There may be a potential to combine the control portions of the IFQ and P. cod studies to allow a more robust statistical analysis.

D-1(c) PROHIBIT NON-PELAGIC TRAWL GEAR IN COOK INLET

Bill Bechtol of ADF&G presented the EA/RIR/IRFA for a proposed amendment to ban non-pelagic trawl gear in Cook Inlet. No public testimony was received.

Historically, there has been very little non-pelagic trawl activity in Cook Inlet. The intent of the action proposed here is to minimize impacts on the brood stocks of Cook Inlet king and Tanner crab stocks. There has been no commercial harvest of king crab from Cook Inlet since 1984 and no commercial harvest of Tanner crab since 1994.

The SSC finds that the document is generally well structured and recommends it be released for public comment conditioned upon addition and expansion of the following discussion points:

1. There is no discussion of economic opportunities foregone due to closure of the area to non-pelagic trawling.
2. A listing of the groundfish composition in the region should be included as well as any survey data from the region.
3. The ADF&G has already closed state waters in Cook Inlet to non-pelagic trawling. A description of the proportion of total crab habitat and/or biomass that remains vulnerable to impact from bottom trawling would be helpful, i.e., identification of the fraction of the crab resource found in federal waters.
4. A figure showing trawl survey locations used to compute the trawl survey index should be added.
5. The decline in both the king and Tanner crab stocks has occurred at the same time as declines in many of the other crustacean stocks in the Gulf of Alaska. The document should discuss these declines in a broader ecosystem context.
6. A ban on trawling around Kodiak Island was instituted following collapse of those king crab stocks in the early 1980's. To date, those stocks have not recovered. It is likely that rebuilding of these stocks may await improved environmental conditions. The proposed activity is a pro-active measure whose intent is to preserve brood stock such that the populations are able to take advantage of a crab-favorable change in the environment.

D-1(e) SHARK MANAGEMENT

The SSC received a report on the Draft EA/RIR/IRFA for Amendment 63/63 to the Fishery Management Plans for the Groundfish Fisheries of the Bering Sea/Aleutian Islands and Gulf of Alaska from Jane DiCosimo (NPFMC) and Linda Brannian (ADF&G). We recommend that the document be released for public review after the following issues are addressed:

1. Reconsider the inclusion of common thresher sharks in the amendment given that its distribution is from British Columbia south to central Baja, California, Mexico.
2. Alternative 2 proposes to remove sharks and skates from the "other species" category and enact appropriate federal management measures

It is suggested that the forage fish species model is one way of managing these resources. The SSC suggests that a discussion of the implications of using the ABC/TAC approach be included in the document.

3. During the SSC's discussion of this amendment, it was suggested that the Plan Team review the "other species" category generally to determine if adequate protection is provided for individual species to ensure their conservation.

D-1(h) GROUND FISH FORUM 1999 EXPERIMENTAL FISHING PERMIT

John Gauvin (Groundfish Forum) and Sarah Gaichas (Alaska Fishery Science Center) presented an Experimental Fishing Permit (EFP) application to test and improve species composition and size sampling methods for trawl fisheries.

The EFP application is focused on verifying adequacy of the Observer Program basket sampling method for species composition. A second portion of the EFP will look at the problem of sampling length frequency in the trawl haul. Both portions of the EFP will utilize stratified sampling to examine heterogeneity in the trawl hauls.

Species Composition Sampling

The species composition portion of this EFP will sample multispecies hauls targeted to the flathead sole fishery using:

1. Observer basket sampling (30 hauls).
2. Mechanical systematic sampling (30 hauls).

Both sampling methods will aim at 6 stratified samples of 100 kg each, evenly spaced throughout the haul. Observer samples will be taken using standard observer sampling method. The mechanical sample will be automatically drawn from the fish line.

A critical part of this study is an attempt to perform a "whole haul census" to the extent practicable. The "whole haul census" will use total haul weight from flow scales, weight by species using vessel specific product recovery rates, PSC discards, and major species discards. Some major discards may be determined by subtraction from total haul weight. In reality, the "whole haul census" is a substitute estimate of species composition, subject to error, which will be treated as the true estimate of catch by species.

The importance of the "whole haul census" is that this allows comparison of Observer Sampling and mechanical sampling results with values that are believed to be as accurate as possible. If the EFP is successfully executed, it will be possible to address some interesting questions concerning species composition samples:

1. What is the possible bias of the Observer sample?
2. Are mechanically selected samples less biased than current Observer sample methods?
3. How feasible is it to get accurate species compositions for a single haul?
4. What is the optimum level of Observer sampling for species composition?
5. In the longer-run, does Observer sampling method provide accurate estimates of species composition?

It should be noted that even if the "whole haul census" proves to be impossible, useful information will be gathered on the heterogeneity of species composition in the haul

Length Frequency Sampling

The length frequency portion of the EFP will sample hauls targeted on Greenland turbot. This is a limited study of only 10 hauls, with at least two species sampled systematically at six locations, with 20 fish randomly selected at each location. Although this portion of the EFP could provide useful information concerning size stratification of fish in hauls, it is also meant to provide economic incentive for vessels to bid on this EFP.

Because of the possibility of extremely useful information coming from the species composition portion of this EFP, the SSC recommends its approval. The attempt at a "whole haul census" will be difficult and labor intensive, so the allowance of Greenland turbot targeting to provide economic incentive appears reasonable.

D-2 (b) CRAB MANAGEMENT: BAIRDI REBUILDING PROGRAM

Dave Witherell presented the EA/RIR/IRFA describing a rebuilding plan for the Bering Sea Tanner crab stock. Drs. Gordon Kruse and Jie Zheng, ADF&G, provided a detailed technical report on the status of stocks and revised methodologies for harvest management. Public testimony was given by John Gauvin and Arni Thompson.

The Bering Sea Tanner crab stock is currently regarded as overfished. The BSAI King and Tanner crab FMP defines Tanner crab overfishing as an instantaneous fishing mortality rate in excess of 0.3, or a minimum stock size threshold (MSST) is 94.8 million pounds. The estimated 1997 mature spawning stock biomass (MSSB) was 64.2 million pounds, and the 1998 MSSB estimate is 36.9 million pounds. The 1998 estimate represents 2.2 million legal male crabs and 6.5 million large female crab and is the lowest estimated abundance on record.

To facilitate rebuilding of the depressed Tanner crab stock, the EA evaluates multiple alternative management actions: 1) endorsement of the new harvest strategy recently adopted by the Alaska Board of Fisheries (BOF), 2) request the BOF adopt concurrent *C. bairdi* and *C. opilio* fishing seasons to minimize *C. bairdi* discard, 3) lower bycatch discard mortality caps and 4) provide additional protection to *C. bairdi* Essential Fish Habitat.

Recently, the Alaska Board of Fisheries adopted a revised stepwise harvest strategy replacing the fixed 40% exploitation rate for legal sized (>109 mm carapace width) male crab. The staircase policy lowers the exploitation rate as dependent upon the mature female biomass.

Having recognized a stock as overfished, the Council is obligated to rebuild the stock to MSY within an appropriate time interval. The MSY for Tanner crab is twice the MSST or 185.6 million pounds. The Council must specify the time interval for rebuilding the overfished stock. The minimum rebuilding time is the length of time it takes to rebuild to MSY under a zero harvest strategy. If this time interval exceeds 10 years, the rebuilding interval may be extended to 10 years plus a generation time. The estimated generation time for Tanner crab is 10 years, therefore the maximum rebuilding interval is 20 years.

The EA provides a thorough review of stock abundance, fishery catch history and bycatch, and an excellent review of the National Standards and guidelines related to overfishing and stock rebuilding. The EA attempts to estimate the rate of recovery to MSST based on predictions of future recruitment mitigated by stock size and environmental conditions. However, the SSC believes the qualitative assessment of the likelihood of rebuilding falls short of inputs needed to allow the Council to stipulate a rebuilding plan. Rebuilding to MSST does not meet the obligation to rebuild the stock to MSY biomass levels. There is no quantitative estimate of the probability that the stock will be rebuilt in the allotted time given an explicit set of proposed management actions.

The SSC recommends that the EA be revised to provide an estimate of the probability of rebuilding to MSY biomass levels within the allotted time interval under an explicit set of assumptions. These assumptions should be provided by the stock assessment scientists, and argued or reasonably defended to support the rebuilding plan. The projected rebuilding plan must demonstrate that rebuilding is achievable following one or more of the proposed alternative management actions. If rebuilding is not achievable under the proposed alternatives, additional recommendations to accomplish rebuilding should be provided. The SSC would like to review the revisions to the rebuilding plan before it goes out for public review.

HALIBUT DISCARD MORTALITY RATES (DMR)

Dr. Robert J. Trumble of the International Pacific Halibut Commission (IPHC) presented results from tagging experiments which were planned to improve estimates of longline discard mortality rates (DMR). A trawl tagging experiment designed to test between the IPHC and University of Washington (UW) methods of estimating trawl DMR was also described. The IPHC uses two sets of DMR's, one for longlines and one for trawls.

Longline DMR

Condition factors, determined by Observers, are used in conjunction with specific mortality rates to estimate total DMR for the longline fishery. Condition categories are "excellent", "poor", and "dead", with mortality rates of 3.5%, 51.3%, and 100%, respectively. These condition categories are problematic because experiments have shown that significant numbers of "dead" halibut actually survive.

The IPHC recommends changing from 3 condition categories to 4 injury categories. Injury categories can be more objectively determined, and the "dead" category was dropped.

New tagging results from halibut caught with "cod-sablefish" 13/0 circle hooks showed lower DMR's than halibut caught with larger 16/0 circle hooks. The recommended injury categories with corresponding survival rates are: minor (96.5%), moderate (63.7%), severe (33.8%), and fleas/bleeding (0%). These survival rates are average survivals for large and small circle hooks. The reason for averaging is the confounding of various hook size and hydraulics in the different longline fisheries.

Trawl DMR

There are two competing methods for estimating DMR for trawl caught halibut: the IPHC model and the UW model developed by Dr. Ellen Pikitch. The IPHC model for trawl caught halibut used the 3 condition categories and mortality rates previously described for longline caught halibut. The UW model estimates probability of survival for each fish using "time out of water", "legal size indicator", "tow duration", "air temperature" and, "sand indicator". A tagging experiment conducted in 1995 to compare the IPHC and UW method of estimating DMR's failed due to insufficient numbers of tag returns. Therefore, no definite answer can be made to this question. IPHC recommends keeping the old method since there is no clear reason for making a change. However, IPHC recommends improving the conditioning key, by changing to dichotomous categories for a series of objective questions.

The SSC recommends accepting the new IPHC method for estimating longline DMR's. The new method based on severity of injuries is more objective, gets rid of the "dead" category, and uses new information from tagging fish with small hooks. However, in moving to the new system, the SSC recommends collecting data using both the old and new method so any dramatic changes in DMR's can be reconciled.

The SSC also recommends staying with the IPHC method of estimating trawl DMR's. The reason for this is that no definitive information is available as to which model is better, the current model is more easily transferable to different fisheries, higher DMR's are more conservative, and it is uncertain whether the information required by the UW model can be rigorously collected by observers. Nevertheless, the SSC urges further consideration of the UW model, because the additional variables in that model could perhaps be useful in addition to or in place of the condition codes in the IPHC model. In addition, the IPHC models need to evolve to use injury codes rather than condition codes, as has been done in the longline fisheries.