Commission for the Conservation of
Southern Bluefin Tuna

みなみまぐろ保存委員会

Report of the CPUE Modelling Workshop

5 March 2002
Tokyo, Japan

REPORT OF THE CPUE MODELLING WORKSHOP
Tokyo, Japan, 5 March 2002

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1. Opening

1. The independent Chair, Professor John Pope, opened the meeting and outlined his proposals for management of the workshop. He indicated that the meeting should work from the draft agenda prepared for the meeting, but that timing would be adjusted. The agenda was agreed and is at **Attachment 1**.

2. The list of participants is at **Attachment 2**.

3. The list of documents is at **Attachment 3**.

2. Importance and Priorities of CPUE and Ageing studies to the achievement of Management Procedures

4. The Scientific Coordinator of the Management Procedures (MP) Workshop, Dr Ana Parma outlined the requirements of the MP for this group. She advised that the most important requirement is the development of a suitable short term aggregate index of abundance.

3. Studies of recent trends in CPUE

5. The chairman suggested that the focus of the discussion should be to agree an interim shortlist of candidate measures of short term CPUE using methods currently available to be used in the initial development of management procedures.

6. Two papers were presented to the workshop. Norio Takahashi presented paper CCSBT-CPUE/0203/09 "Some Consideration on Japanese Longline CPUE as a Potential Input to Management Procedures". Dale Kolody presented paper CCSBT-CPUE/0203/04 "Approaches for Using Longline Fishery Catch and Effort Data to make inferences about Southern Bluefin Tuna Stock Dynamics". Both had relevance to this Agenda item and to Agenda item 4 (reported in Section 5).

7. Following presentation of these papers, the workshop discussed and developed a list of criteria for assessing the suitability of short term (5-10 year) measures of CPUE based on Japanese longline data. These measures, together with grading of the 5 candidate CPUE indexes against a list of desirable characteristics are shown in Table 1 below.

Table 1: Evaluation of possible short term measures of CPUE against agreed suitability criteria

Criterion	ST Window[1] (nominal)	$W_{0.5}$ & W_{08}[2]	Core Areas[3]	Nominal[4]
Will it seem pragmatic to managers / industry?	Yes	Maybe yes	Yes	Yes
Will it be understandable to managers / industry?	Concept & details easy	Complex	Concept easy; details difficult	Yes
Are data available to all Members?	?	Yes	Yes	Yes
Is the trend consistent (monotonic)?[5]	?	?	?	?
Is bias a problem?[6]	Refer to Table 2	Refer to Table 2	Refer to Table 2	Refer to Table 2
Is it robust to deliberate change of fleet behaviour	?	Maybe better than ST Window	Maybe better than ST Window	Yes except to major re-distribution of effort or targeting behaviour
Is process error a problem ? (also see Table 3) Can variability be calculated?	? Knowable	Unsure if better or worse than ST Window Less knowable than ST Window	? Knowable within model structure	Vulnerable Unknown
Is Meta data[7] needed?	Important	Less important than ST Window	Important but less so than ST Window	Important
Will there be continuity of data collection?	Maybe yes	Maybe less future data availability outside core fishing area	Maybe yes, less certain than ST Window	Yes

[1] CCSBT-CPUE/0203/09.
[2] Pseudo-geostatistical & Pseudo-B_{ratio} (CCSBT-SC/0103, Attachment D).
[3] CCSBT-CPUE/0203/BGD/01 (CCSBT-SC/0103/06).
[4] Nominal CPUE needs to be clearly defined, index largely depends on the time-area strata to be used (eg, Japanese effort in Area 4 to 9 includes both target and non-targeted effort). It would be vulnerable if this was not properly addressed.
[5] CPUE goes up or down when biomass goes up or down but not necessarily by the same percentage.
[6] Whether the CPUE series trend is more or less optimistic than the biomass series trend.
[7] Metadata is extra information that characterises the quality of the data.

8. The workshop discussed the potential for bias and process errors occurring in the various Japanese longline CPUE indices identified in earlier discussion. It was agreed that the existing indices would not be reworked to allow for these factors in the initial development of management procedures consistent with the view that the process should commence with known and available data. A summary of potential bias and process error problems was developed for further consideration as the management procedure evolved. The summary of potential biases and process errors and their relevance to the candidate CPUE indices are set out in Tables 2 and 3. These tables were developed by the Coordinating Committee. It was recognised that there was an element of subjective judgment in compiling the table and that different individuals in the workshop may have preferred alternative ordering within the cells.

Table 2: Qualitative summary of potential bias problems for proposed short-term Japanese logline SBT CPUE indices.

CPUE Time Series / Potential Problem	1) age/size dependent SBT behaviour	2) Coarse-scale Seasonal variability in SBT distn.	3) SBT density-dependent range contraction	4) Oceanographic variability affects SBT distn.	5) Changes in effort distn. due to SBT distn.	6) Changes in effort distn. due to area closures	7) Changes in effort distn. due to economics	8) Changes in fishing efficiency	9) Non-SBT targeting	10) SBT age estimation from cohort-slicing
Nominal CPUE	#	.	+	+	?	+	?	+	+	*
Proxy B-Ratio and Proxy Geo-statistical	#	.	+	+	?	+	?	+	+	*
Takahashi Space-Time Window (nominal version)	#	.	.	+	?	.	?	+	.	*
Laslett Core Area	#	.	.	+	?	.	?	+	.	*

\+ Potentially substantial temporal bias expected (direction not always obvious or consistent).
. Substantial bias not expected.
\# Positive for aggregate measures, length or age disaggregated methods are less affected.
* Positive for when measures are age disaggregated, length based or aggregate measures not affected.
? Effect uncertain.

Table 3: Qualitative summary of potential process error problems for proposed short-term Japanese longline SBT CPUE indices. By comparison with biases which are considered to act over a longer term, process error is seen as being of annual or short duration. These problems are in addition to the potential temporal biasing effects described in Table 2.

CPUE Time Series / Potential Problem	1) age/size dependent SBT behaviour	2) Coarse-scale Seasonal variability in SBT distn.	3) SBT density-dependent range contraction	4) Oceanographic variability affects SBT distn.	5) Changes in effort distn. due to SBT distn.	6) Changes in effort distn. due to area closures	7) Changes in effort distn. due to economics	8) Changes in fishing efficiency	9) Non-SBT targeting	10) SBT age estimation from cohort-slicing
Nominal CPUE	#	+		+	+	+	+			*
Proxy B-Ratio and Geo-statistical	#	.		+	+	+	+			*
Takahashi Space-Time Window (nominal version)	#	.		+	.	.	.			*
Laslett Core Area	#	.		+	.	.	.			*

\+ Process error expected (resulting in increased variance over the model prediction).
. Substantial process error not expected.
\# Positive for aggregate measures, length or age disaggregated methods are less affected.
* Positive for when measures are age disaggregated, length based or aggregate measures not affected.
? Effect uncertain.

9. Estimates of variability of the data series will be calculated empirically based upon linear regression against year.

4. Studies of appropriate levels of collection of direct ageing materials in the various SBT fisheries.

10. Five papers were presented to the workshop. The first two papers dealt with conceptual issues relating to sampling and problems with aging data, while the last three papers described the main sampling schemes that are in operation for SBT.
    - Tom Polacheck presented CCSBT-CPUE/0203/5 "Considerations for the development of SBT otolith sampling procedures"
    - John Pope presented CCSBT-CPUE/0203/10 "A background to problems connected to age sampling"
    - Tom Polacheck presented CCSBT-CPUE/0203/11 "Summary of SBT otolith sampling from the Indonesian longline and Australian domestic fisheries"
    - Sachiko Tsuji presented CCSBT-CPUE/0203/8 "Otolith sampling protocol under RTMP observer program"
    - Talbot Murray presented CCSBT-CPUE/0203/12 "New Zealand Instructions for Extraction of Southern Bluefin Tuna Otoliths"

11. Discussion and questions of clarification followed the presentation of each paper. There was considerable interest from the meeting in the work described in paper CCSBT-CPUE/0203/5. This paper provided an analytical method (QRALK) that could be used to create improved age/length keys. This was thought to have potential to become a cost effective approach to improving age structure information, and further development of the technique was recommended. It was thought that the existence of this technique could influence current sampling protocols and move otolith sampling strategies towards fish near the asymptotic length, where this analytical technique was of less use.

12. Collaborative investigations between Australia, Japan and New Zealand was encouraged to develop improved ways to use age materials to calculate catch at age data (e.g. by the use of QRALK). It was acknowledged that this effort should commence after the otolith ageing workshop in Australia in June 2002.

13. The workshop felt that the required level of precision for SBT age information was a question that would need to remain open at the present time. The answer to the question would depend significantly on the use made of the age distribution information, and there was some uncertainty here. In the meantime, it was agreed that intersessional work by Members should be conducted to determine the level of precision that Members are currently achieving, once otoliths have been aged. Members agreed to do this work (initially using simple techniques such as "Shepherd Nicholson[1]") and report the results to the next SAG meeting.

14. It was also suggested that collaborative intersessional work be conducted to compare growth rates between areas as an indicator of the extent to which otolith sampling from different areas can be combined to fill in gaps that exist in the sampling for certain areas.

[1] Shepherd, J.G., and Nicholson, M.D. (1991). "Multiplicative modeling of catch-at-age data, and its application to catch forecasts." J.int.Explor.Mer, 47:284-294.

5. Studies of historic long term trends in CPUE series

15. The workshop agreed to an interim decision to use the same CPUE indices (for the purpose of conditioning the operating model for management procedures) as identified for short term CPUE trends but to exclude the nominal index from the collection of long term indices under consideration. The "owners" of the respective CPUE series were asked to provide the complete series to the Management Procedure Coordinator (Ana Parma). After conditioning the list of four might be reduced to two based on experience. New indices, provided data was available, might then be added if warranted and this would be a focus of the next meeting.

16. The workshop recognised that further work was required to establish and/or verify suitable long term CPUE indices. Issues such as changes in economics, technology and spatio-temporal behaviour were given as examples of issues which might be studied further.

17. It was agreed that the CPUE Modelling coordinating committee (John Pope, Dale Kolody, Norio Takahashi, Talbot Murray, Shui-Kai Chang, and a member from Korea) would meet during the course of the Management Procedure Workshop and by e-mail to discuss and determine the next steps to take to progress the development of suitable CPUE indices, and to communicate these to the workshop.

6. Acceptance of Report

18. The report was accepted by the workshop.

LIST OF ATTACHMENTS

Attachment 1: Agenda

Attachment 2: List of participants

Attachment 3: List of Documents

Attachment 1

Agenda and the Annotation
CPUE Modelling Workshop
5 March 2002
Tokyo, Japan

1. Importance and priorities of CPUE and Ageing studies to the achievement of Management Procedures.

The task is to orientate the work of the group. In particular the Management Procedures group should have provisionally identified which CPUE and catch-at-age data sets will critically impact its work and to provisionally identify which are in greatest need of improvements in precision and accuracy in order to improve the efficacy of management procedures. This item will prioritise and focus work under the remaining agenda items, which may consequently be rescheduled to reflect this prioritisation.

2. Studies of recent trends in CPUE.

The task is to examine how best to describe recent trends in SBT biomass at size or age by refining CPUE data by means of statistical techniques applied to the data and by the introduction of concomitant variables into their interpretation. This task will be approached by reviewing existing and presented papers on these problems. A further task is to advise on priorities for future studies in the light of the perceived requirements.

3. Studies of appropriate levels of collection of direct ageing materials in the various SBT fisheries.

The ultimate task is to identify the appropriate, desirable and achievable levels of sampling for age in SBT fisheries both for the purpose of constructing catch at age matrices and for constructing CPUE at age data, the immediate task is to propose provisional age sampling protocols. This agenda item will be used to review existing and presented papers and analyses on these subjects.

4. Studies of long term trends in CPUE series.

The task is to examine how best to describe long term trends in SBT biomass at size or age. This might be achieved by refining available CPUE data by means of statistical techniques applied to the data, by consideration of changes in fishing power and possibly by the introduction of concomitant variables into the interpretation of data. This agenda item will be used to review existing and presented papers on these areas and to plan future studies in the light of perceived requirements.

5. Report

The CPUE Group will prepare and agree its report and recommendations during the course of the Management procedures meeting for presentation to the SAG/SC.

Attachment 2

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CCSBT
CPUE Modelling Workshop
5 March 2002
Tokyo, Japan

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Attachment 3

List of Documents
CPUE Modelling Workshop

(CCSBT-CPUE/0203/)

1. Draft Agenda
2. List of Participants
3. List of Documents
4. (Australia) Approaches for using LongLine Fishery Catch and Effort Data to make inferences about Southern Bluefin Tuna Stock Dynamics. D. Kolody, T. Polacheck and A.Preece
5. (Australia) Quantile regressions for sparse year-round age-length data. M. Bravington
6. (not presented)
7. (not presented)
8. (Japan) Current otolith sampling protocol under the RTMP observer program. Sachiko Tsuji.
9. (Japan) Some consideration on Japanese longline CPUE as a potential input to management procedures. Norio Takahashi, Hiroshi Shono and Sachiko Tsuji.
10. A Background to Problems Connected to Age Sampling. Professor. John pope.
11. (Australia) Summary of SBT Otolith Sampling from the Indonesian Longline and Australian Domestic Fisheries. T. Polacheck, and T. Davis.
12. (New Zealand) New Zealand instructions for extraction of southern bluefin tuna otoliths. Lynda Griggs, NIWA.

(CCSBT-CPUE/0203/BGD)

1. (Australia) Exploratory analysis of the SBT CPUE data using smoothing splines. CCSBT-SC/0103/06
2. (Australia) Modelling Catch and effort in the southern bluefin tuna fishery. CCSBT-SC/0108/10
3. (Japan) Quick examination of Japanese longline CPUE data in the light of SRP development. CCSBT-SC/0103/14. S. Tsuji, N. Takahashi and T. Itoh.
4. (Japan) Critical review of CPUE models with an emphasis on management scheme. SBFWS/96/13. S. Tsuji, T. Itou and Takenoi.

(CCSBT-CPUE/0203/Info)

1. (Japan) Consideration on the B-Ratio model and its potential alternative. CCSBT-SC/0108/29
2. (Australia) Indices of abundance for southern bluefin tuna from analysis of fine-scale catch and effort data. CCSBT-SC/96/10
3. (Australia) Spatio-Temporal analysis of southern bluefin tuna catch per unit effort data: a best linear unbiased predictor approach. CCSBT-SC/0108/08
4. (Australia) Trends in Catch, effort and nominal catch rates in the Japanese longline fishery for SBT. CCSBT-SC/0108/22
5. (Australia) Exploratory and descriptive analyses of catch, effort and size data for southern bluefin tuna from Japanese longline vessels. CCSBT-SC/0103/10
6. (Australia) Where to with modelling CPUE? CCSBT-SC/0108/09
7. (Japan) Preliminary analysis for CPUE standardization and area stratification by tree-regression models. CCSBT-SC/0108/30

(CCSBT-CPUE/0203/Rep)

1. The Report of the Sixth Meeting of the Scientific Committee

Classification of List of Documents

(CCSBT-CPUE/0203/)
Documents to be discussed at the meeting and not yet given a document number of CCSBT, to be classified into this category.

(CCSBT-CPUE/0203/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-CPUE/0203/Info)
Documents not to be discussed at the meeting but presented for information and reference, to be classified into this category.

(CCSBT-CPUE/0203/Rep)
The previous report of CCSBT to be classified into this category.

(CCSBT-CPUE/0203/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.