Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the Second Meeting of the Management Procedure Workshop

7-9 & 12, 14-15 April 2003
Queenstown, New Zealand

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Agenda Item 1. Opening, Terms of Reference and Adoption of Agenda

1. The Workshop was opened by Mr Penney, independent Chair of the Scientific Committee and Chair of the Workshop. He welcomed all participants, who introduced themselves (see list of participants Attachment A). The draft agendas circulated prior to the workshop for both the workshop and industry consultation were accepted (see Attachments B and C). The list of documents available at the start of the meeting was accepted (Attachment D), and the documents were classified into those addressing the various agenda items.

Agenda Item 2. Overview of steps in the process of developing an MP for SBT

2. The Chair reminded participants that this 2nd MP workshop had been planned for during the initial planning of the management procedure process at SC6 in Tokyo in August 2001. Of the schedule of tasks identified at SC6 for development of a CCSBT management procedure, tasks A - D had been completed up to the conducting of the 1st MP workshop in Tokyo in March 2002. Remaining tasks thereafter were:

   E. Consultant and/or national scientists run preliminary trials.

   F. Hold Workshop to:

      (a) evaluate performance of operating models in fitting to the historical data.
      (b) assign weights to alternative operating models.
      (c) examine results of first set of trials.
      (d) identify changes to be made and second set of simulation testing.

   G. Consultant and/or national scientists run 2nd stage trials.

   H. Hold workshop to evaluate results and make recommendations to the Extended Scientific Committee (ESC) regarding recommended procedure.

3. The trials envisaged in E were conducted by national scientists between the Stock Assessment Group (SAG) meeting in 2002 and March 2003, and the primary task of this second workshop (F above) was to review these results in order to prepare revised operating models for use in the second stage development and testing of proposed management procedures by member scientists (G above). The results of the 2nd stage testing will be reviewed at the 2003 SAG and ESC meetings in preparation for the final MP workshop in early 2004 (H above).

4. The specific terms of reference defined in the agenda for this second workshop were:

   1. Evaluation of performance of initial candidate Management Procedures (MP) tested during first-year trials.

2. Produce final specification of operating models to be used for the second-year evaluations of MP, including estimation procedures for conditioning on past data, projection models and models used to simulate data.
3. Definition of a workplan and timetable.

Agenda Item 3. Performance of initial candidate Management Procedures from first-stage trials

5. CCSBT-MP/0304/5 presented graphic utilities that were considered to be useful but there were some discussion of how correlations were calculated and presented.
6. The remainder of this session consisted of presentation of the papers on initial MP results by scientists from Australia, Japan and Taiwan, these being CCSBT-MP/0304/6, CCSBT-MP/0304/11, CCSBT-MP/0304/12 and CCSBT-MP/0304/13.
7. The MP's presented in these papers could be divided into rules that were based on CPUE trends, and those that were model based. A categorisation of these various MP's and summaries of some of their special features may be seen in Paper CCSBT-MP/0304/15.
8. The primary challenge for initial MP's was how to prevent further declines in spawning biomass when the operating model reflected low productivity. Generally all MP's performed well with respect to stock status objectives when managing high productivity operating models.
9. Developers of MPs all requested further definition of manager's objectives in order to refine their MPs.

Agenda Item 4. Reconsideration of Operating Models

4.1. Review of results of exploratory model fits done by national scientists using the generalized conditioning code distributed in January 2003 (i.e. sbtmod3.tpl).

10. Conditioning results from the updated SBT operating model for testing the performance of management procedures was described (CCSBT-MP/03004/07). This paper noted that the results do not represent an exhaustive exploration of the parameter space of the agreed uncertainties. Results indicate that some issues need to be further addressed before the final trials are done. In particular, conditioning results and estimates of steepness (h) are sensitive to assumptions about the length frequency in the early part of the fishery and how it is modelled. Further consideration is needed of the values of steepness and mortality to use in the final trials and whether high steepness values without high autocorrelation in recruitment or depensation are consistent with historical data. Final trials should also include uncertainty in effective sample sizes, depensation in the stock recruitment relationship, and the relationship between CPUE and variability in selectivity. The paper noted that it is unlikely that a full assessment of the performance of management procedures across the full range of uncertainties in stock status will be computationally feasible.

4.2. Possible changes in the structure of the conditioning model and consideration of additional estimation trials to be performed/evaluated during the meeting.

11. The meeting reconvened in a smaller group for technical discussions to develop the specifications for the second stage of operating models for use by participants in preparing for the SAG meeting in August 2003. The group noted that the process of selection of operating models for the second stage of evaluations should be conducted in parallel with the discussion on the process for subsequent synthesis of results over all operating models. This process is discussed under item 5.2 in the report.

12. The changes to model specifications are detailed in **Attachment E**. The main axes of uncertainty explored in conditioning were steepness and natural mortality. It was decided to represent these in the next stage of trials with three M vectors (detailed in **Attachment E**) and three values for steepness (h = 0.3, 0.55 and 0.8) giving a set of nine operating model scenarios.

13. The three values for steepness agreed relate to a stock that ranges from highly productive (h = 0.8) to low productivity (h = 0.3) will be used both for the conditioning and the projections. The potential for autocorrelation in the S/R residuals will be addressed in the projections ($\rho = 0$ for the conditioning; $\rho = 0.3$ for $h = 0.3$ and $\rho = 0.6$ for $h = 0.55$ and $\rho = 0.7$ for $h = 0.8$ in the projections for Hierarchy 3; ρ = empirical estimate from the operating model conditioning for the years 1965-1995 in the projections for Hierarchy 4) (see section 5.1 for description of Hierarchies). Because the variation in recruitment levels in the S/R plots seem low, σ_R will be estimated with a lower bound of $\sigma_R = 0.4$. The meeting also agreed that applying time varying weights to the effective sample sizes was more appropriate than using constants, and that the estimates provided in CCSBT-MP/0304/07 would be used in the conditioning (see **Attachment E** for further details).

4.3. Discussion of specific models used to simulate dynamics and future data, as well as other robustness tests.

14. In addition to the two uncertainty dimensions explored in conditioning, the uncertainty about future changes in catchability was incorporated as a third main uncertainty axis.. Further, a series of robustness trials were defined relative to two reference cases. Model specifications used during the meeting relating to length frequency weighting, selectivity, natural mortality, growth, CPUE trends, use of tag recovery data, errors in estimation of catch, changes in fecundity, trends in carrying capacity and catch biomass consistency are described in **Attachment E**. These issues were explored further during the meeting through computer runs and discussion in small groups.

4.4. Further technical issues pending resolution:

15. Two technical issues not resolved during the workshop will require resolution intersessionally. All participants agreed that errors in catch estimation were important but could not agree on how to specify these during the workshop. Another issue involved how to incorporate catch by "unregulated" fisheries. Vivian Haist will provide a facility within the projection and conditioning code to allow for these factors. These two issues will be progressed intersessionally by e-mail and discussed further at the SAG/ESC meetings

4.5. Produce final specification of OMs.

16. Appendix 2 **Attachment E** describes the changes relative to the 1st operating model specifications for the baseline case for the conditioning and for the

projections. The specifications for the robustness trials is given in Appendix 3, these will be run with h = 0.3 and 0.55, the intermediate M vector Mv10, and no change in future catchability.

Agenda Item 5. Testing Management Procedures

5.1. Hierarchy of uncertainty levels to be considered for second-year trials

17. Five hierarchy levels were defined in the Report of the First Management Procedure Workshop. The group agreed that the two key hierarchies to use for presentation of results in the next phase are hierarchy 3 (process and sampling errors) and hierarchy 4 (MCMC runs). It was also agreed that 100 replicates would be used as the default number under hierarchy 3 for presentation purposes, though members are encouraged to explore the sensitivity of performance statistics to the number of replicates.

18. Data files to be used with hierarchy 1 (deterministic case) will only be provided for the mode of the posterior distribution (MPD). The MPD estimates conditioned on low and high B_0 will not be computed.

19. With regard to hierarchy 4, the group decided to conduct one MCMC to try out the approach in projections. This run will be done estimating the natural mortality parameters M_0 and M_{10}, using the functional form applied to first-stage trials but fixing the curvature parameter to 0.7. Caution was expressed with regard to the choice of a prior for M_0, given past experience, which showed that the data support a small value. The parameter would be bounded between 0.3 and 0.5 with a prior distribution centred at 0.4.

20. The group agreed that a full MCMC approach to the steepness parameter, h, would not be informative given the lack of reliability in the likelihood, because this is open to alternative specifications which imply different relative weights for h. Instead, it was suggested that an MCMC be conducted estimating h but setting parameter bounds on a small range of h values around one of the base case choices. A range between 0.5 and 0.6 (around the base choice of h=0.55) was chosen. The group noted that a similar run may be done for the low steepness value at a later stage.

21. The results of conditioning using the specifications above will be evaluated by the programmer and steering group and some changes may be introduced based on results.

5.2. Process for choosing weights assigned to alternative scenarios and for evaluating MP performance

22. Possible approaches to synthesising results across a range of operating model scenarios were reviewed (CCSBT-MP/0304/08). Eight performance indicators, agreed at the 2002 SAG, have been used for evaluating possible management procedures. It was suggested that the trade-off in performance between the stock status and total catch indicators will form the primary basis for a final recommendation on Management Procedures when synthesizing results across scenarios. It was also noted that in some of the initial scenarios, it was not possible to achieve the Commission's stock rebuilding objective ($SSB_{2020} \geq SSB_{1980}$) even under zero catch. In other scenarios, this objective could be achieved even under current catches. This suggests that there will be a need to

consider different criteria for different scenarios when assessing the overall performance of candidate Management Procedures.

23. Paper CCSBT-MP/0304/08 dealt with the following issues: Two possible approaches for synthesising results across scenarios were discussed. These include a weighted statistical approach and an approach that reflects the robustness of management procedures to the agreed range of uncertainties. The weighted statistical approach applies weights related to the relative plausibility of alternative operating model hypotheses to the output statistics to give an overall measure of the performance of any given management procedure across the different scenarios. These weights may be based both on prior information (or expert judgment) and consistency with historical data. In the robustness approach, "acceptable" limits would be agreed for critical performance indicators in relation to management objectives and management procedures would be evaluated to see if they met these levels. Only Management Procedures that satisfied these across all scenarios would be considered robust. To implement the weighted statistical approach agreement would be needed on: assignment of weights and the specification of appropriate summary statistics. To implement the robustness approach would require: definition of robustness criteria. For both approaches, the set of scenarios to be included would need to be specified and they may well be different between the two approaches. The paper proposed that a "hybrid" approach could be used, in which candidate Management Procedures that did not meet all minimum robustness criteria over all operating models considered would be rejected. Management procedures would be optimised by integrating over a set of operating models considered more plausible.

24. The working group decided not to integrate over all operating models, but to adopt a hybrid approach. Within an operating model, MCMC would be used to integrate over parameter uncertainty where appropriate. It was noted that MCMC could be used to integrate over the steepness parameter (*h*), which is one of the key parameters, but the group decided not to integrate over this parameter because the likelihood is not considered to be reliable.

25. Future meetings will need to decide on a final set of operating models and assign weights to them. The difficulty of assigning weights, is recognised and specific proposals should be submitted to the 2003 SAG meeting.

26. A 'two-phase approach' to synthesise results, which is an elaboration of a hybrid approach, is presented in **Attachment F**. The first phase is intended to eliminate management procedures which do not provide robustness in terms of conservation goals (i.e. in terms of biomass). This step involves defining 'acceptable' regions of biomass (and possibly catch) levels. The idea is to define biomass levels where there would be an acceptably low risk of recruitment failure or stock collapse, and discarding management procedures (MPs) which frequently lead to biomass levels outside of the acceptable region. The second phase would then focus on MPs which pass the first phase tests, and the choice of MP can be based on optimising performance within the 'acceptable' region.

27. Although there was general agreement about the concept of a 'two-phase' approach, and agreement that one of the key aims was to find a robust MP, there were divergent views about the details of implementation. The differences related to the definition of an 'acceptable' region, and how to choose scenarios and approach the synthesis of results from those scenarios. These implementation

details have not yet been resolved, and the importance of defining the approach to weighting scenarios before looking at final results was emphasised. These issues will need to be resolved at the CCSBT SAG August 2003 meeting

5.3. Feasibility of MCMC or other methods to approximate posterior distributions of state variables and model parameters.

28. This agenda item was discussed and reported under 5.1. The group concluded that the MCMC approach would be used primarily to generate a more representative set of initial conditions. No other methods were considered appropriate.

5.4. Reconsideration of performance statistics to be used.

29. The following eight performance statistics were chosen for the first-stage of trials:

Maximizing catches:

Let Y represent the first year of the simulations, C_y the total catch in year y and $C_{surface,y}$ the surface fishery catch in year y

(1) $\frac{\sum_Y^{Y+4} C_y}{5}$ (2) $\frac{\sum_Y^{Y+19} C_y}{20}$ (3) $\frac{1}{20}\sum_Y^{Y+19}\frac{C_{surface,y}}{C_y}$

Biomass (S: spawning biomass, NB: non-spawning biomass)

(4) $\frac{S_{Y+5}}{S_Y}$ (5) $\frac{S_{Y+20}}{S_Y}$ (6) $\frac{S_{2020}}{S_{1980}}$ (7) $\frac{NB_{Y+20}}{NB_Y}$

Inter-annual variations in catches:

(8) $AAV = \frac{1}{20}\sum_{Y-1}^{Y+18}\frac{|C_{y+1} - C_y|}{C_y + 1^{-6}}$

30. During the initial phases of management procedure development, it was noted that additional performance measures were required because of the very different dynamics associated with the low and high productivity scenarios. The group agreed to maintain the existing set of 8, but to add several more. It was noted that, although the non-spawning biomass performance measure had not really been used thus far, this measure will become relevant when different ratios of surface-to-longline catch are considered.

31. The following performance statistic was added to evaluate minimum spawning biomass relative to current:

(9) $Min\left\{\frac{S_y}{S_Y}\right\}$ over 20-year projections.

Two performance measures relating to MSY concepts were added: one related to spawning biomass, and one related to exploitation rate.

(10) $\frac{S_{2020}}{S_{MSY}}$

(11) Catch-to-total biomass ratio

$$\frac{1}{5}\sum_{y=2018}^{2022} \frac{C_y}{\text{Total Biomass}_y} \quad \text{relative to} \quad \frac{C_{MSY}}{\text{Total Biomass at MSY}}$$

The latter is formulated in terms of the ratio between catch and total biomass (age 2 and older) over the last 5 years in the simulation versus the ratio of MSY catch to biomass (age 2 and older) to avoid the difficulties associated with the appropriate definition of fishing mortality when selectivity's are changing. The group also noted that there are potential difficulties with regard to interpretation of these measures when selectivities change greatly, and/or if the split between the surface and longline catch changes from the values used in the MSY calculations. Note that the above implies computing the MSY and the total biomass (age 2 and older) at MSY for the different conditioning scenarios. This would be done using the most recent weights at age and selectivities at age.

32. Three additional TAC-related performance measure were proposed. The first was intended to reflect whether the TAC trajectories change direction in the early years, with the notion that one did not want the TAC to first increase and then decrease or vice versa over the first 6 years.

(12) $$A = 1 - \Pr\begin{Bmatrix} TAC_{2003} < TAC_{2006} < TAC_{2009} \\ TAC_{2003} > TAC_{2006} > TAC_{2009} \end{Bmatrix}$$

i.e. avoid situations where TAC_{2006} lies outside the range of TAC_{2003} and TAC $_{2009}$ (low *A* desired). There was some discussion on the appropriateness of such a measure.
The second addressed issues about stability of TACs

(13) Number of cases when $\lfloor \Delta TAC_{y-1} \times \Delta TAC_y < 0 \rfloor$ ($\Delta TAC_y = TAC_y - TAC_{y-1}$)
where all years with no change in TAC are ignored. This statistics evaluated the number of time TAC changes go in opposite direction in consecutive years.

The last statistic added measures consistency in the trends in biomass with those in the TACs:

(14) Number of cases when $\lfloor \Delta S_y \times \Delta TAC_y < 0 \rfloor$
It was acknowledged that this performance statistic would be difficult to interpret and would have to be viewed in conjunction with other performance statistics.

33. In addition to the performance statistics, several 'robustness criteria' were defined. In some cases, the criteria were intended to avoid 'catastrophe', whereas in other cases the criteria were more akin to 'minimum standards' that one might prefer from a performance measures. All the 'robustness criteria' involved spawning biomass, and were intended to reflect probabilities of falling below some level, reflecting how low the spawning biomass drops during the projection period, or evaluating probabilities of achieving various levels of recovery. It was

acknowledged that standards may have to vary depending on the operating model scenario. The following proposals were made:

Japan:

$$\Pr\left[S_{\text{any year}} < 0.50\ S_{2002}\right] < 0.10$$
$$\Pr\left[S_{\text{any year}} > 100 \text{ tons}\right] \geq 0.95$$

For *h*=0.3

$$\left(MedianS_{2022} > MedianS_{2021} > MedianS_{2020}\right)$$

Australia:
First, evaluate whether the operating model scenario meets the rebuilding condition below when catch is set constant at 75% of current catch levels.

$$\Pr\left[S_{2020} > S_{1980}\right] > 0.90$$

If the operating model scenario does meet the condition, then the robustness criteria for a management procedure is whether it can also meet the rebuilding condition with a probability of 90%. If the operating model scenario does not meet the condition above, then evaluate

$$\Pr\left[S_{\text{any year}} < 0.75\ S_{2002}\right] < 0.10$$

$$\Pr\left[S_{2022} > S_{2002}\right] > 0.90$$

In order to evaluate these last set of standards, operating models will need to first be classified between those that meet the criteria above and those that do not. Vivian will evaluate this by running 20-year simulations under constant catch set at 75% of current values. The number of replicates used for this will be 100.

34. The projection code will compute and output the probabilities associated with each of the criteria above, as well as a value of 1 or 0 to indicate whether or not the robustness criteria was met. These values will be printed together with the rest of the performance statistics.

35. The group noted that the robustness criteria above are not equivalent in terms of the standards of performance imposed. The criteria proposed by Japan are less stringent and correspond to situations that need to be avoided at all costs (i.e. that the stock collapses or drops below 50% of current levels, and no increasing trend in biomass is achieved at the end of the 20 years). The criteria proposed by Australia imply higher levels of rebuilding (i.e. a high probability of rebuilding to the 1980 target if this can be achieved without reducing catches below 75% of current, or, if not, a high probability of increasing the biomass above current levels and a low probability of falling below 75% of current levels.)

Agenda Item 6. Coding issues and Mechanics for conducting the evaluation tests

6.1. Coding issues arising from users experience with simulation code.

36. A number of new user capabilities were requested:

- An option to allow all worm plots for catch and biomass to be printed during projections (as opposed to only 10 as printed in current version).
- An option to control the length of the simulation.
- Conditioning code: an option to control the value for the lower bound on the estimate of σ_{CPUE}, which controls the weight given to the CPUE data.

37. Vivian Haist was tasked to generate total catch by weight and historical age-composition data by cohort-slicing using the same algorithm for future projections, using the length-frequency data (by 2-cm intervals). This "historical" data would be available for the management procedures to use.

6.2. Define a protocol for comparison of results (tables, graphic output, etc.).

38. Regarding outputs, the group agreed that it is important to consider combinations of graphics rather than to try to summarise everything in one graph, and that this will become even more important when considering results from hierarchy 4. At this stage the group was not prescribing which performance measures should be plotted, or in which manner.

39. The difficulties associated with absolute performance statistics were discussed. The group agreed on the need to somehow reflect performance relative to starting conditions as well as to productivity and achievable targets for the different operating models. Some possibilities for graphics were discussed using examples from Namibian hake.

40. The group noted that in order to facilitate comparisons of results obtained using different management procedures, it would be ideal to consolidate all output statistics into a single data-base. The workshop noted that there would be no time to implement such a system prior to the next SAG meeting but that the issue would have to be on the agenda so that a process is in place prior to MP Workshop III.

6.3. Other issues.

41. There were no other issues.

Agenda Item 7. Workplan and timetable

Task	Date
- Incorporate changes into conditioning and simulation codes - Code distributed - National scientists explore performance of candidate operating models and MPs	31/5/2003
- National Scientists submit documents for the SAG (2 weeks prior to SAG)	11/8/2003
- Meet at SAG and ESC to discuss results of MPs, select a set of final operating models and robustness tests and assign weights to alternative hypotheses	25/8/2003
- Distribute final simulation code and input parameters	SAG to decide
- National Scientists conduct trials of MPs and document results	…

- Consolidate results for ease of comparison	…
- Workshop III	Apr 2004

Agenda Item 8. Other business

8.1. Feedback to CCSBT 10 on the management procedure development process

42. Following consultation with industry (as described in **Attachment G**), two members of the panel held individual briefings with members of industry and management. In the light of these briefings it was agreed that individual briefings by a member/s of the independent panel to Commissioners prior to CCSBT10 would greatly facilitate the management procedure development process.

43. The workshop felt that some formal guidance from the Commission would be necessary to permit the issues identified during industry consultations to be incorporated into decisions on the selection of management procedures.

44. The workshop also considered it important to provide an opportunity for feedback and discussion of the MP development process ahead of the CCSBT 10 meeting. It was noted that it would be useful to proceed this with some individual discussions with members regarding implications of various operating model scenarios. It was therefore proposed that:

- Professor Hilborn be requested to conduct individual discussions with member country managers and industry representatives on implications of use of management procedures under various operating model scenarios prior to the SAG meeting.
- An informal consultation with Commissioners, stakeholders and at least one member of the panel before the meeting be held to provide an overview of the management procedure development process and the results of the individual feedback discussion. An additional day should be added to the start of the meeting to cater for this.

45. The Secretariat undertook to approach the Commission in this regard.

Agenda Item 9. Finalisation of meeting report

46. The report was adopted.

Agenda Item 10. Close of meeting

47. Workshop participants thanked the Chair, Advisory Panel members, Secretariat, interpreters and other participants for their contributions to the success of the workshop. Korea particularly thanked the Panel for the specific efforts made to conduct additional briefing sessions on the MP development process.

48. On behalf of the Fisheries Administration of the Fishing Entity of Taiwan, Dr Kuo offered to host the 3rd Management Procedure workshop in Taiwan in 2004, and noted that he would correspond with the Secretariat to confirm details.

49. The Chairman also thanked the interpreters and participants for their hard work and closed the meeting at 6:30pm, 15 April 2003.

Agenda Item 11. Consultation with industry

50. The report of the Industry Consultation is at **Attachment G**.

List of Attachments

Attachment

A	List of Participants
B	Agenda
C	Agenda – Industry Consultation
D	List of Documents
E	Further Development of Operating Model Specifications
F	Thoughts on a two stage weighting procedures for Operating Models
G	Report of the Industry Consultation

Attachment A

List of Participants
CCSBT
2nd Management Procedure Workshop
7-9 April and 12-15 April 2003
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CHAIR

Mr Andrew PENNEY
Pisces Environmental Services (Pty) Ltd
22 Forest Glade
Tokai Road, Tokai 7945
South Africa
Phone: +27 21 7154238
Fax: +27 21 7154238
Email: apenney@pisces.co.za

SAG CHAIR

Dr John ANNALA
Chief Scientist
Ministry of Fisheries
PO Box 1020
Wellington
New Zealand
Phone: +64 4 470 2661
Fax: +64 4 470 2686
Email: annalaj@fish.govt.nz

COORDINATOR

Dr Ana PARMA
Centro Nacional Patagonico
Puerto Madryn, Chubut
Argentina
Phone: +54 2965 451024
Fax: +54 2965 451543
Email: parma@cenpat.edu.ar

ADVISORY PANEL

Dr James IANELLI
REFM Division
7600 Sand Pt Way NE
Seattle, WA 98115
USA
Phone: +1 206 526 6510
Fax: +1 206 526 6723
Email: jim.ianelli@noaa.gov

Professor Ray HILBORN
School of Aquatic and Fishery 355020
University of Washington
Seattle, WA 98195
USA
Phone: +1 206 543 3587
Fax: +1 206 685 7471
Email: rayh@fish.wahsington.edu

Professor John POPE
The Old Rectory
Burgh St Peter
Norfolk, NR34 0BT
UK
Phone: +44 1502 677377
Fax: +44 1502 677377
Email: PopeJG@aol.com

CONSULTANT

Ms Vivian HAIST
6224 Groveland Drive
Nanaimo, B.C.
Canada
Phone: +1 250 985 0518
Fax: +
Email: haistv@shaw.ca

AUSTRALIA

Mr Paul ROSS
Manager
International Fisheries
Agriculture, Fisheries & Forestry Australia
GPO Box 858
Canberra ACT 2601
Phone: +61 2 6272 5760
Fax: +61 2 6272 4875
Email: Paul.Ross@affa.gov.au

Mr Jay HENDER
Policy Officer
International Fisheries
Agriculture, Fisheries & Forestry Australia
GPO Box 858
Canberra ACT 2601
Phone: +61 2 6272 3608
Fax: +61 2 6272 4875
Email: Jay.Hender@affa.gov.au

Dr James FINDLAY
Senior Research Scientist
Fisheries & Marine Science Program
Bureau of Rural Sciences
GPO Box 858
Canberra ACT 2601
Phone: +61 2 6272 5534
Fax: +61 2 6272 3882
Email: James.Findlay@affa.gov.au

Mr Andy BODSWORTH
Manager
Southern Bluefin Tuna
Australian Fisheries Management
Authority
PO Box 7051, Canberra Mail Centre
ACT 2610
Phone: +61 2 6272 5290
Fax: +61 2 6272 3730
Email: Andy.Bodsworth@afma.gov.au

Dr Tom POLACHECK
Senior Principal Research Scientist
CSIRO Marine Research
PO Box 1538
Hobart, TAS 7001
Phone: +61 3 6232 5312
Fax: +61 3 6232 5012
Email: tom.polacheck@csiro.au

Mr John GUNN
Principal Research Scientist
CSIRO Marine Research
P.O. Box 1538
Hobart, Tas 7001
Phone: +61 3 6232 5375
Fax: +61 3 6232 5012
Email: John.Gunn@csiro.au

Dr Dale KOLODY
Research Scientist
CSIRO Marine Research
P.O. Box 1538
Hobart, Tas 7001
Phone: +61 3 6232 5121
Fax: +61 3 6232 5012
Email: Dale.Kolody@csiro.au

Dr Marinelle BASSON
CSIRO Marine Research
P.O. Box 1538
Hobart, Tas 7001
Phone: +61 3 6232 5492
Fax: +61 3 6232 5012
Email: marinelle.basson@csiro.au

Mr Brian JEFFRIESS
President
Tuna Boat Owners Association
PO Box 416
Fullarton SA 5063
Phone: +61 8 8373 2507
Fax: +61 8 8373 2508
Email: austuna@bigpond.com

FISHING ENTITY OF TAIWAN

Dr Chin-Lau KUO
Secretary General
Fisheries Administration
No.2, Chaochow St.,
Taipei 100
Taiwan
Phone: +886 2 2321 9764
Fax: +886 2 2341 1953
Email: chinlau@msl.fa.gov.tw

Dr Shu-Hui WANG
Assistant Researcher
Overseas Fisheries Development
Council of the Republic of China
19, Lane 113, Roosevelt Rd,
Sec.4, Taipei
Taiwan
Phone: +886 2 2738 1522
Fax: +886 2 2738 4329
Email: jessica@ofdc.org.tw

JAPAN

Dr Sachiko TSUJI
Section Chief
Temperate Tuna Section
National Research Institute of
Far Seas Fisheries
5-7-1 Shimizu-Orido, Shizuoka 424-8633
Phone: +81 543 36 6042
Fax: +81 543 35 9642
Email: tsuji@affrc.go.jp

Dr Norio TAKAHASHI
Senior Researcher
Temperate Tuna Section
National Research Institute of
Far Seas Fisheries
5-7-1 Shimizu-Orido, Shizuoka 424-8633
Phone: +81 543 36 6043
Fax: +81 543 35 9642
Email: norio@affrc.go.jp

Dr Hiroyuki KUROTA
Temperate Tuna Section
National Research Institute of
Far Seas Fisheries
5-7-1 Shimizu-Orido, Shizuoka 424-8633
Phone: +81 543 36 6043
Fax: +81 543 35 9642
Email: kurota@affrc.go.jp

Dr Kazuhiko HIRAMATSU
Section Chief
Mathematical Biology Section
National Research Institute of
Far Seas Fisheries
5-7-1 Shimizu-Orido, Shizuoka 424-8633
Phone: +81 543 36 6014
Fax: +81 543 35 9642
Email: hira@affrc.go.jp

Mr Hiroshi SHONO
Mathematical Biology Section
National Research Institute of
Far Seas Fisheries
5-7-1 Shimizu-Orido, Shizuoka 424-8633
Phone: +81 543 36 6039
Fax: +81 543 35 9642
Email: hshono@affrc.go.jp

Prof Doug BUTTERWORTH
Department of Mathematics and Applied
Mathematics
University of Cape Town
Rondebosch 7701
South Africa
Phone: +27 21 650 2343
Fax: +27 21 650 2334
Email: dll@maths.uct.ac.za

Mr Takashi KOYA
Deputy Director
International Affairs Division
Fisheries Agency of Japan
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3591 1086
Fax: +81 3 3502 0571
Email: kouya_takashi@nm.maff.go.jp

Mr Yukito NARISAWA
Section Chief
International Affairs Division
Fisheries Agency of Japan
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3591 1086
Fax: +81 3 3502 0571
Email: yukito_narisawa@nm.maff.go.jp

Ms Miho WAZAWA
International Affairs Division
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3591 1086
Fax: +81 3 3502 0571
Email: miho_wazawa@nm.maff.go.jp

Mr Yuji NISHIMOTO
Section Chief
Far Seas Fisheries Division
Fisheries Agency
1-2-1 Kasumigaseki, Chiyoda-ku
Tokyo 100-8907
Phone: +81 3 3502 8479
Fax: +81 3 3591 5824
Email: yuji_nishimoto@nm.maff.go.jp

Mr Nozomu MIURA
International Division
Federation of Japan Tuna Fisheries
Cooperative Associations
3-22 Kudankita 2-chome, Chiyoda-ku
Tokyo 102
Phone: +81 3 3264 6167
Fax: +81 3 3234 7455
Email: section2@intldiv.japantuna.or.jp

NEW ZEALAND

Dr John MCKOY
General Manager
Fisheries and Bioactives
National Institute of Watr & Atmospheric
Research Ltd
PO Box 14-901, Kilbernie, Wellington
Phone: +64 4 386 0300
Fax: +64 4 386 0572
Email: j.mckoy@niwa.co.nz

Dr Talbot MURRAY
Pelagic Project Leader
National Institute of Watr & Atmospheric
Research Ltd
PO Box 14-901, Kilbernie, Wellington
Phone: +64 4 386 0540
Fax: +64 4 386 0574
Email: t.murray@niwa.co.nz

Dr William EMERSON
Senior Advisor
Ministry of Fisheries
PO Box 1020, Wellington
Phone: +64 4 470 2650
Fax: +64 4 470 2669
Email: william.emerson@fish.govt.nz

Ms Emma WATERHOUSE
Senior Advisor
Ministry of Fisheries
PO Box 1020, Wellington
Phone: +64 4 470 2644
Fax: +64 4 470 2669
Email: emma.waterhouse@fish.govt.nz

Dr Kevin STOKES
Chief Scientist
New Zealand Seafood Industry Council
Private Bag 24901
Wellington
Phone: +64 4 385 4005
Fax: +64 4 385 4595
Email: kevin@seafood.co.nz

REPUBLIC OF KOREA

Dr Dae-Yeon MOON
Senior Scientist
Distant-water Fisheries Resources Division
National Fisheries R & D Institute
408-1 Shirang-ri, Kijang-gun
Busan 619-902
Tel: +82 51 720 2320
Fax: +82 51 720 2337
Email: dymoon@nfrdi.re.kr

Dr Doo-Hae AN
Distant-water Fisheries Resources Division
National Fisheries R & D Institute
408-1 Shirang-ri, Kijang-gun
Busan 619-902
Phone: +82 51 720 2325
Fax: +82 51 720 2337
Email: dhan@nfrdi.re.kr

Dr SungKwon SOH
Counsellor for Fisheries
Office of the International Cooperation
Ministry of Maritime Affairs and Fisheries
139 Chungjong-No 3, Seodaemun-Gu
Seoul 120-715
Phone: +82 2 3148 6995
Fax: +82 2 3148 6996
Email: sksoh@momaf.go.kr
sksoh@hotmail.com

CCSBT SECRETARIAT

PO Box 37, Deakin West ACT 2600
AUSTRALIA
Phone: +61 2 6282 8396
Fax: +61 2 6282 8407

Mr Brian MACDONALD
Executive Secretary
Email: bmacdonald@ccsbt.org

Mr Robert KENNEDY
Database Manager
Email: rkennedy@ccsbt.org

Ms Kozue LOGHEM
Administrative Officer
Email: sec@ccsbt.org

INTERPRETERS

Ms Saemi BABA

Ms Kumi KOIKE

Attachment B

AGENDA FOR MANAGEMENT PROCEDURE WORKSHOP

New Zealand, 7-9 & 13-15 April 2003
Chair: Andrew Penney
Technical Coordination: Ana Parma

Draft Terms of Reference

1. Evaluation of performance of initial candidate Management Procedures (MP) tested during first-year trials.
2. Produce final specification of operating models to be used for the second-year evaluations of MP, including estimation procedures for conditioning on past data, projection models and models used to simulate data.
3. Definition of a workplan and timetable.

Proposed Agenda

1. **Opening, Terms of Reference and Adoption of Agenda**
   Andrew Penny

2. **Overview of steps in the process of developing an MP for SBT**
   [where we are in the process]
   Ana Parma

3. **Performance of initial candidate Management Procedures from first-stage trials**

   3.1 Review of MP trial results.
   [expect papers from national scientists summarizing trial results]

4. **Reconsideration of Operating Models**

   4.1 Review of results of exploratory model fits done by national scientists using the generalized conditioning code distributed in January 2003 (i.e. sbtmod3.tpl). *Papers tabled on this.*
   4.2 Possible changes in the structure of the conditioning model and consideration of additional estimation trials to be performed/evaluated during the meeting. *Work will progress in parallel to the Indonesian Catch Review. We should aim at finishing with conditioning trials during the meeting.*
   4.3 Discussion of specific models used to simulate dynamics and future data, as well as other robustness tests. *Proposals for 2nd-stage OM discussed during the 7th SCC are documented in Attachment 4. Expect proposals for specific scenarios from national scientists.*
   4.4 Further technical issues pending resolution:

- fishing mortality specifications (Attach. 4, Rep. 7th SCC).
- treatment of bycatch in projections (Attach. 4, Rep. 7th SCC).
- etc.

4.4 Produce final specification of OMs.

5. Testing Management Procedures

5.1 Hierarchy of uncertainty levels to be considered for second-year trials.
5.2 Process for choosing weights assigned to alternative scenarios and for evaluating MP performance.
[Note: assignment of actual weights may be postponed until final conditioning trials are completed and results of initial candidate MPs are available- We need to discuss process and time table]
5.3 Feasibility of MCMC or other methods to approximate posterior distributions of state variables and model parameters.
5.4. Reconsideration of performance statistics to be used.

6. **Coding issues and Mechanics for conducting the evaluation tests**

6.1 Coding issues arising from users experience with simulation code.
6.2 Define a protocol for comparison of results (tables, graphic output, etc.).
6.3 Other issues.

7. Workplan and timetable

7.1. Further changes to conditioning and simulation codes introduced and code distributed.
7.2. Consultant and National Scientists estimate model parameters by conditioning to historical data and explore performance of candidate operating models and MPs.
7.3. Consultant updates draft documentation for operating models and process used for testing MP during final trials.
7.4. Meet intersessionally (SAG/SSC?) to (i) discuss results of conditioning, (ii) select final set of operating models and structure of robustness tests and (iii) assign weights to alternative hypotheses.
7.5. Distribute final simulation code and input parameters.
7.6. National Scientists conduct trials of MPs and document results.
7.7. Consolidate results for ease of comparison.
7.8. Hold Workshop III.

8. Other business

9. Finalization of meeting report

10. Close of meeting

11. Consultation with industry

Attachment C

Industry Consultation: CCSBT Management Procedures
2nd Meeting of Management Procedure Workshop
9:00-12:30 on 12 April 2003
Queenstown, New Zealand

1. Opening

1.1 Introduction of participants
1.2 Administrative arrangements

2. Adoption of Agenda

3. Introduction to the CCSBT Management Procedure

[Brief overview of the design and implementation of management procedures, for the benefit of industry representatives who were not able to attend the industry briefing held in 2002 (Ray Hilborn)]

4. Progress in Development of the CCSBT Management Procedure

[Feedback on development of the CCSBT management procedure to date, and schedule for completion of the procedure (Ana Parma)]

5. Brief Review of Evaluation of Initial Candidate Management Procedures

[Brief and understandable results and views of each members based on the initial candidate management procedures (MPs) from the first-stage trials (Each members' scientists). Overview by the Panel of results of member's testing of initial candidate management procedures, highlighting examples of how such procedures might be used (Ray Hilborn and John Pope)]

6. Feedback from Industry Representatives

6.1 What are the preferred objectives for long-term management of SBT, from the viewpoint of industry?

6.2 What does the industry consider to be useful (believable) fisheries indicators, and how might these be incorporated in MPs / decision rules?

6.3 What constraints would the industry like to see on things like inter-annual change in TAC resulting from a decision rule?

6.4 Industry comments on the results of initial testing of candidate management procedures (as presented in item 5).

7. Close of Consultation

Attachment D

List of Documents
2nd Management Procedure Workshop (MPWS)

（CCSBT-MP/0304/ ）

1. Draft Agenda of 2nd MPWS
2. Draft Agenda of the Industry Consultation for 2nd MPWS
3. List of Participants of 2nd MPWS
4. List of Documents of 2nd MPWS
5. (Australia) An Overview of Potential Graphical for Evaluating the Performance of Candidate Management Procedures for Southern Bluefin Tuna. P.Eveson and D. Ricard
6. (Australia) Results from Initial Testing of Some Candidate Management Procedures for Southern Bluefin Tuna. T. Polacheck, D. Ricard, P. Eveson, M. Basson and D. Kolody
7. (Australia) The Behaviour and Fit of Alternative Operating Model Specification for Testing the Performance of Southern Bluefin Tuna Candidate Management Procedures. T. Polacheck and D. Kolody
8. (Australia) Synthesising Performance of Candidate Management Procedures Across Different Operating Model Scenarios. T. Polacheck and D. Kolody
9. (Australia) Additional comments on Operating Model Specifications for Evaluation of SBT Management Procedures. D. Kolody and T. Polacheck
10. (Australia) SCALIA Simulation-Estimation Study Results Relevant to the CCSBT Management Procedures Development. D. Kolody and P. Jumpannen
11. (Japan) Results of the first exploration of potential Management Procedures based on the CPUE index. S.Tsuji, H.Kurota, N.Takahashi, H.Shono, T.Itoh and K.Hiramatsu,
12. (Japan) Some initial investigations of possible Management Procedures for SBT based upon age-aggregated production models. D.S.Butterworth and M.Mori.
13. (Fishing Entity of Taiwan) The first stage trial of performance statistics of initial candidate management procedures for southern bluefin tuna of CCSBT. S.H.Wang, M.H.Chen, C.L.Kuo.
14. (Advisory Panel) Management Prodecures for SBT
15. (Advisory Panel) Overview of Progress with Management Procedures

（CCSBT-MP/0304/BGD ）

（CCSBT-MP/0304/Info ）

1. (Australia) Estimating relative per capita SBT egg production as a replacement for SSB

（CCSBT-MP/0304/Rep ）

1. Report of the Ninth Annual Commission Meeting (October 2002)
2. Report of the Seventh Meeting of the Scientific Committee (September 2002)
3. Report of the Third Stock Assessment Group Meeting (September 2002)
4. Report of the First Meeting of Management Procedure Workshop (March 2002)
5. Report of the CPUE Modelling Workshop (March 2002)
6. Report of the Management Strategy Workshop (May 2000)

Classification of Documents List for 2nd MPWS

（**CCSBT-MP/0304/**　）
Documents to be discussed at the meeting and not yet given a document number of CCSBT, to be classified into this category.

（**CCSBT-MP/0304/BGD**　）
Documents to be discussed at the meeting and already given a document number of CCSBT in the previous meeting, to be classified into this category.

（**CCSBT-MP/0304/Info**　）
Documents not to be discussed at the meeting but presented for information and reference, to be classified into this category.

（**CCSBT-MP/0304/Rep**　）
The previous report of CCSBT to be classified into this category.

（**CCSBT-MP/0304/WP**　）
The draft of the document and report developed through the discussion of the meeting and documents of informal meetings, to be classified into this category.

Further development of operating model specifications

Summary

The following discussion is about defining a set of operating model scenarios to be used for MP development. A "baseline set" of operating models was selected to cover the range of uncertainty about SBT dynamics over three key axes: the steepness of the stock recruitment function, the rate of natural mortality and the uncertainty about plausible changes in catchability affecting CPUE in the future. The first two axes determine the productivity of the stock and have implications in the performance of management procedures. The third axis affects the reliability of the main index used to adjust TACs in the future.

The following table identifies the series of conditioning runs needed to specify the baseline set of operating models to be used for MP development. Each of those operating models will be run under two alternative assumptions about future trends in catchability: one scenario including only autocorrelated variability in CPUE (sub-model Q0) and the other including, in addition, a steady 1% increase per year in catchability (sub-model Q1).

	Main Uncertainty Axes	
Operating Model Scenario	**Steepness (*h*) (and ρ)**	***M* Vector**
H30M05	0.30	M05
H55M05	0.55	M05
H80M05	0.80	M05
H30M10	0.30	M10
H55M10	0.55	M10
H80M10	0.80	M10
H30M15	0.30	M15
H55M15	0.55	M15
H80M15	0.80	M15

Results from conditioning runs conducted with these models are summarized in Appendix 2. Naming conventions for the baseline set of operating models will be as above but adding Q0 or Q1 to indicate assumptions made about future trends in catchability (e.g., H30M05Q0 & H30M05Q1).

In addition to this baseline set, a series of operating models (scenarios) were identified to conduct "robustness tests". Also a conditioning run estimating M_0 and M_{10} and h bounded between 0.5 and 0.6 will be included to implement MCMC (specifications provided under Agenda item 5.1). During the workshop, a detailed electronic working paper (WP04) was distributed that contains a large number of figures for evaluating alternatives.

Stock-recruitment issues

Steepness

In the following trials, the value of steepness (*h*) was estimated conditioned on the three vectors of natural mortality selected for the default trials (discussed later).

H__M05	estimated	M05
H__M10	estimated	M10
H__M15	estimated	M15

The estimate of h increased with increasing values of natural mortality from 0.22 to 0.52. Higher values of h, although favored by the likelihoods, were heavily penalized by the stock-recruitment relationship assumed in conditioning, which has no autocorrelation in the stock-recruitment residuals. When h=0.8 was assumed, the recruitment residuals were highly autocorrelated (ρ between 0.6 and 0.7).

Discussion on alternative ranges for steepness proposed values of 0.3, 0.6, and 0.8. Compared to previous selections, this replaced 0.9 by 0.8, because the evidence for a value as high as 0.9 was considered weak based on model fits to the data. An alternative proposal of 0.3, 0.55, and 0.8 to center the range.

The issue of "reverse engineering" (the notion that Management Procedures can be adjusted/designed to perform well for specific values at the extreme of the productivity range) was presented. This was noted as a possible problem in that the MP may perform well for the scenarios picked, but poorly in practice for the intermediate (and potentially interacting) values.

A proposal of having more values in the intermediate range was expressed to help resolve this problem. Also, Hierarchy 4 (with the MCMC analyses) would help resolve this potential problem.

Conditioning

The workshop agreed that the values for the trials should minimally include 0.3, 0.55, and 0.8.

Projections

Same as in conditioning runs.

Depensation

The workshop decided not to explore depensation quantitatively since there was no basis (in the data) for deciding on a level of spawning biomass below which depensation would or could occur. It was noted that if the spawning biomass remained above the lowest observed level, the probability of depensation occurring was likely to be low. This issue should be noted when presenting results on robustness to the Commission.

Autocorrelation of stock-recruitment residuals

Based on the correlation between estimates of h, ρ and recruitment variability σ_R discussed above, the following values were recommended.

Conditioning

Same as previous (ρ=0)

Projection

For Hierarchy 3:

h=0.30, set ρ=0.3,

h=0.55, set ρ=0.6,

h=0.80, set ρ=0.7.

For Hierarchy 4:

ρ as empirical estimate for the years 1965-1995.

Treatment of recruitment for recent years (e.g., 1995-2001)

Projection

Estimated values for these years are determined by the penalty in the stock-recruitment function because there is no information to estimate year-class strength for these years. The workshop proposed to replace these point estimates by recruitment values simulated using the same model used for future recruitments. Note that these simulated recruitments need to be propagated up to year 2001 subtracting natural mortality and the historical catches. The age-specific exploitation fraction over all fisheries will be bounded at 0.5. If the bound is exceeded a new random recruitment series will be generated. This issue will require some complications in coding since the conditioning model uses 6 fisheries while the projection model uses 4 fisheries.

Treatment of σ_R

Conditioning

Based on results of Run Set 1, estimate σ_R but with a lower bound of 0.40.

Projections

Use empirical estimates for 1965-1995 but bound at 0.40 (for both hierarchy 3 & 4).

Trends in carrying capacity

Conditioning

A suggestion was made that one reason many assessment results show a low value of steepness may be attributed to changes in carrying capacity. It was suggested that the Aleutian low (i.e., large-scale climate/oceanographic regime shifts) may affect spawning grounds for SBT (but in a way that is not directly obvious). The shift was identified in 1977 and the suggestion was made to apply a different value for R_0 (stock-recruitment scale parameter), which would be estimated in the model-fitting process. Results of this conditioning trial resulted in an estimate of h=0.57 and a value of R_0 about half the value estimated for the earlier years. The workshop decided to maintain this run as a robustness test. Parameter values related to MSY, depletion, etc. will be computed using the set of parameters estimated for the most recent period.

Projections

Use stock recruitment parameters estimated for the most recent period and values of ρ and σ_R as specified for the baseline sets.

Fecundity

At the previous SAG, a suggestion was made to add a factor to reflect the notion that the effective reproductive potential may be higher (given the same size) of older SBT. Information paper CCSBT-MP/0304/Info01 presented some analyses on this effect.

The workshop concluded that a robustness test on fecundity was to add 0.5 to the exponent of the length-to-fecundity relationship. The formula used to compute spawning biomass specified at the 7th SC meeting (attachment 4 of report),

$$S_y = \sum_{a=1}^{m} b_a \left(w_{y,a}^1\right)^{\delta} N_{y,a} \tag{2}$$

incorporates size effects on spawning potential by changing the value of the parameter δ. A value equal to 1.17 was selected to achieve an effect equivalent to adding 0.5 to the power of the length-weight relationship in a robustness test. The purpose of this test is to evaluate whether the issue is worth reconsidering using realistic values derived from biological studies.

Length frequency weighting

CCSBT-MP/0304/07 presented time-varying relative weights to apply to effective sample sizes for the length frequency data by fishery. The workshop agreed that this approach was more appropriate than the current defaults and proposed a set of tests (Run Set 1) combining the issue of σ_R with the effect of length frequency weighting.

Conditioning

Use the provided estimates of sample sizes evaluated in Run Set 1, as specified in CCSBT-MP/0304/07 (pg. 13) with maximum effective sample sizes equal to:

LL1	LL2	LL3	LL4	IND	SF
500	50	300	300	300	240

Projections

For the 1st stage trials, age and length frequency data were generated based on the assumed sample size used in the conditioning. Using the length frequency weighting above, the sample size assumed for the projections would be LL1=500, LL2=50, IND=300 and SF=16, as in the last year of conditioning. The value for the Indonesian fishery seems a bit high while the surface fishery seems a bit low. The large value for the Indonesian fishery was chosen because otolith collections are large in this region. The sample size for the surface fishery was increased to 30 resulting in:

LL1	LL2	IND	SF
500	50	300	30

At present it is not clear how much use of age-composition data the management procedures will make. The concern over the high effective sample size assumed for the Indonesian fishery may be irrelevant if management procedures do not use these data. The workshop decided to reconsider the issue based on results of the next series of MP trials.

Selectivity

Conditioning

The data strongly suggests a domed-shaped selectivity in the Indonesian longline fishery. The mechanism for this is unclear and is perhaps an artifact related to changes in growth.

CCSBT-MP/0304/07 demonstrates the confounding of the effect of the selectivity curvature penalty and recruitment variability.

Projections

If management procedures use age-composition data, randomness in future selectivities will need to be introduced, otherwise the simulated data will be unrealistically informative. Random-walk processes as assumed in conditioning are not appropriate because they may result in the selectivities wandering off into implausible regions. Because there are interactions between selectivity variability and the information content of CPUE data, the workshop decided to introduce variability into the selectivity for LL1. The following lognormal formulation was proposed (note that first subscript corresponds to fishery *f*=1):

$$s_{1,a,y} = s_{1,a,2000} e^{\varepsilon_{a,y}} \quad \text{for} \quad a_1^{\min s} \geq a \geq a_1^{\max s} \quad \text{where} \quad a_1^{\min s} = 2, a_1^{\max s} = 17$$

$$\varepsilon_{2,y} = \eta_{2,y}$$

$$\varepsilon_{a+1,y} = \rho_{\text{sell}}\, \varepsilon_{a,y} + \sqrt{1-\rho_{\text{sell}}{}^2}\, \eta_{a,y}, \qquad \text{where} \quad \eta_{a,y} \sim N(0, 0.2^2) \quad \text{and} \quad \rho_{\text{sell}} = 0.7$$

and selectivities will only change every four years so that $s_{1,a+3,y} = s_{1,a,y+2} = s_{1,a,y+1} = s_{a,y}$

For the Australian surface fishery, lognormal variability combined with targeting on age 3 will be assumed as follows:

Define

$$P_{3,y} = \frac{N_{3,y}}{\sum_{a=1}^{5} N_{a,y}} \quad \text{and} \quad \overline{P}_3 = \frac{1}{10}\sum_{y=1991}^{2000} P_{3,y}$$

If $P_{3,y} \geq \overline{P}_3$

$$s_{6,a,y} = s_{6,a,2000}\, e^{\varepsilon_{6,a,y}} \qquad \text{for} \quad a = 1,2,3,4,5 \qquad \text{where} \quad \varepsilon_{6,a,y} \sim N(0, 0.1^2)$$

Otherwise, increase selectivity of age 3:

$$s_{6,3,y} = s_{6,3,2000}\, e^{\varepsilon_{6,a,y}} \left(1 + 0.5\frac{\overline{P}_3 - P_{3,y}}{\overline{P}_3}\right)$$

$$s_{6,a,y} = s_{6,a,2000}\, e^{\varepsilon_{6,a,y}} \qquad \text{for} \quad a = 1,2,4,5$$

The workshop discussed results obtained implementing this model in simulations and recommended that a robustness test be conducted assuming constant selectivity in projections to evaluate if the models above lead to implausible combinations of selectivity and abundance. To help evaluate this problem the group requested that the highest age-specific exploitation fraction for LL1.

$$\max_a \left[\frac{C_{1,a,y}}{\frac{s^*_{1,a,y}}{\max(s^*_{1,i,y})} N_{a,y}} \right]$$

be generated as output in addition to the overall exploitation fraction by fishery provided in the current version of the projection code.

Selectivity will be assumed to remain constant for the other fisheries unless management procedures utilize age-composition data. In that case, variability will be introduced for the final stage of trials.

Natural mortality

Conditioning

It was noted that the value of juvenile mortality (M_0) estimated for the first-stage trials was low compared to independent estimates from multiple tagging of cohorts of $M_1 = M_2 = 0.4$. Also, the model fitting procedure did not make use of the tagging information (by cohort) feeding directly into these estimates.

Furthermore, sensitivity analysis reported in paper CCSBT-MP/0304/07 showed that there is confounding between the steepness parameter of the stock-recruitment relationship and M_0.

The meeting agreed to use the following for conditioning operational models, with linear interpolation for intermediate values.

M_0	M_6	*M10*
0.5	0.2	0.15
0.4	0.2	0.10
0.3	0.2	0.05

Resulting M vectors are:

Age	0	1	2	3	4	5	6	7	8	9	≥10
M15	0.50	0.45	0.40	0.35	0.30	0.25	0.20	0.19	0.18	0.16	0.15
M10	0.40	0.37	0.33	0.30	0.27	0.23	0.20	0.18	0.15	0.13	0.10
M05	0.30	0.28	0.27	0.25	0.23	0.22	0.20	0.16	0.13	0.09	0.05

Robustness tests:

M_0	M_6	M_{10}
0.5	0.2	0.05
0.3	0.2	0.15

Projections

Same as in conditioning.

Growth

Conditioning

Concerns were raised about lack of information on growth rate in the early years of the fishery coupled with the low numbers of large fish taken in that period. Paper CCSBT-MP/0304/07 explored sensitivity to changing the lower size of the plus-group from 186 in the reference case to 150. The possibility of using a lower size for the plus-group as a default in baseline operating models was considered. A test (Run set 3) using a lower size for the plus-group (162 cm) was run using a range of maximum ages for which selectivity is estimated. The workshop concluded that the default value of 186 should be maintained and that a minimum length for the plus-group equal to 162 (test G2) should be explored as a robustness tests.

The workshop discussed that having a method to specify alternative somatic growth relationships during different time frames would be useful. The conditioning code may be generalized to explore alternative growth scenarios in the early years. This modification to the operating model will be made if time is available.

Projections

The workshop discussed the possibility of density-dependent growth but considered that it was not likely that abundance would increase to levels where density-dependence would have a noticeable effect within the next 20 years. A decision was made to hold the length-age relationship constant for the projection model.

CPUE

Catchability Model

Conditioning

The following model was proposed at the 7th SC meeting to link abundance with expected CPUE.

$$CPUE_y = q_y \tilde{N}_y^{\varpi} \left(1 + \beta \left(\frac{E_y - E_{2000}}{E_{2000}} \right) + \gamma \left(\frac{E_y - E_{2000}}{E_{2000}} \right)^2 \right)$$

$$\text{where} \quad \tilde{N}_y = \sum_a \left(\frac{s_{LL1,y,a}}{\frac{1}{(a_2 - a_1 + 1)} \sum_{j=a_1}^{j=a_2} s_{LL1,y,j}} \right)^{\psi} N_{y,a} \qquad (1)$$

$$\text{and} \quad E_y = \frac{C_{LL1,y}}{CPUE_y}$$

In this model, parameters $\beta, \gamma, \varpi, \psi, q_y$ and a_1 and a_2 are specified by the user. Current default values are: $\beta = 0, \gamma = 0, \omega = 1, \psi = 1$, $a_1 = 4$, $a_2 = 30$.

Parameters β and γ : changing the values of β and γ had little or no effect in the conditioning (CCSBT-MP/0304/07)

Parameter ω : the workshop proposed a robustness test of ω=0.5 for both conditioning and projections.

Parameters a_1 and a_2 (age range to standardize selectivity for CPUE predictions): the workshop recommended a range from a_1=4 and a_2=18. The rational for changing a_2 from 30 to 18 was that selectivities estimated for ages 19-30 are very low. The effect of this change was shown to be insignificant (results of Run Set 2) except for the estimated selectivity for LL1 in the most recent period. A decision was made to keep a_2=30 and explore two age ranges as robustness tests: [a_1=4 as a_2=18] and [a_1=8 as a_2=12].

Parameter ψ: the workshop recommended a value of 0.5 as a robustness test for both conditioning and projections. This corresponds to the less effective "transfer" of effective effort between different cohorts as targeting changes over time.

Projections

Same as in conditioning.

Trends in efficiency

Conditioning

The analyses looking at historical CPUE trend based on a linear increase (CCSBT-MP/0304/07) showed that no improvement was obtained by imposing this relationship.

Suggestions were made that catchability might best be modeled as a break-point (two periods, pre and post GPS/plotting). This is supported somewhat with the residual pattern. Japan may have some information that will improve the location (in time) of this breakpoint. These issues were further discussed by the CPUE working group.

The CPUE working group (Appendix 5) proposed to conduct a robustness test assuming a linear increase in catchability of 1% per year throughout the whole time series. As an additional robustness test, the workshop agreed to consider a scenario based on assuming a 20% increase in catchability between 1988 and 1990.

Projections

The workshop discussed the baseline assumptions used to simulate CPUE. It was decided that all operating models in the baseline set should generate CPUE using autocorrelated trends in catchability, as estimated from conditioning. The estimates of correlation and variance of CPUE residuals was examined (see Table in Appendix 5) and the following values were recommended:

Autocorrelation: use empirical estimate based on the entire time series.

Sigma: use a value of 0.2 or the empirical estimate for the entire time series, whichever is largest.

In addition to this random variability in q, the workshop considered that the baseline set should also allow for the possibility in some scenarios that efficiency increased in the future. It was decided to include a third axis of uncertainty in the baseline set, namely, the rate of increase in future efficiency. A range between zero (constant q except for autocorrelated variation) and a 1% increase per year was considered appropriate. The workshop chose to include in the baseline set of operating models the two extremes of this range.

As a robustness test, the linear increase will be evaluated jointly with the assumption of $\omega = 0.5$.

Selections of CPUE series

Conditioning

Conditioning on median and nominal was recommended from the CPUE working group. Based on the fact that the series were fairly similar, the workshop recommended using the same as the 1st stage conditioning of the operational models, viz. median, which showed lesser variance.

Tag data

The analyses changing the reporting rate assumptions and the emphasis/weighting on the tag data affected model results only slightly. The workshop recommended using the existing reference case settings for conditioning the operational model.

Errors in catches

Conditioning

This was highlighted as a potential issue for conditioning operating model. The workshop suggested that analyses on the impact of errors in total catch would be worth pursuing in robustness tests. Different hypotheses about errors in estimated catches could be implemented by using different input catch data during conditioning. The specifics will be determined at the SAG meeting.

Projections

- When errors in historical catches are allowed in the conditioning, only reported catches will be assumed known by the MPs. In other words, the MP will not know the “true” historical catch vectors used for conditioning.

- Simulated future catches may allow for different levels of errors as well. Specific hypotheses will be determined at the SAG meeting.

Bycatch and Unregulated fisheries

Projections

The workshop agreed that it would be important to conduct robustness tests for different scenarios that assume different rates of unregulated fishing for the four fisheries identified in projections. The specific hypotheses will be determined at the next SAG. Generalized code will be developed prior to the SAG. This code will allow control on future unregulated F levels for each of the 4 fisheries. The MP will only control the regulated catch, which will be added to the unregulated catch.

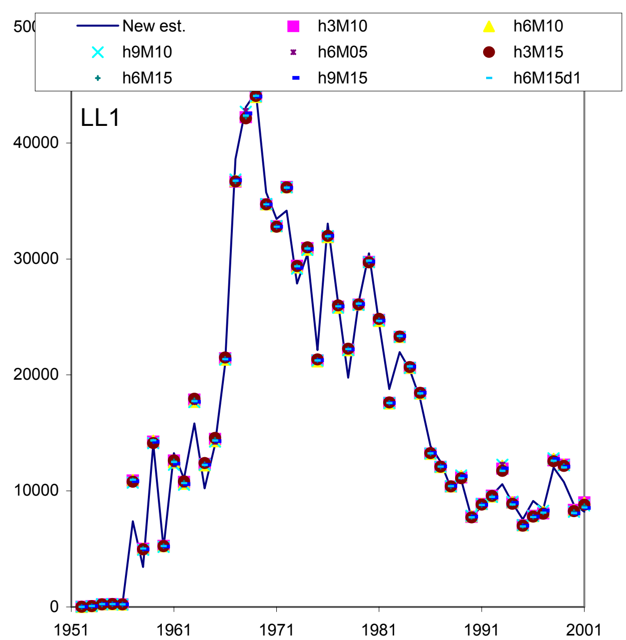
Catch biomass consistency

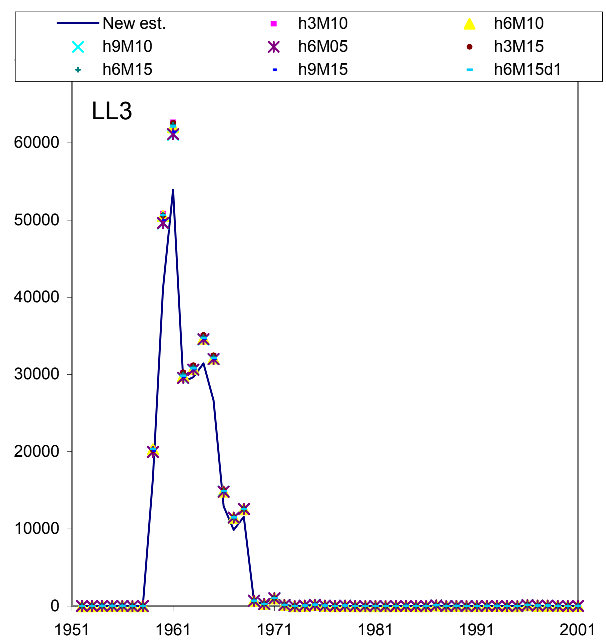
Catch estimates used in MP operating model conditioning fits for LL1 and LL3 fisheries.

Catch estimates for the LL1 and LL3 fisheries, which are fitted in the operating model, have been expressed in terms of the total number of SBT caught. As a result, the total mass of SBT that are caught in all fisheries is different for each operating model. This was considered unsatisfactory for the MP testing.

A small group met and decided on an alternate approach for fitting the LL1 and LL3 catch data. The catch in mass for these fisheries will be calculated as the sum of the product of the observed numbers-at-length and the weight-at-length (as used in the MP code). For the 2001 fishing season, for which we do not yet have length frequency data, the average length frequency for the previous 2 years (ie. 1999 and 2000 fishing seasons) will be used. Thus, all future fits of the operating model to historic data will be based on catch biomass estimates for all fisheries.

The following figures compare the catch biomass estimates obtained with the new method to those obtained from previous versions of the operating model.





An issue related also to catch consistency between the tests and the actual catches to be used when the procedure is implemented in reality was discussed. To help understand the differences between fisheries categories and seasons assumed in the model and the TAC calendars a document was prepared by the secretariat (Appendix 6)

Conditioning

The working group recommended to condition the models by fitting to historical catches in biomass for all fisheries. Catches in biomass will be computed from the observed catch in numbers and the size compositions using a length-to-weight conversion.

Issues about Management Procedures

Catch split by fisheries

The projection code will provide the capability for adjusting the catch split by fishery.

Year-to-year changes in TACs

The following standards for MP comparison were chosen.

- minimum change: 100 tons.
- maximum change: 3000 tons.
- frequency of changes: 1 year.

Scientists are encouraged to explore performance under different constraints.

Other technical issues

Formulation of fishing mortality specifications

The report of the 7th SC meeting (attachment 4) discussed the problem associated with the fishing mortality formulation used in the first-stage operating models. A finite-rate formulation was used, with a maximum age-specific exploitation rate of 0.99. When the bound is exceeded, the catch at age is reduced to meet the bound but the exploitation rates for other ages are nor adjusted. This leads to unnecessary catch reductions in cases when the TAC could be taken by increasing selectivities of other ages. Three different alternatives were proposed to deal with this problem. Alternative 2 (“Finite harvest rates and selectivity adjustments”, specified in Appendix 4) was favored. This formulation was found to perform well and it avoided a major restructuring of the conditioning code.

Equation used to compute exploitation fraction in projections

Compute exploitation fraction as before, using selectivities standardized with respect to the maximum. When selectivities are adjusted using the new formulation in Appendix 4, then use adjusted selectivities $s^*_{f,a}$ to compute the exploitable biomass.

Data for 2001

- Catch: use actual catches in biomass.
- CPUE and age-compositions: simulate data from operating model using same algorithms used for 2002 and later years. The conditioning code will be modified to pass the expected values to the projection code.

Lags in data availability

The issue about what constitute realistic lags in data availability was discussed over email prior to this meeting. Based on the normal schedule of events for setting SBT catches, the current projection code assumes that when a TAC for year *y* is determined, the following data are available:

- Catches up to year *y*-2
- TAC up to year *y*-1
- CPUE up to year *y*-2
- Age-composition data up to year *y*-2

All data up to year 2000 correspond to actual historical data. In addition the actual catch up to 2001 is also available. The most recent data up to year *y*-2 is simulated from the operating model.

Appendix 1. Exploratory conditioning runs

Run set 1 (analyses done on Wednesday)

Specifications

M_{10}=0.1, 3 values for h use:

1) σ_R=0.4
2) time-varying length freq weight (from CCSBT-MP/0304/07)
3) both 1) and 2)

This amounted to 9 models from which we expected to select one of the 1) - 3) options above.

The maximum sample sizes for fisheries 1-6 used were: 500, 50, 300, 300, 300, 240. These were multiplied by the relative effective sample size presented in CCSBT-MP/0304/07.

Results

Results of these runs are presented in WP03.

The workshop agreed that the time-varying effective sample sizes specified above be used. For σ_R, the workshop agreed that this value be estimated but with a minimum bound of 0.40. This specification was agreed for conditioning the operating models.

Run Set 2

Parameters a_1 and a_2 (age range to standardize selectivity): The workshop recommended that the age range used to standardize selectivity for CPUE predictions be changed from 4-30 to 4-18 to exclude ages with very low estimated selectivities

Specifications

Using final specs from Run Set 1, run tests using a_1=4 and a_2=18 (equation (1)) for the three levels of steepness and for the middle M vector.

Upper limit of age range	***h***	***a*₂**
References		
H30M10	0.30	30
H55M10	0.55	30
H80M10	0.80	30
H30M10_a18	0.30	18
H55M10_a18	0.55	18
H80M10_a18	0.80	18

Results

Changing the age range from 4-30 to 4-18 had virtually no effect on the estimates of spawning biomass and recruitment. The most noticeable effect was on the estimates of selectivity for the LL1 in the most recent period. The workshop decided to maintain the current default values of a_2=30 and use a_2=18 and a_2=12 as robustness tests.

The key results are summarized in the following table:

	Name:	H30M10_a18	H55M10_a18	H80M10_a18	H__M10_a18
ρ	1931-2001	0.580	0.635	0.716	0.600
	1965-1995	0.400	0.545	0.708	0.452
	Model SigR	0.400	0.400	0.488	0.400
σ_R	1931-2001	0.360	0.392	0.486	0.370
	1965-1995	0.267	0.306	0.392	0.279
CPUE	1969-2000	0.359	0.434	0.448	0.392
Corr.	1990-2000	0.524	0.571	0.577	0.548
	Steepness	0.300	0.550	0.800	0.381
Likelihoods:	Total	765.17	769.20	776.25	767.34
	LL1	256.85	257.51	256.39	256.94
	LL2	49.73	50.00	50.07	49.82
	LL3	103.81	101.94	101.09	103.05
	LL4	192.08	190.81	185.24	191.68
	IND	39.91	39.05	39.00	39.51
	SURF	100.65	99.87	99.03	100.38
	CPUE	-49.17	-46.01	-45.34	-47.92
	Tags	11.66	10.82	10.80	11.28
	Sel.Ch	38.43	38.51	39.11	38.36
	Sel.sm	57.42	57.71	56.58	57.46
	Sg.R	-36.20	-31.01	-15.73	-34.64
	Prior on *h*	0.00	0.00	0.00	1.42

Run Set 3

Specification

Using final specs from Run Set 2, run a test using a lower size for the plus-group (162 cm compared to 186 cm in reference case). For this to be done appropriately, the range of ages over which selectivities are estimated has to be changed. Run test using the intermediate vector of mortality-at-age (M10Q0) and the three values of steepness (*h* = 0.3, 0.55, 0.8).

For fisheries 1-4: use the following age-ranges for selectivities with 162 cm as the plus-group specification:

Fishery	1 (Japan LL1)	2	3	4
H55M10_G1	2-17	2-9	2-17	8-22
H55M10_G2	2-12	2-9	2-12	8-12
H55M10_G3	2-14	2-9	2-14	8-14
H55M10_G4	2-16	2-9	2-16	8-16

And similarly for *h*=0.30, *h*=0.80 and *h* estimated. Note that the G1 test corresponds to the age range used for the reference case.

Results

The key results are summarized in the table below. Although lowering the minimum size of the plus group decreased the magnitude of the recruitment drop prior to the start of the fishery, the treatment was not considered adequate because it really did not properly account for possible errors in the growth model used in the early years and it resulted in loss of information. The workshop also noted that a large fraction of the recruitments estimated in case G2 were below the stock-recruitment function. A decision was made to use the assumptions in G2 as a robustness test.

(Note, these runs were done using the version of code as of April 11th)

	Name	H30M10_G1	H30M10_G2	H30M10_G3	H30M10_G4	H55M10_G1	H55M10_G2	H55M10_G3	H55M10_G4	H80M10_G1	H80M10_G2	H80M10_G3	H80M10_G4
ρ	1931-2001	0.601	0.506	0.573	0.601	0.598	0.570	0.578	0.596	0.629	0.678	0.600	0.628
	1965-1995	0.395	0.301	0.381	0.395	0.428	0.344	0.427	0.427	0.540	0.591	0.554	0.544
	Model SigR	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.412	0.434	0.400	0.412
σ_R	1931-2001	0.381	0.331	0.366	0.382	0.384	0.358	0.375	0.383	0.411	0.435	0.392	0.411
	1965-1995	0.269	0.254	0.261	0.269	0.276	0.258	0.272	0.276	0.308	0.328	0.306	0.310
CPUE	1969-2000	0.423	0.409	0.421	0.421	0.429	0.447	0.420	0.422	0.301	0.460	0.334	0.307
Corr.	1990-2000	0.567	0.560	0.571	0.566	0.554	0.582	0.548	0.549	0.416	0.587	0.449	0.424
	Steepness	0.300	0.300	0.300	0.300	0.550	0.550	0.550	0.550	0.800	0.800	0.800	0.800
	Total	676.38	713.27	685.63	675.23	674.82	721.05	682.76	673.48	678.97	732.51	686.23	677.80
	LL1	235.26	245.56	234.40	234.61	237.33	248.75	235.55	236.71	240.66	249.51	238.79	239.86
	LL2	49.25	49.14	49.23	49.25	49.44	49.51	49.43	49.45	49.67	49.82	49.75	49.69
	LL3	88.35	100.55	88.11	88.15	85.87	99.00	84.71	85.70	84.01	97.35	83.41	83.96
	LL4	138.72	150.96	147.92	138.85	136.83	152.84	144.60	137.03	136.02	152.74	143.84	136.11
	IND	39.81	41.09	39.52	39.76	39.40	41.31	38.90	39.37	39.45	41.12	39.00	39.53
	SURF	100.58	100.36	101.14	100.59	99.88	99.63	100.43	99.86	98.98	98.87	99.83	98.99
	CPUE	-46.74	-46.72	-46.85	-46.78	-45.17	-44.86	-45.52	-45.37	-47.38	-44.10	-46.88	-47.24
	Tags	12.08	11.99	12.05	12.09	11.15	11.09	11.15	11.16	10.74	11.05	10.72	10.77
	Sel.Ch	33.95	36.53	32.89	33.55	34.25	36.51	33.09	33.85	35.88	36.50	34.04	35.23
	Sel.sm	57.86	64.47	62.36	57.74	58.24	63.82	64.26	58.16	58.54	63.19	64.55	58.55
	Sg.R	-32.74	-40.65	-35.14	-32.60	-32.41	-36.55	-33.83	-32.44	-27.61	-23.54	-30.88	-27.65

Appendix 2. Default specification for baseline

Summary of changes relative to the 1st operating model specifications

Based on analyses conducted at the workshop, the following changes to the 1st set of operational model specifications were agreed upon:

Conditioning

- Year-specific effective sample sizes.
- Set the lower bound in the estimation of σ_R to 0.40.
- Use a set of fixed natural mortality vectors (3).
- Fit models to the estimated catch in biomass for all fisheries (this has not been used for the results in this document).

Projections

- Use stochastic selectivities for LL1 and the surface fishery.
- Simulate recruitments (starting in 1995) using an autoregressive process with σ_R and ρ as specified in this document.
- Different sample sizes used to simulate age-composition data.
- Simulate CPUE with autocorrelated residuals with σ_{CPUE} and ρ_{CPUE} as specified in this document

Results

The main results for the 12 baseline specifications from the MP/0304 is shown in the following figures and table.

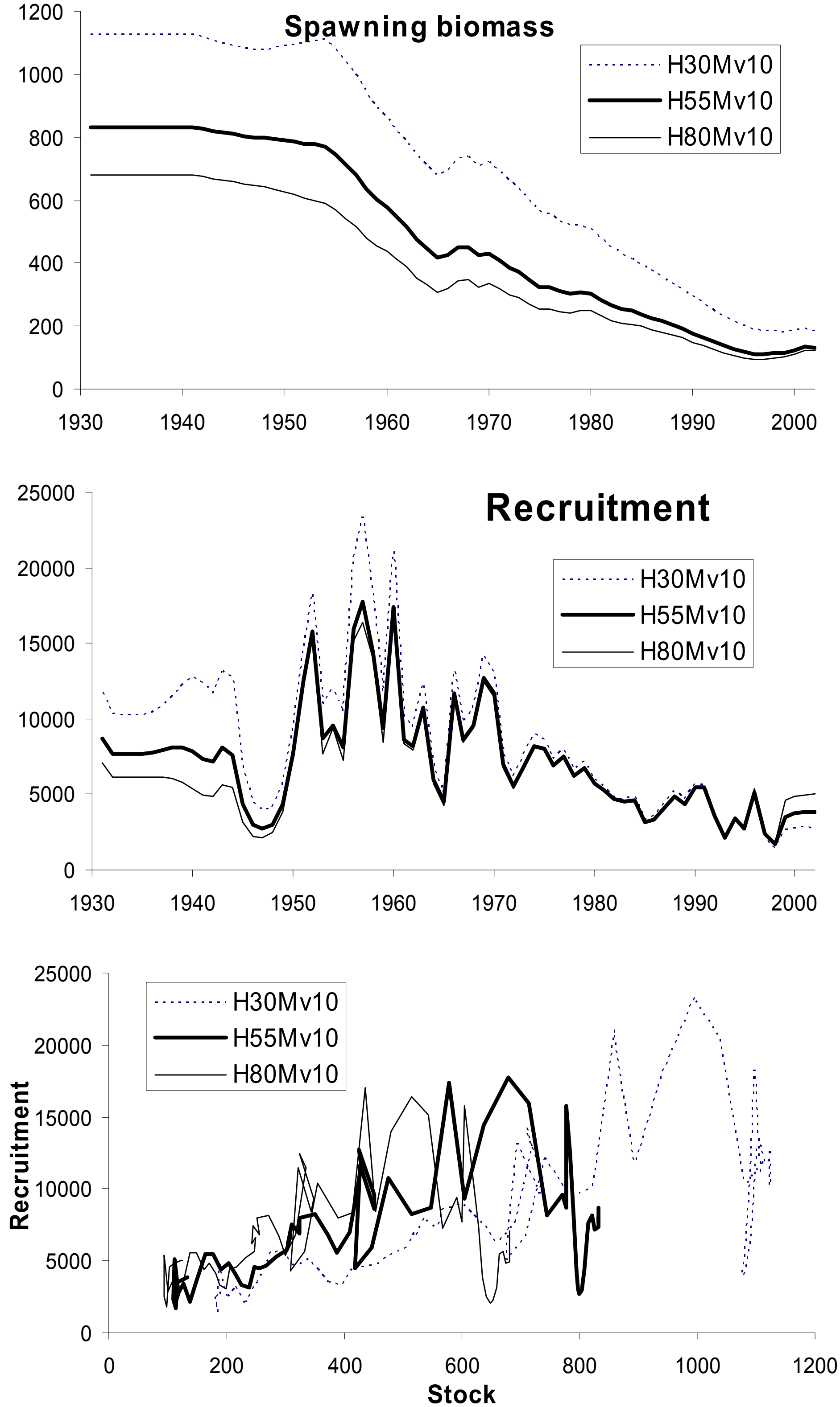


Figure 1. Default specification comparison over different steepness values (using an intermediate vector of natural mortality).

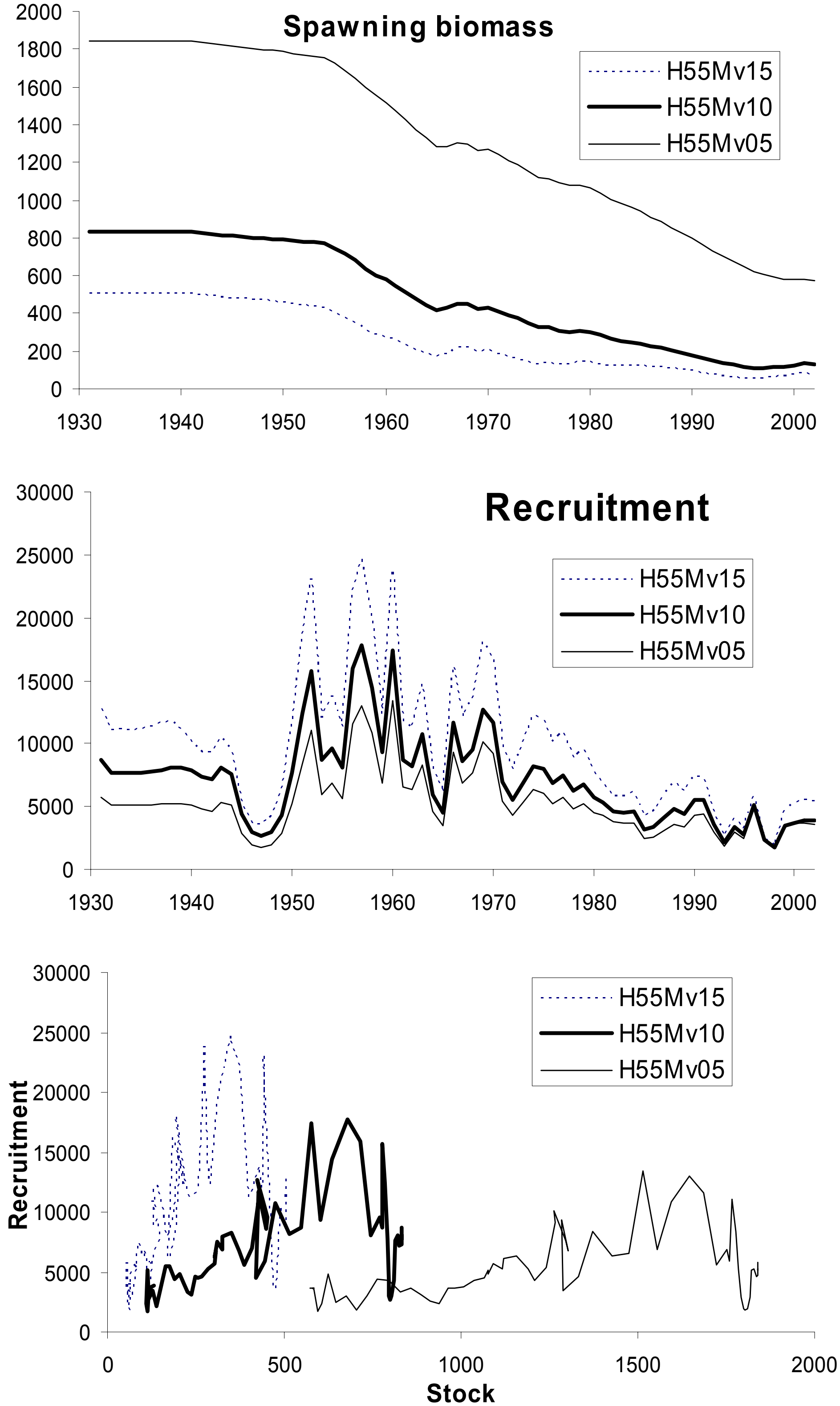


Figure 2. Default specification comparison over different natural mortality vectors (using an intermediate value of steepness).

Attachment E

Attachment E

Note: the following runs were done fitting total catches in biomass by fishery (the new default established during the workshop).

	Name	H30M05	H30M10	H30M15	H55M05	H55M10	H55M15	H80M05	H80M10	H80M15	H__M05	H__M10	H__M15
ρ	1931-2001	0.636	0.582	0.581	0.687	0.637	0.674	0.718	0.701	0.731	0.623	0.615	0.666
	1965-1995	0.551	0.381	0.394	0.660	0.520	0.606	0.719	0.665	0.735	0.521	0.462	0.600
	Model SigR	0.400	0.400	0.400	0.429	0.400	0.432	0.472	0.461	0.519	0.400	0.400	0.422
σ_R	1931-2001	0.385	0.360	0.366	0.430	0.391	0.434	0.475	0.460	0.518	0.377	0.377	0.424
	1965-1995	0.310	0.265	0.271	0.359	0.300	0.338	0.400	0.365	0.422	0.300	0.283	0.334
CPUE	1969-2000	0.544	0.401	0.495	0.592	0.468	0.250	0.585	0.483	0.187	0.518	0.447	0.259
Autocorr.	1990-2000	0.672	0.537	0.351	0.699	0.584	0.306	0.692	0.585	0.284	0.656	0.572	0.308
σ_{CPUE}	1969-2000	0.167	0.138	0.157	0.182	0.153	0.128	0.180	0.158	0.123	0.161	0.147	0.129
	1990-2000	0.248	0.193	0.167	0.267	0.216	0.163	0.262	0.222	0.163	0.239	0.208	0.163
	Steepness	0.300	0.300	0.300	0.550	0.550	0.550	0.800	0.800	0.800	0.251	0.435	0.544
	Total	777.07	768.13	780.65	781.50	770.29	777.32	784.12	775.66	780.60	779.68	769.53	778.02
Like-	LL1	256.86	256.09	256.90	256.18	255.61	258.59	255.54	254.76	255.22	257.01	255.64	258.74
lihoods	LL2	50.04	49.76	49.80	50.18	50.02	49.95	50.20	50.13	49.90	49.99	49.90	49.99
	LL3	103.00	104.15	104.72	101.61	102.20	102.08	101.19	100.86	100.90	103.43	102.93	102.18
	LL4	189.94	192.85	195.52	187.44	191.82	192.40	185.13	187.52	187.26	190.33	192.31	193.29
	IND	41.92	40.42	40.19	41.44	39.72	39.36	41.25	39.57	39.35	42.12	39.92	39.32
	SURF	99.93	100.58	100.54	99.25	99.81	99.37	98.94	98.95	98.71	100.10	100.14	99.46
	CPUE	-41.25	-47.35	-43.32	-38.60	-44.12	-49.78	-38.96	-43.08	-50.93	-42.52	-45.32	-49.64
	Tags	11.52	12.73	16.18	11.17	11.71	14.49	11.21	11.63	14.38	11.69	12.04	14.55
	Sel.Ch	38.19	37.85	38.08	38.43	37.53	38.54	38.73	37.88	39.55	38.17	37.57	38.53
	Sel.sm	59.10	57.19	56.88	58.77	57.14	56.01	58.30	57.02	57.41	59.15	57.09	56.92
	Sg.R	-32.19	-36.14	-34.84	-24.36	-31.15	-23.68	-17.40	-19.58	-11.15	-33.38	-33.49	-25.39
	Prior on *h*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.61	0.80	0.09

Appendix 3. Robustness tests

These will be run with h=0.3 and 0.55, M set at the intermediate vector M10, and no linear increase in catchability except when noted. Other assumptions are as in the baseline set. Note: naming convention is such that the text to the left of the "_" (underscore) identifies the specification of the baseline OM, whereas the text to the right represents the robustness test specification. These names are listed below in **boldface** text.

Catchability/CPUE model

(14 tests)

- ψ = 0.5 for conditioning and projections (default is the ψ= 1)

  H30M10Q0_Psi & H55M10Q0_Psi

- Age range used for standardizing selectivity function for CPUE predictions: robustness test using a_1=4 and a_2=18, and

  H30M10Q0_a18 & H55M10Q0_a18

- a_1=8 and a_2=12.

  H30M10Q0_a12 & H55M10Q0_a12

- ω = 0.5 for both conditioning and projections (compared to default ω = 1)

  H30M10Q0_Omega & H55M10Q0_Omega

- linear increase in catchability of 1% per year in conditioning and projections.

  H30M10Q1_q1 & H55M10Q1_q1

- linear increase in catchability of 1% per year and ω = 0.5 in conditioning and projections.

  H30M10Q1_q1Omega & H55M10Q1_q1Omega

- allow for a 20% increase in catchability between 1988 and 1990, constant in projections.

  H30M10Q0_q20 & H55M10Q0_q20

Fecundity

(2 tests)

Set δ = 1.17 in the computation of spawning biomass (equation 2) in conditioning and projections

H30M10Q0_Fec & H55M10Q0_Fec

Natural mortality

(4 tests)

M_0	M_6	M_{10}
0.5	0.2	0.05
0.3	0.2	0.15

H30M05Q0_Mo3 & H55M05Q0_Mo3

H30M05Q0_Mo5 & H55M05Q0_Mo5

Carrying capacity

(1 test)

- estimate two values of R_0 (one for $y \leq 1977$ and the other for $y > 1977$) and estimate h. In projections use ρ and σ_R^2 as specified for baseline sets.

H__M10Q0_CC

Minimum size of plus group

(2 tests)

Use 162 as the minimum size of plus group, and estimate selectivity parameters for the following age-ranges:

	LL1	LL2	LL3	LL4
Age-range	2-12	2-9	2-12	8-12

Note that this corresponds to case G2 in Run Set 3.

H30M10Q0_G2 & H55M10Q0_G2

Selectivity

(2 tests)

Assume constant selectivities in projections.

H30M10Q0_SC & H55M10Q0_SC

Appendix 4. Alternative fishing mortality formulations.

Basic equations

Fishing mortality specifications in the current model (year subscripts omitted) are based on:

$$C = \sum_f \sum_a s_{f,a} F_f N_a$$

$$C = \sum_f C_f \qquad \text{so that} \qquad C_f = (\sum_a s_{f,a} N_a) F_f \qquad \text{and} \qquad F_f = \frac{C_f}{\sum_a s_{f,a} N_a}$$

Note also that $C_{f,a} = s_{f,a} F_f N_a$

and $C_a = (\sum_f s_{f,a} F_f) N_a$

Problem arises if $(\sum_f s_{f,a} F_f) > 1$ so that $C_a > N_a$.

In the model used for 1st-stage trials, age-specific exploitation rates $(\sum_f s_{f,a} F_f)$ were bounded at 0.99. When the bound is exceeded, the catch at age is reduced to meet the bound but the exploitation rates of the other ages are not adjusted. This leads to unnecessary reductions of catches in cases when the TAC could have been taken if selectivities of the other ages had been increased.

Case of one fleet (or non-overlapping selectivities):

Consider the single-fleet case, so omit *f* subscript. Compute F using the basic equations above; if $F \le 0.9$, no change

If $F > 0.9$, then:

$$C = \sum_a g(s_a F) N_a \qquad \text{(A1)}$$

$$C = \sum_a s_a^* F \, N_a \qquad \text{where modified selectivity} \qquad s_a^* = \frac{g(s_a F)}{F} \qquad \text{(A2)}$$

Propose

$$g(x) = \begin{cases} x & x \le 0.9 \\ 0.9 + 0.1[1 - \exp(-10(x - 0.9))] & 0.9 < x \le \infty \end{cases} \qquad \text{(A3)}$$

Note: (i) $g(x) < 1$

hence: $C_a = g(s_a F) N_a < N_a$ as required.

(ii) $g(x)$ is continuous and derivative-continuous at x=0.9

A process such as Newton-Raphson is used to solve equation (A1) for F and hence compute $C_a = g(s_a F) N_a$.

Extension to more than one fleet

If from basic equations, $\sum_f s_{f,a} F_f < 0.9$ for all ages, then use basic equations. If $\sum_f s_{f,a} F_f > 0.9$ for any age, then

$$C = \sum_a g(\sum_f s_{f,a} F_f) N_a \tag{A4}$$

where $g(x)$ as above, so that $C_a = g(\sum_f s_{f,a} F_f) N_a \quad < N_a$ as required.

Assume farther that effective proportional reduction of selectivity for each fleet at a certain age a is the same for each fleet (but differs by age). Then the modified selectivity $s^*_{f,a}$ is given by:

$$s^*_{f,a} = s_{f,a} \left[\frac{g(\sum_{f'} s_{f',a} F_{f'})}{\sum_{f'} s_{f',a} F_{f'}} \right] \tag{A5}$$

Then

$$C_{f,a} = s^*_{f,a} F_f N_a = s_{f,a} \left[\frac{g(\sum_{f'} s_{f',a} F_{f'})}{\sum_{f'} s_{f',a} F_{f'}} \right] N_a \tag{A6}$$

Then

$$C_a = \sum_f C_{f,a} = \sum_f s_{f,a} F_f \left[\frac{g(\sum_{f'} s_{f',a} F_{f'})}{\sum_{f'} s_{f',a} F_{f'}} \right] N_a \qquad \text{as required by (A4)}$$

$$= g(\sum_f s_{f,a} F_f) N_a$$

Thus, a multivariate root finding process (e.g. extended Newton-Raphson) is needed to solve for F_f in the following coupled non-linear differential equations for $f = f_1, f_2, f_3 \ldots$.:

$$C_f = \sum_a C_{f,a} = \sum_a s^*_{f,a} F_f N_a$$

$$\text{i.e., } C_f = \sum_a s_{f,a} F_f \left[\frac{g(\sum_{f'} s_{f',a} F_{f'})}{\sum_{f'} s_{f',a} F_{f'}} \right] N_a$$

Appendix 5. Ad Hoc Meeting of the CPUE Steering Group

Introduction: The CPUE Steering Group met from 1700-1800h on the 10th April 2003 to provide input to the Management Procedures Workshop. The key question was what would form the outer plausible variants on the assumption of constant catchability, which is used in the current operating models. Such outer plausible variants were for the purpose of testing management procedures for robustness. They should not be interpreted as best estimates of catchability change.

Two possibilities for catchability change were considered

- That there was one or more step changes through the time series caused by the rapid adoption of new technology or practices.
- That there was a gradual creep in the catching efficiency of tuna longliners through time.

Step changes in Catchability: Industry representatives thought there may have been a steep decrease in longline catchability in the mid 1990's and there was some evidence in CPUE residuals (see figure 3 CCSBT-MP/0304/07) that this was the case. These residuals also indicated an increase in catchability in the earlier years of the 1990s. These were possibly attributable to industry reactions to TAC changes. However, it was considered that both these changes were too recent to be satisfactorily estimated by the conditioning model and it would be safer to regard these as evidence for autocorrelation that might be used in the projection models.It was not considered likely that specific technical improvements (for example the introduction of GPS in the early 1980s would have produced a step effect. It was concluded that operating models did not need to consider step changes in catchability.at this stage.

Trends in catchability: It was noted that for gears such as trawls a 2% annual change in catchability (technical creep) was considered a plausible figure. However it was also noted that some technical improvements which would improve trawl catch rates would not apply to longline catch per 1000 hooks. After some discussion it was agreed that 1% could be taken as a plausible upper limit for catchability change. It was concluded that for robustness testing purposes operating models should be constructed that considered catchability might increase by 1% per annum since 1969 since when the CPUE series is available. How this rate should be included in prediction models was also discussed but deferred for consideration by the MP workshop.

Other matters. Questions were raised about the possibility of standard CPUE trends being affected by regulation changes (for example longliners being excluded from some grounds). This would be investigated intersessionally. The reaction of industry to management changes (particularly to large changes in TAC) in terms of its effects on catchability was raised as a potentially issue in the operation of management procedures. Members were asked to think hard about this and to make brief written submissions to the Chair as to how they considered the catchability of longliners would change as a result of a 30% change in TAC. This question might also be discussed further at the meeting with industry representatives.

Appendix 6. Data Issues relating to Management Procedures

Comparisons with Official Statistics

CCSBT requests official statistics on the total catch of SBT from each country/fishing entity. The official statistics are requested by gear, fleet (e.g. domestic/foreign) in both weights and numbers on both a calendar and quota year basis.

In practise, some countries/fishing entities have not provided official statistics for catch in numbers, or have only provided catch in numbers for recent years. Similarly, official statistics by "quota year" is not available for all years.

Therefore, the only available time series of official statistics is weight of SBT by country/fishing entity per calendar year. Calendar year data has been the primary timeframe used for discussions within the CCSBT.

These official statistics differ from data used in the operating model. A primary reason for this is that the operating model uses catches in numbers[1] for some of its fisheries and the weight of catches in these cases is then obtained by using length frequency distributions to convert the numbers to weights. Therefore, the weights used in the operating model are not directly comparable to the official weights provided by countries/fishing entities.

Quota Years

CCSBT members have differing quota years as specified in the following table:

Country/Fishing Entity	Quota Year
Australia	1 December to 30 November
Fishing Entity of Taiwan	1 January to 31 December[2]
Japan	1 March to 28 February
New Zealand	1 October to 30 September
Republic of Korea	1 March to 28 February

It is almost certain that recommendations from any management procedure (MP) will need to operate on a quota year basis. Therefore, if the MP requires a TAC change, the change would most likely apply to quota years and will therefore be implemented on a slightly different time scale for different members. Furthermore, as the decision for a TAC change would occur at the annual Commission meeting in October, it is probably not possible for some members to implement the change for at least 12 months (e.g. the start of Australia's and New Zealand's quota year is almost at the same time as the Commission's annual meeting). This means that a two year time lag or more may occur between the year for which an MP is evaluated and the implementation of any consequential TAC change.

The Commission will need to discuss and specify the quota year in which a TAC change arising from the MP would be implemented for each member.

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[1] Numbers are used for some fisheries in the operating model either because numbers are the only data available at the specified scale (time frame/fishery) or because numbers are considered to be more reliable than weights for the specified scale.

[2] This is the current quota year, but Taiwan has expressed interest in moving to a quota year of 1 April to 31 March.

Data Inputs to the Operating Model

At the First Management Procedures Workshop (MPWS1), SBT fishing was characterised into 5 fisheries, and a "fishing season" for each of these fisheries was defined in such a manner that encompassed an entire year of fishing for each fishery. The appropriate data (numbers or weights) to use for each fishery was also defined at MPWS1. The required data was then assembled to match these fishery and season definitions. The definitions of these fisheries and seasons are provided in the following table:

Fishery	Fishing Season (in operating model)	Numbers or Weights	Fishery Components
Aust. surface	1 Jul – 30 Jun	Weights	• Australian surface fishery
LL1	1 Jan – 31 Dec	Numbers	• Japan LL excluding areas 1 & 2 • Australian domestic longline • Australian joint venture • New Zealand charter • New Zealand domestic • Taiwan longline SBT • Korea longline • Misc 1[3] • Misc 2[4]
LL2	1 Jan – 31 Dec	Weights	• Taiwan longline, non-targeted SBT (primarily small SBT) • Taiwan gillnet (1982-1992)
LL3	1 Jul - 30 Jun	Numbers	• Japan longline area 2
LL4	1 Jul - 30 Jun	Weights	• Japan longline area 1 • Indonesia longline

Timeframes for updating data inputs

Within CCSBT, updated data (to the end of the previous calendar year) is usually provided at 30 April each year and it is likely to take about another month for related datasets (catch-at-age) and converted data to become available. It is unlikely that complete calendar year data can be provided prior to 30 April, so there is little scope to significantly reduce these timeframes.

Therefore, it seems likely that data would first become available for management procedures at approximately 31 May each year.

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[3] Catch recorded in Japanese import statistics as being fresh SBT from Taiwan, but not recorded in Taiwan export statistics. Further clarification of these data is required.

[4] SBT catch other than those listed for specific countries (obtained from Japanese import statistics).

Attachment F

Thoughts on a two stage weighting procedures for Operating Models

(John Pope)

One suggestion for weighting operating models was to treat this as a two stage process. The first stage would consider robustness. It would set outer limits to acceptable performance by management procedures. Figure 1 illustrates this with a lower biomass limit (vaguely defined as in the unspecified grey rectange marked "Area of possible lower biomass limit??") below which is the "no go area". Similarly there is an area of low catch at higher biomass which might also be regarded as undesirable. Some lower biomass limits might be suggested by aspects of International legislation to which Member States might feel bound (e.g. the CITES decline critera). If such undesirable regions can be defined then the robustness tests would proceed with all operating models to be tested weighted 1 at this stage. Only Management Proceedures which avoided these limits (with a prespecified probablility) would be considered for the second stage.
The second stage would weight the plausibility of the various Operating Models. The Management Procedures which survived stage 1 would be judged on how well their OM weighted performance met the several objectives (i.e. the second stage would apply the one stage approach as described in the report but on a censored set of MPs)

This approach would have both advantages and disadvantages.
Potential Advantages would include

- Confidence that the worst outcomes would be avoided under any operating model considered.
- Some restriction of the area of optimisation might make the process of weighting scenarios less critical.
- It forces recognition of undesirable states of stock or the fishery
- It forces recognition of trade-offs between objectives
- With conflicting objectives it is often easier to define what is undesirable that desirable.

Potential Disadvantages would include

- Problems of agreement on outer limits.
- Determining which OM to include in tests may be difficult.
- Possibility that outer limits might constrain MPs to only the most conservative.

Whether such an approach is viable depends on whether or not these advantages and disadvantages can be traded-off and agreed.

Figure 1

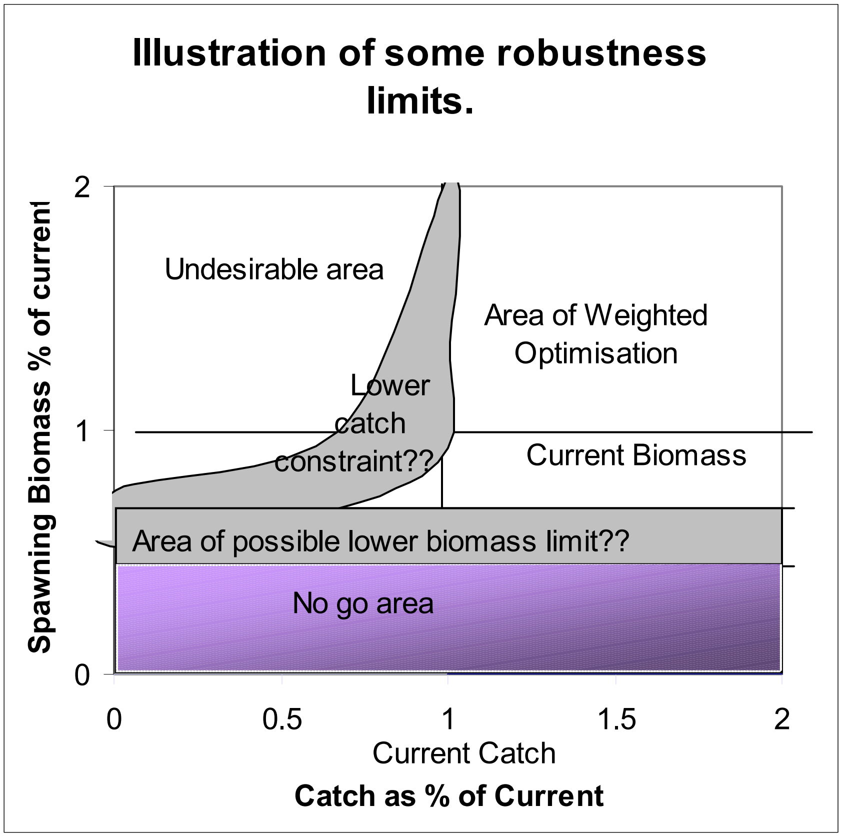

Illustration of some robustness limits.
Undesirable area
Area of Weighted Optimisation
Lower catch constraint??
Current Biomass
Area of possible lower biomass limit??
No go area
Spawning Biomass % of current
2
1
0
0
0.5
1
1.5
2
Current Catch
Catch as % of Current

Attachment G

Report of the Industry Consultation for the Management Procedures

1. An industry consultation regarding management procedures was conducted at 9.00 am, Saturday 12 April 2003. Representatives of management authorities and the Australian and Japanese industries were present. At the consultation, industry was informed of the developments in the development of the CCSBT management procedure since the Third Stock Assessment Group meeting in September 2002. Advice was sought from industry concerning aspects of the fisheries' management that they considered relevant to the development of the management procedure. Managers from member countries also provided advice on aspects of the management procedure that they thought were important to consider in further developments.
2. There was general commitment to the concept of a management procedure to provide transparency to decision making. However, the industry representatives felt that to date, the process had been conducted in a scientific context, and the full range of management implications including social and economic factors now need to be considered.
3. Industry representatives outlined the effects on their fishing and associated industries from reductions in catch levels, emphasising the financial and social impacts. In this context, industry indicated they would wish the management procedure to be constructed to avoid any large reductions with changes made gradually to allow time for adjustments to be made. Increases in catch levels where appropriate would be acceptable.
4. The Australian industry representative expressed concern on a number of issues. He believed that longline CPUE may not be a reliable indicator of stock abundance and that industry were keen on seeing other indicators being developed.He was concerned about assumptions relating to natural mortality and suggested that natural mortalities as high as 0.3 were not believable. As a consequence, he believed that care needs to be given to the setting of weights in the operating models. Careful judgement needed to be applied to ensure that the appropriate balance was achieved between rebuilding the stock and capture levels.
5. Managers acknowledged the views of industry regarding the need for stability and avoiding unnecessary changes in catch levels. Australian management representatives noting the historically low spawning biomass suggested that the most important consideration was that the management procedure allowed for stock rebuilding.
6. Members of the panel conducted individual briefing sessions with industry and management representatives. The briefing sessions used a spreadsheet, which described how the operating models would respond to specific catch sequences that were designed by participants for each operating model.
7. Dr Hilborn reported that two key issues emerged from the briefings:
    - Under high productivity scenarios, none of the participants chose to increase catches dramatically if there were substantial increases in stock levels all citing economic reasons for this view – no participant proposed increases exceeding a few hundred tonnes per year.

- when dealing with low productivity scenarios the preferred harvesting strategy was staged ramping down of catch levels – not closure or large changes – with some participants preferring to aim for re-building of the stock to 2002 levels while others favoured a strategy of arresting the decline in biomass.

8. Dr Hilborn suggested that those involved in development of management procedures should take these views into account.