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**Proceedings of the PSARC Pelagic
Subcommittee Meeting**

**September 3, 2008
Nanaimo, BC**

Linnea Flostrand

**Compte rendu de la réunion du
sous-comité du CEESP sur les
poissons pélagiques**

**Le 3 septembre 2008
Nanaimo, C.-B.**

Linnea Flostrand

Fisheries & Oceans Canada/Pêches et Océans Canada
3190, route Hammond Bay Road
Nanaimo, BC/C.-B.
V9T 6N7

March 2009

Mars 2009

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings include research recommendations, uncertainties, and the rationale for decisions made by the meeting. Proceedings also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. En outre, il fait état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenus dans le présent rapport puissent être inexacts ou propres à induire en erreur, ils sont quand même reproduits aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considéré en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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SUMMARY

The Pacific Scientific Advice Review Committee (PSARC) Pelagics Subcommittee met September 3, 2008 at the Coast Bastion Inn, at Nanaimo, B.C. Twenty-one Subcommittee participants met, consisting of representatives from DFO, industry, one First Nation group and one NGO. DFO recently advanced a fishery decision-making framework incorporating the precautionary approach that is intended to assure resource sustainability and meet the requirements of various eco-certification programs. The framework requires the application of reference points, harvest rules and compliance with the precautionary approach. In response to this framework, the PSARC Pelagics Subcommittee reviewed a working paper that describes a revised Pacific herring assessment model pertinent to providing advice on harvest levels. Subsequent to the meeting, two CSAS documents are expected to be published, one describing attributes of a revised stock assessment model and one describing current stock assessment results and forecasts.

SOMMAIRE

Le sous-comité du Comité d'examen des évaluations scientifiques du Pacifique (CEESP) sur les poissons pélagiques s'est réuni, le 3 septembre 2008, au Coast Bastion Inn, à Nanaimo, en C.-B. Vingt-et-un membres du sous-comité ont participé à cette réunion, parmi lesquels figuraient des représentants du MPO, de l'industrie, d'un groupe des Premières nations et d'une ONG. Dernièrement, le MPO a présenté un cadre décisionnel pour la pêche fondé sur l'approche de précaution dont le but est d'assurer la durabilité de la ressource et de respecter les exigences des divers programmes d'écocertification. Le cadre prévoit la mise en œuvre de points de référence et de règles sur la pêche ainsi que l'application de l'approche de précaution. En réponse à ce cadre, le sous-comité du CEEESP sur les poissons pélagiques du CEEESP a passé en revue un document de travail qui décrit un modèle révisé d'évaluation des stocks de hareng du Pacifique que l'on a jugé pertinent pour formuler des avis sur les niveaux de prélèvement. À la suite de la réunion, deux documents du SCCS devraient être publiés, l'un décrivant les attributs d'un modèle d'évaluation du stock révisé et l'autre, les prévisions et les résultats actuels en matière d'évaluation des stocks.

INTRODUCTION

The PSARC Pelagics Subcommittee met September 3, 2008 at the Coast Bastion Inn, in Nanaimo, British Columbia. External participants from industry, First Nations and conservation groups attended the meeting. The Subcommittee Chair, L. Flostrand opened the meeting by welcoming the participants, reviewed the agenda and referred to the terms of reference. During the introductory remarks the objectives of the meeting were reviewed, and the Subcommittee accepted the meeting agenda.

The Subcommittee reviewed two Working Papers, summary of the review process is in Appendix 1. The meeting agenda appears as Appendix 2. A list of meeting participants and reviewers is included as Appendix 3.

DETAILED COMMENTS FROM THE REVIEWS

Working Paper P2008-01: Modeling herring population dynamics: Herring catch-at-age model version 2 - *L. Bang Christensen, V. Haist and J. Schweigert*

Subcommittee Discussion

The working paper presented the second version of the herring catch-at-age model (HCAMv2) that addressed some of the modeling concerns with the HCAM (version 1). Vivian Haist presented the model and illustrated the differences relative to HCAM. She emphasized that the new version of the model includes: fixed availability/ maturity; time invariant estimates of fishery selectivity; revised priors for natural mortality; fishing mortality parameters were estimated (not solved analytically), and the model initialization year was 1946 (not 1951). The authors concluded that HCAMv2 was a preferred model to HCAM because it offered: greater numerical stability and no indication of local minima; reduced retrospective bias; natural mortality rates that were more biologically plausible and a maturity ogive that was fixed at rates consistent with other biological information. She presented plots that showed revised comparisons of the retrospective recruitment forecasts for three comparative estimators (figures in the working paper were incorrect). Jake Schweigert presented comparative plots for HCAM and HCAMv2 output (estimates of age 3 recruitment, instantaneous annual natural mortality, and instantaneous annual fishing mortality, and estimates of the proportion of age 3 fish). These comparisons were requested by the reviewer and the Subcommittee and will be included in the revised document.

The reviewer outlined points requiring clarification, statements requiring validation, and provided suggestions for more clearly describing the structure of the model, but overall found no major difficulties with the new modeling approach. The Subcommittee accepted the paper with revisions as noted by the reviewer and Subcommittee but it was noted that the authors adopted the new version of the model without providing an alternative. Both the reviewer and some members of the Subcommittee found the paper difficult to understand and suggested that its presentation needed to be improved to explain model structure, assumptions and results. It was also suggested that more background on availability/maturity, catchability and selectivity would be helpful so that readers would not have to refer to past documents for clarification. Descriptions of the analyses with the fishing penalty multiplier and predation mortality were unclear and other editorial comments related to poorly labeled plots and unsubstantiated hanging statements.

There was extensive discussion on whether the revised model generated forecasts of 2+ recruits more accurately than the currently applied poor/ average/ good procedure. Although there was no consensus to incorporate new recruitment forecasting methods into this year's stock assessment, the Subcommittee was in agreement that results of different recruitment forecasting methods should be systematically evaluated and compared so that such results can be considered at a future meeting. It was suggested that future work should compare recruitment forecast trends between HCAMv2 output and recruitment classes, offshore LaPerouse survey, and perhaps the juvenile herring surveys. One member pointed out that one approach would be to use a simulation-estimation framework.

The Subcommittee discussed the problem of model stability with HCAM and whether HCAMv2 actually had better numerical stability. HCAM generated local minima solutions for the SOG in 2008 but this effect is not apparent with HCAMv2. It was noted that local minima influences could still be occurring and it was suggested that further validation be done to check for this. The authors reported that fairly extensive but unreported trials were conducted but agreed to look into this further and include in the revised document.

There was some debate over how the authors did the retrospective analysis. It was suggested that the results of HCAMv2 should be directly compared to the observed biomass (spawn and catch data) in the preceding year rather than a roll up of estimates up to the current year. The authors indicated that they did compare the HCAMv2 results to the catch and spawn index and found that they closely matched.

The retrospective bias of HCAMv2 was discussed. It was noted that the Central Coast reconstruction had negative retrospective bias for 1999-2000 and positive bias for 2001-2006 (Table 2). The authors indicated that the bias was reduced relative to HCAM. It also was noted that Table 2 numbers did not appear to match the data presented in Figures 27-31. The authors agreed to review and correct the table as required.

Points related to residual patterns were discussed (Figures 6-14). It was unclear as to whether the plots of residuals were raw or standardized. A Subcommittee member asked "if smaller residuals are a function of assumptions or an inherit time function independent of the model assumptions", and an author stated that it was the latter. Autocorrelation was apparent in the residuals and it was asked whether there are any biological implications? The authors acknowledged the autocorrelation and suggested possible causes relate to density dependence or cohort effects that are not accounted for in the model. A Subcommittee member inquired as to why autocorrelations in recruitment residuals are not considered. One of the authors stated that past experience suggests that it may not be possible to simultaneously estimate autocorrelation coefficients and variance parameters (recruitment deviations) but future work could look into this.

Members of the Subcommittee questioned whether an intent of the paper was to change cut-off levels given that new estimates of "Unfished Biomass" (Bo) were applied (Working Paper Table 4). The authors assured the Subcommittee that there was no intention of applying these estimates to revise cut-off levels and that further work should be done to examine the confounding parameters impacting Bo estimates.

It was pointed out that HCAMv2 estimates for the WCVI did not have output that suggested the predicted 4+ age biomass to be larger than the previous season's spawning biomass as did HCAM, suggesting improved performance of the new model

The Subcommittee members agreed that HCAMv2 was an improvement over HCAM, but encouraged further model development in the future.

Subcommittee Conclusions

- Science advice from the current assessment will apply HCAMv2 results that depict stock trends of abundance and characterize recruitment classes of Poor, Average and Good but will not use HCAMv2 estimates of B_0 to adjust the estimates of cut-off levels.
- Science advice will apply the same recruitment forecast rules as in recent years but these methods should be evaluated and compared with other methods.

The Subcommittee accepted the paper subject to revisions which include:

- Clarification and validation in text of the points highlighted by the reviewer and Subcommittee.
- Correction of discrepancies identified, especially Figures 32-36; Table 2 and Figures 27-31, median natural mortality rates also need inspection (p 14).
- Addition of the HCAM and HCAMv2 figures comparing fishing mortality, natural mortality, recruitment, and pre-fishery biomass.
- Clarification of the local minima trials that were performed and why local minima is not a problem with HCAMv2

Subcommittee Recommendations

1. An evaluation of B_0 estimates is required to evaluate risk assessment for possible future modifications of harvest control rules and cut-off levels.
2. An evaluation of recruitment forecasting methods is required for possible future application of the harvest control rules.

Working paper P2008-02: Stock Assessment for British Columbia Herring in 2008 and Forecasts of the Potential Catch in 2009 -*J. Schweigert, L. Bang Christensen and V. Haist*

Subcommittee Discussion

Results from the current Pacific herring stock assessment were generated using a revised version of the HCAM previously developed by Haist and Schweigert (2006). The HCAMv2 was reviewed and adopted for science advice for management decisions in 2008 and documented previously in these PSARC proceedings.

A presentation was made by Jake Schweigert on stock assessment results and trends, which included results from the 2008 fishery and escapement (spawn) surveys. The Subcommittee discussed current population trends and indicators of poor productivity were emphasized. Poor recruitment was realized in all regions in 2008 (WP Figures 21 and 22), where proportions of three year olds (i.e. 2+) ranged from 7 to 24% (all stocks except the WCVI had 10% or less, Working Paper Appendix Table 1). The HCAMv2 estimates of spawn index,

spawning biomass and pre-fishery biomass indicate that abundance of all major stocks declined considerably in 2008 and that spawning biomass estimates for the Central Coast (CC) and West Coast Vancouver Island (WCVI) are at levels not seen since these stocks collapsed in the 1960s. Current time series trends of abundance suggest: (1) the Queen Charlotte Island stock has been below its fishery cut-off since 2001; (2) the CC stock has been below its fishery cut-off since 2005; and (3) the WCVI has been below its fishery cut-off since 2003. Time series results show notable declines in size at age over the past 10 year for all stocks (Working Paper Figure 24) and increases in natural mortality (Working Paper Figure 14).

The 2008 August WCVI offshore trawl survey was described, and recruitment forecasts for WCVI and SOG herring were presented by Ron Tanasichuck. The PSARC approved recruitment forecasting methodology includes predictive regressions that are based on the relationship between the proportion of age 2+ fish trawled in August and the proportion of age 2+ fish estimated by the HCAMv2 for the subsequent pre-fishery or pre-spawning season. The data pair for 2008 for WCVI herring deviated substantially from the apparent trend. Therefore, data from 2008 were excluded from the recruitment forecasting calculations for WCVI herring. The recruitment forecasts for the 2009 pre-fishery/pre-spawning season are “Poor” for WCVI herring and “Good” for SOG herring.

A presentation was given by Doug Hay on observations from the Strait of Georgia (SOG) juvenile herring survey. There was discussion over age class observations from the WCVI summer trawl survey and the SOG fall juvenile herring survey, which both correctly predicted the extremely low recruitment in the SOG in 2008 from a very small 2005 year class. Observations from the juvenile survey also predict that recruitment to SOG in 2010 will likely be weak (the survey’s abundance index of the 2007 year class is similar to that of the 2005 year class). The Subcommittee expressed concern about the recent decline in the SOG stock and cumulative effects of mortality (environmental and fishery dependent). Some Subcommittee members were apprehensive about the result of applying the “Good” recruitment forecast (equivalent to 39 809 tonnes, Working Paper Table 1) but acknowledged the current decision forecasting rules as accepted methods from past PSARC Subcommittee meetings. Concern was expressed that public perception may blame fishing pressures for depressed stocks

The Subcommittee discussed the various recruitment forecasting options in terms of evaluating which method is the most effective. Although participants agreed to continue using previously accepted forecasting methods for the current year, it was suggested that the different approaches should be compared by systematically evaluating performance of: the summer trawl WCVI survey estimates; the SOG juvenile survey indices; and model forecasts of 1+ (2 year old) abundance versus the current recruitment decision rules.

Similar to previous Subcommittee meetings, points pertaining to maximizing sampling strategy (design, intensity and coverage), reducing costs (financial and error bias) and increasing benefits (maximizing data representation) were discussed with an emphasis on evaluating cost-benefit performance of different sampling designs under different population scenarios. It was noted that although recent work examined the effects of varying input data on stock assessment outcomes (Haist and Schweigert 2007¹), rigorous testing of “simulated”

¹ Haist, V., and J. Schweigert. 2007. Investigation of potential impacts of reductions in spawn survey and bio-sampling program effort on herring stock assessments and management advice. DFO Can. Sci. Advis. Res. Doc. 2007/064. 17p.

populations was not done to quantify the impacts of reduced sampling coverage. Some frustration was expressed because this topic keeps coming up but little progress has been made. It was suggested that a working group be assigned to focus on this task. It was recognized that this would be a large and time consuming project for which no additional resources are available. It was pointed out that staff cannot overcome the field season workload so if a more efficient sample design was validated from a cost benefit analysis, in the long run staff involved with surveys may not have such hectic and unpredictable seasons. It was also pointed out that a nationally funded project is underway to examine sampling design tradeoffs for stock assessment and management advice and that a generic model may be developed that can be adapted to herring. The Subcommittee was in agreement that until results of a cost-benefit sampling strategy analysis can provide direction on this topic, that sampling efforts should not be reduced. Sampling funds provided by DFO in 2008 were more than expended in 2007 but funding was still less than previously supplied by the Herring Conservation and Research Society.

Subcommittee Conclusions

- The SOG stock abundance may be expected to decline further in the short term from cumulative effects of the poor 2005 and possibly poor 2007 year classes.
- Recruitment forecasting options should be evaluated further (i.e. comparing different estimates from HCAMv2 output, offshore trawl survey, juvenile survey, etc.)
- Until a thorough study evaluating different sampling strategies and cost benefit options has occurred that directly provides scientific advice on varying components of sampling design (ie. frequency, coverage, intensity, etc), there should be no reduction in temporal, or spatial coverage and intensity for either sampling catch or surveying spawn in future years. Reduction in survey effort risks hampering the performance of any version of a herring stock assessment method that uses population data from fisheries and spawn surveys.
- The forecasts of abundance for the QCI, CC and WCVI assessment areas are below cut-off.
- The forecasts of abundance for the minor assessment areas of Area 27 and Area 2W allow for conservative potential harvests.

Subcommittee Recommendations

1. Managers are advised that the SOG stock is impacted by the low 2008 recruitment of the poor 2005 year class and the potential effects of another poor recruitment in 2010 from the 2007 year class (as suggested by the juvenile herring survey). Managers may choose to adapt their recommendations on allowable harvest in the SOG accordingly.
2. The Subcommittee recommends that the different recruitment forecasting methods be systematically compared to evaluate their performance in terms of which is most effective and under which circumstances. Comparative methods include: the summer trawl WCVI survey estimates; the SOG juvenile survey indices; model forecasts

based on 1+ (2 year old) abundance; and default recruitment assignment rules of “Poor”, “Average” and “Good”.

3. Consistent with recommendations from past meetings, the Subcommittee strongly recommends that temporal and spatial coverage of sampling efforts not be reduced until a thorough evaluation has occurred that can give specific advice on sampling strategy cost benefits. Recent declines in stock sizes should not be interpreted as reason to reduce sampling intensity since reduced spatial and temporal sampling coverage would only increase uncertainty during times when unpredictable fluxes in ecosystem and stock dynamics are occurring.
4. The Subcommittee recommends that a thorough study be undertaken by a working group to evaluate different Pacific herring population sampling strategies and cost-benefit options that can offer scientific advice on varying components of sampling design (i.e. frequency, coverage, intensity, etc). This may be associated with other departmental initiatives addressing similar issues for other species.
5. Abundance forecasts for the Queen Charlotte Islands (QCI), the Central Coast (CC) and the west coast of Vancouver Island (WCVI) major assessment regions are below commercial fishery cutoffs. Any commercial harvest in 2009 is therefore contrary to the intent of the harvest rule designed to increase production from below cut-off levels. . Abundance forecasts for the Prince Rupert District (PRD) and the Strait of Georgia Strait (SOG) are above the fishery thresholds, therefore harvest rules apply for potential yields at 20% harvest rates. Abundance forecasts for the minor assessment areas of Area 27 and Area 2W (where there are no fishery cutoff levels) suggest potential yields at 10% harvest rates. Area-specific science advice is summarized in Appendix Tables 4-10, and more briefly in the text below.
 - Queen Charlotte Islands, Central Coast and west coast Vancouver Island: as in 2006 and 2007, the forecasts are below their respective commercial fishery cut-offs and commercial harvests at any level are inconsistent with the intent of the harvest rule.
 - Prince Rupert District - Forecast abundance is above the cut-off with a potential commercial yield of 3,468 tonnes.
 - The Strait of Georgia - Forecast abundance is above the cut-off with a potential commercial yield of 11,797 tonnes.
 - Area 2W - A potential commercial yield of 165 tonnes is consistent with the 10% harvest rule for Minor Areas.
 - Area 27 - A potential commercial yield of 132 tonnes is consistent with the 10% harvest rule for Minor Areas.

APPENDIX 1: Working Paper Summary

Working Paper P2008-01: Modeling herring population dynamics: Herring catch-at-age model version 2 - *L. Bang Christensen, V. Haist and J. Schweigert*

In this paper the second version of the herring catch-at-age model (HCAMv2), which is closely modeled after the herring catch-at-age model (HCAM) previously developed by Haist and Schweigert (2006), is presented. The revised model simplifies assumptions made in HCAM and reduces the types of parameters that are estimated without compromising model performance. The core of HCAMv2 closely mimics HCAM, but has some significant differences including model initialization, availability parameter estimates and deviations, fishing mortality calculations and natural mortality components. Specifically, the major differences are:

- 1) **Fishing mortality** parameters are estimated in HCAMv2 and calculated analytically in HCAM.
- 2) **Maturity/availability** parameters are assumed known and time invariant in HCAMv2, but were calculated as free parameters and assumed to vary over time in HCAM.
- 3) **Population initialization**, in HCAMv2 we assume that the stock is in a fished state in 1951 and accordingly initialize the population age structure by starting the model in 1946. In HCAM the population in 1951 was estimated as free parameters.
- 4) The **natural mortality** accredited to each fishery period (winter, seine roe, gillnet roe) differ between HCAMv2 (0.9, 0.05, 0.05) and HCAM (0.45, 0.45, 0.1).
- 5) **Selectivity** parameters are estimated using a logistic equation for the winter and seine roe fisheries in HCAMv2 whereas they are fixed at 1 for HCAM.
- 6) **Catchability** (spawning proportionality constant) for 1951 – 1987 is calculated using the conditional maximum likelihood estimate of the differences between observed and predicted spawning biomass in HCAMv2. In the prior implementation, HCAM, this quantity was estimated as a free parameter.
- 7) The **variance of recruitment deviations** was estimated as a free parameter in HCAM, but is fixed in HCAMv2.
- 8) In HCAMv2 fishing mortality parameters are estimated, and the difference between these quantities is minimized as part of the **likelihood component** in HCAM.
- 9) The **priors assumed** in HCAMv2 differ mainly for the steepness parameter (assumed to have a mean of 0.67 in HCAMv2 and 0.5 in HCAM. An additional prior occurs in HCAMv2 for the initial fishing mortality rate in HCAMv2, while other priors from HCAM do not carry over to HCAMv2 as they are no longer estimated.

Results produced by HCAMv2 are conservative relative to results produced by HCAM. The HCAMv2 implementation is an improvement over the HCAM formulation most importantly because model stability has been significantly improved by estimating the fishing mortality parameters rather than calculating analytical solutions. The issue of ‘getting stuck’ at a local minimum (for the GS stock in the 2007 assessment) appears to be eliminated in HCAMv2. Further, retrospective patterns in HCAMv2 do not indicate any bias. The standardization of availability/maturity to indicate that 90% of age-3 herring are mature is more consistent with biological information and the additional estimation of selectivity parameters for the winter and seine roe fisheries in HCAMv2 improves realism as younger fish may be delayed in migrating inshore in the northern areas of BC. Additionally, the lower estimates of natural mortality in HCAMv2 are biologically more realistic. Finally, a full scale management strategy

evaluation framework is recommended to examine the stability of this model, and determine the best model to deal with the uncertainties inherent in the data as well as addressing questions of the relative importance of the different input data sets.

Working paper P2008-02: Stock Assessment for British Columbia Herring in 2008 and Forecasts of the Potential Catch in 2009 -*J. Schweigert, L. Bang Christensen and V. Haist*

The revised Herring Catch Age Model (HCAMv2) methodology for assessment of Pacific herring was adopted for the 2008 assessment. The model is more fully described in the accompanying working paper (Christensen et al 2008). The methodology and scientific advice follows the assessment framework described in Schweigert (2005), and stock assessments, forecasts and resulting yield recommendations are presented for the five major migratory stocks and for two minor stocks (Areas 2W and 27).

Estimates of spawn index, spawning biomass and pre-fishery biomass from the HCAM model indicate 2008 abundances declined slightly for all major stocks. Of particular concern is the estimated 2008 spawning stock biomass for the QCI, Central Coast, and WCVI, which are at very depressed levels comparable to the late 1960s. Only the Strait of Georgia, Prince Rupert, and minor stock in Areas 27 and Area 2W have harvestable surpluses. The Subcommittee accepted yield recommendations are provided in Appendix Tables 4 to 10 and summarized as follows:

- Queen Charlotte Islands, Central Coast and west coast Vancouver Island: As in 2006 and 2007, the forecasts are below their respective commercial fishery cut-offs and commercial harvests at any level are inconsistent with the intent of the harvest rule.
- Prince Rupert District - Forecast abundance is above the cut-off with a potential commercial yield of 3,468 tonnes.
- The Strait of Georgia - Forecast abundance is above the cut-off with a potential commercial yield of 11,797 tonnes.
- Area 2W - A potential commercial yield of 165 tonnes is consistent with the 10% harvest rule for Minor Areas.
- Area 27 - A potential commercial yield of 132 tonnes is consistent with the 10% harvest rule for Minor Areas.

APPENDIX 2: PSARC Pelagic Subcommittee Meeting Agenda

AGENDA
PSARC PELAGICS SUBCOMMITTEE MEETING
September 3-4, 2008
Coast Bastion Inn, Nanaimo, BC

Nanaimo, BC

Wednesday, September 3

- 9:00 Introductions and Opening Remarks.
9:30-12:00 Review of Working Paper: Modeling herring population dynamics: Herring catch-at-age model version 2
12:00-1:00 Lunch
1:00-3:00 Continue working paper reviews, discussion and recommendations.
3:00-4:00 Summarize stock assessment harvest recommendations (i.e. TAC tables)

***** Thursday, September 4 *****

- 9:00-12:00 Continue with summarizing of stock assessment harvest recommendations (i.e. TAC tables)
12:00-1:00 Lunch
1:00-4:00 *Continue with summarizing of stock assessment advice recommendations (i.e. TAC tables)

*Note that schedule is subject to change depending on review progress of the catch-at-age model version 2. Results from the working paper assessment will be considered for harvest recommendations.

****** THURSDAY SEPT 4th CANCELLED (FINISHED ON SEPT 3rd) *****

APPENDIX 3: Meeting Terms of Reference

Regional Advisory Meeting

Pacific Scientific Advice Review Committee (PSARC) Pelagics Subcommittee Review

3 and 4, September 2008
Coast Bastion Inn, Nanaimo, BC

Chairperson: Linnea Flostrand

Background

DFO recently advanced a fishery decision-making framework incorporating the precautionary approach that is intended to assure resource sustainability and meet the requirements of various eco-certification programs. The framework requires the application of reference points, harvest rules and compliance with the precautionary approach. In response to this framework, the PSARC Pelagics Subcommittee will review a working paper that describes a revised Pacific herring assessment model that addresses various aspects of this and will be used to provide advice on harvest levels.

Objectives

1. Peer review the draft working paper, "Modeling herring population dynamics: Herring catch-at-age model version 2";
2. Specifically review the structure and results from this implementation relative to version 1 of the model. Ensure that the modeling approach structure are scientifically sound.
3. Peer review the results from the application of the model to the available herring dataset and the scientific advice regarding precautionary harvest levels for 2009.

Products

- CSAS Proceedings summarizing the discussion.
- CSAS Research document
- CSAS Science Advisory Report with maximum recommended TAC tables by herring stock assessment region

Location and Date

Coast Bastion Inn, Nanaimo, BC, Sept 3 and 4, 2008

Participants

Participants (approx. 25) will include internal DFO representatives and invites from academia, First Nations, NGO's and industry.

APPENDIX 4: List of Attendees & Reviewers

Subcommittee Chair: Linnea Flostrand
PSARC Chair: Al Cass

Reviewer: Steve Martell (not present)

EXTERNAL MEMBERS		AFFILIATION
Dennis	Chalmers	Province of BC
Vivian	Haist	Independent
Doug	Hay	Independent
Russ	Jones	Council of Haida Nations
Ed	Safarik	Herring Conservation and Research Society
Scott	Wallace	David Suzuki Foundation
DFO MEMBERS		
Al	Cass	
Jaclyn	Cleary	
Kristen	Daniel	
Linnea	Flostrand	
Harpreet	Gill	
Lorena	Hamer	
Vanessa	Hodes	
Cynthia	Johnston	
Mark	Portyrala	
Jake	Schweigert	
Brenda	Spence	
Ron	Tanasichuck	
Tom	Therriault	
Greg	Thomas	
Matt	Thompson	

Appendix 5. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: Queen Charlotte Islands

Criteria	Status								
<p>1. Data Quality a) All catch reported b) All spawn surveyed c) Good sample coverage</p> <p>2. Stock status and trends a) HCAMv2 b) Spawn indices</p> <p>3. Perceptions of Stock Status a) Charter skippers comments b) Management staff</p> <p>4. Recruitment a) HCAMv2</p> <p>5. Forecast Abundance a) Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality a) No commercial fisheries in 2008, FSC amounts unknown. b) Yes, 22.5 km surveyed by divers c) Limited coverage.</p> <p>Stock status and trends a) Below cutoff since 2001 & decline from 2007. b) Decline from 2007.</p> <p>Perceptions of Stock Status a) Test vessel crew perceived no change from 2007. b) Measured spawn to be about ½ of that of 2007.</p> <p>Recruitment a) <u>Poor</u>: 2005, 2006, 2008 (i.e. 7% of population in 2008); <u>Poor/Average</u>: 2000, 2001, 2002, 2004; 2007, 2008 <u>Average/Good</u>: 2003</p> <p>Forecast Abundance (Similar to 2008 forecast)</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Abundance</td> <td style="width: 50%;">Potential Harvest</td> </tr> <tr> <td style="text-align: center;">3 647</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">5 658</td> <td style="text-align: center;">0</td> </tr> <tr> <td style="text-align: center;">15 205</td> <td style="text-align: center;">3 041</td> </tr> </table> <p>No Additional Information</p> <p>Cutoff: 10 700 tonnes</p> <p>Yield Recommendation No yield</p>	Abundance	Potential Harvest	3 647	0	5 658	0	15 205	3 041
Abundance	Potential Harvest								
3 647	0								
5 658	0								
15 205	3 041								

Appendix 6. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: Prince Rupert District

Criteria	Status								
<p>1. Data Quality</p> <p>a) All catch reported</p> <p>b) All spawn surveyed</p> <p>c) Good sample coverage</p> <p>2. Stock status and trends</p> <p>a) HCAMv2 (WP Fig 4)</p> <p>b) Spawn indices</p> <p>3. Perceptions of Stock Status</p> <p>a) Charter skippers comments</p> <p>b) Management staff</p> <p>4. Recruitment</p> <p>a) HCAMv2</p> <p>5. Forecast Abundance</p> <p>a) Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality</p> <p>a) All roe herring catch reported; FSC amounts unknown)</p> <p>b) Yes</p> <p>c) Yes</p> <p>Stock status and trends</p> <p>a) Steady decline 2003-2006; 2006 -2008 similar;</p> <p>b) Decline since 2003, 2006 -2008 similar.</p> <p>Perceptions of Stock Status</p> <p>a) Test fishing crew perceived good stock strength.</p> <p>b) Same as above, but expected more spawn than what was measured.</p> <p>Recruitment</p> <p>a) <u>Poor</u>: 2004, 2006, 2008 (i.e. 10% of population in 2008)</p> <p><u>Average</u>: 2000, 2002, 2005,</p> <p><u>Good</u>: 2001, 2003, 2007</p> <p>Forecast Abundance (Similar to 2008 forecast)</p> <table data-bbox="792 1073 1279 1209"> <tr> <td>a) Abundance</td> <td>Potential Harvest</td> </tr> <tr> <td>13 782</td> <td>1 682</td> </tr> <tr> <td>17 342</td> <td>3 468</td> </tr> <tr> <td>30 397</td> <td>6 079</td> </tr> </table> <p>No Additional Information</p> <p>Cutoff: 12 100 tonnes</p> <p>Yield Recommendation</p> <p>Maximum potential yield of 3468 tonnes.</p>	a) Abundance	Potential Harvest	13 782	1 682	17 342	3 468	30 397	6 079
a) Abundance	Potential Harvest								
13 782	1 682								
17 342	3 468								
30 397	6 079								

Appendix 7. Criteria for assessment of stock status in 2008 and yield recommendation for 2009 Central Coast

Criteria	Status								
<p>1. Data Quality</p> <p>a) All catch reported</p> <p>b) All spawn surveyed</p> <p>c) Good sample coverage</p> <p>2. Stock status and trends</p> <p>a) HCAMv2</p> <p>b) Spawn indices</p> <p>3. Perceptions of Stock Status</p> <p>a) Charter skippers comments</p> <p>b) Management staff</p> <p>4. Recruitment</p> <p>a) HCAMv2</p> <p>5. Forecast Abundance</p> <p>a) Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality</p> <p>a) No commercial fisheries in 2008, FSC amounts unknown..</p> <p>b) Yes, good coverage</p> <p>c) Limited coverage.</p> <p>Stock status and trends</p> <p>a) Steady decrease since 2004 and 2008 lowest since 1960s-1970s</p> <p>b) Steady decrease since 2004 and 2008 lowest since 1960s-1970s.</p> <p>Perceptions of Stock Status</p> <p>a) Stock declined to low levels.</p> <p>b) Stock declined to low levels.</p> <p>Recruitment</p> <p>a) <u>Poor</u>: 2001, 2004, 2006, 2007, 2008 (i.e. 10% of population in 2008)</p> <p><u>Average</u>: 2000, 2005</p> <p><u>Good</u>: 2003.</p> <p>Forecast Abundance</p> <table border="0" data-bbox="776 1142 1243 1276"> <tr> <td>a) Abundance</td> <td>Potential Harvest</td> </tr> <tr> <td>6 207</td> <td>0</td> </tr> <tr> <td>9 775</td> <td>0</td> </tr> <tr> <td>19 266</td> <td>1 666</td> </tr> </table> <p>No Additional Information</p> <p>Cutoff: 17 600 tonnes</p> <p>Yield Recommendation</p> <p>No yield</p>	a) Abundance	Potential Harvest	6 207	0	9 775	0	19 266	1 666
a) Abundance	Potential Harvest								
6 207	0								
9 775	0								
19 266	1 666								

Appendix 8. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: Strait of Georgia

Criteria	Status								
<p>1. Data Quality</p> <p>a) All catch reported b) All spawn surveyed c) Good sample coverage</p>	<p>Data Quality</p> <p>a) Yes, all roe herring catch reported. b) Yes c) Yes</p>								
<p>2. Stock status and trends</p> <p>a) HCAMv2 b) Spawn indices</p>	<p>Stock status and trends</p> <p>a) Steady decline from peak in 2003 b) Steady decline from peak in 2003</p>								
<p>3. Perceptions of Stock Status</p> <p>a) Charter skippers comments</p> <p>b) Management staff</p>	<p>Perceptions of Stock Status</p> <p>a) Stock appears smaller but because season was condensed difficult to assess; Amount of spawn observed by some charter skippers seemed more than measured by the dive surveys. b) Stocks down and spawn narrow. Noted that HCamv2 estimates for 2008 seem more accurate than those from HCAM; Good over-flight coverage in Areas 14, 17 and 18.</p>								
<p>4. Recruitment</p> <p>a) HCAMv2</p> <p>b) Offshore Trawl Survey c) Juvenile survey SOG</p>	<p>Recruitment</p> <p>a) <u>Poor</u>: 2008 (i.e. 7% of population in 2008) <u>Average</u>: 2005, 2006 <u>Good</u>: 2000-2004, 2007 b) Forecast for 2009 is "Good" c) Abundance index of 2006 year class suggests average recruitment in 2009 (anecdotal observation).</p>								
<p>5. Forecast Abundance</p> <p>a) Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good 	<p>Forecast Abundance</p> <table border="0"> <tr> <td>a) Abundance</td> <td>Potential Harvest</td> </tr> <tr> <td>31 002</td> <td>6 200</td> </tr> <tr> <td>40 999</td> <td>8 200</td> </tr> <tr> <td>58 985</td> <td>11 797</td> </tr> </table>	a) Abundance	Potential Harvest	31 002	6 200	40 999	8 200	58 985	11 797
a) Abundance	Potential Harvest								
31 002	6 200								
40 999	8 200								
58 985	11 797								
<p>6. Additional Information</p>	<p>Additional Information</p> <p>SOG juvenile survey: 2005 yc lowest index since survey started in 1991 predicted low recruitment in 2008. The 2007 year class also may be poor and could impact 2010 season. Gillnet fishery didn't get quota due to a combination of factors: lack of effort early in season, small fish and scattered distribution of fish later in the season.</p>								
<p>7. Cutoff:</p>	<p>Cutoff: 21 200 tonnes</p>								
<p>8. Yield Recommendation</p>	<p>Yield Recommendation: 11 797 tonnes</p>								

Appendix 9. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: West Coast of Vancouver Island

Criteria	Status								
<p>1. Data Quality</p> <p>a) All catch reported</p> <p>b) All spawn surveyed</p> <p>c) Good sample coverage</p> <p>2. Stock status and trends</p> <p>a) HCAMv2</p> <p>b) Spawn indices</p> <p>3. Perceptions of Stock Status</p> <p>a) Charter skippers comments</p> <p>b) Management staff</p> <p>4. Recruitment</p> <p>a) HCAMv2</p> <p>b) Offshore Trawl Survey</p> <p>5. Forecast Abundance</p> <p>a) Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality</p> <p>a) No commercial fisheries in 2008; FSC amounts unknown.</p> <p>b) No, perceived deep spawn was not surveyed, large area with limited vessel coverage.</p> <p>c) Limited coverage.</p> <p>Stock status and trends</p> <p>a) Decreasing since 2003, abundances appear similar for 2006-2008 at lowest levels since 1960s.</p> <p>b) Decreasing since 2003, abundances appear similar for 2006-2008 at lowest levels since 1960s.</p> <p>Perceptions of Stock Status</p> <p>a) No improvement in abundance detected in 2008. Estimates from spawn surveys less than schools observed from charter vessel acoustics.</p> <p>b) Stock remains at very low level but herring and spawn appeared relatively deep and staff not able to properly assess deep spawn. Thought that 2 vessels do not provide adequate coverage of such a large area.</p> <p>Recruitment</p> <p>a) Poor: 2000, 2001 & 2004-2008 (i.e. 25% of population in 2008) Average: 2002, 2003 Good: 1997</p> <p>b) Forecast for 2009 is "Poor"</p> <p>Forecast Abundance</p> <table border="0" data-bbox="792 1339 1255 1476"> <tr> <td>a) Abundance</td> <td>Potential Harvest</td> </tr> <tr> <td style="text-align: right;">3 894</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">7 772</td> <td style="text-align: right;">0</td> </tr> <tr> <td style="text-align: right;">16 070</td> <td style="text-align: right;">0</td> </tr> </table> <p>No Additional Information</p> <p>Cutoff: 18 800 tonnes</p> <p>Yield Recommendation: No yield</p>	a) Abundance	Potential Harvest	3 894	0	7 772	0	16 070	0
a) Abundance	Potential Harvest								
3 894	0								
7 772	0								
16 070	0								

Appendix 10. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: Minor stock Area 2W

Criteria	Status								
<p>1. Data Quality a) All catch reported</p> <p>b) All spawn surveyed c) Good sample coverage</p> <p>2. Stock status and trends a) HCAMv2 b) Spawn indices</p> <p>3. Perceptions of Stock Status a) Charter skippers comments</p> <p>b) Management staff</p> <p>4. Recruitment a) HCAMv2</p> <p>5. Forecast Abundance Recruitment Assumption</p> <ul style="list-style-type: none"> • Poor • Average • Good <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality a) SOK amounts reported. No roe fisheries in 2008. b) Unlikely, and surface surveyed c) No, 3 samples only</p> <p>Stock status and trends a) Tail of increasing trend since 2005. b) Length and width of spawn decreased but intensity difficult to compare due to change in survey protocol (dive vs surface).</p> <p>Perceptions of Stock Status a) Similar to 2007 but survey was limited by weather. b) Spawn deposition similar to 2007 but different distribution. Observed estimate of spawn thought to be conservative.</p> <p>Recruitment a) No recruitment forecast</p> <p>Forecast Abundance</p> <table data-bbox="836 1071 1396 1207"> <thead> <tr> <th>Abundance</th> <th>Potential Harvest</th> </tr> </thead> <tbody> <tr> <td>1 543</td> <td>154</td> </tr> <tr> <td>1 654</td> <td>165</td> </tr> <tr> <td>3 054</td> <td>305</td> </tr> </tbody> </table> <p>10 % harvest rule consistent with minor stocks</p> <p>No Additional Information</p> <p>No cutoff</p> <p>Yield Recommendation: 165 tonnes</p>	Abundance	Potential Harvest	1 543	154	1 654	165	3 054	305
Abundance	Potential Harvest								
1 543	154								
1 654	165								
3 054	305								

Appendix 11. Criteria for assessment of stock status in 2008 and yield recommendation for 2009: Minor stock Area 27

Criteria	Status								
<p>1. Data Quality a) All catch reported b) All spawn surveyed c) Good sample coverage</p> <p>2. Stock status and trends a) HCAMv2 b) Spawn indices</p> <p>3. Perceptions of Stock Status a) Charter skippers comments b) Management staff</p> <p>4. Recruitment a) HCAMv2</p> <p>5. Forecast Abundance Recruitment Assumption <ul style="list-style-type: none"> • Poor • Average • Good </p> <p>6. Additional Information</p> <p>7. Cutoff</p> <p>8. Yield Recommendation</p>	<p>Data Quality a) No roe herring fisheries. Some unreported SOK. b) No (SOK operators thought some missed). c) No, 4 SOK samples collected</p> <p>Stock status and trends a) Considerable decline from 2007 b) Considerable decline from 2007</p> <p>Perceptions of Stock Status a) No vessel in Area 27 b) No Area 27-specific information</p> <p>Recruitment a) No recruitment forecast</p> <p>Forecast Abundance</p> <table data-bbox="803 905 1364 1039"> <tr> <td>a) Abundance</td> <td>Potential Harvest</td> </tr> <tr> <td>1 143</td> <td>114</td> </tr> <tr> <td>1 324</td> <td>132</td> </tr> <tr> <td>2 142</td> <td>214</td> </tr> </table> <p>Additional Information 10 % harvest rule consistent with minor stocks</p> <p>No cutoff</p> <p>Yield Recommendation: 132 tonnes</p>	a) Abundance	Potential Harvest	1 143	114	1 324	132	2 142	214
a) Abundance	Potential Harvest								
1 143	114								
1 324	132								
2 142	214								