

## Issues noted during the Management Procedure development process in 2004/2005

2004/2005 の MP 開発作業で気づいた点

Sachiko Tsuji, Norio Takahashi, Hiroyuki Kurota  
*National Research Institute of Far Seas Fisheries*

This document summarized points noted during a management procedure development process since the previous Scientific Meeting. Points covered included reality check and performance examination of Operating Model through age 4 population and longline CPUE in 2004, some consideration of preferable MP and procedures for MP selection, and schedules in order to implement MP at targeted year of 2006 and 2008.

前回の科学委員会以降、管理方策を開発する中で気づいた点についてまとめた。2004 年の 4 歳魚資源尾数、はえ縄 CPUE による OM の動きや現実性のチェック、望ましい MP や MP 選択の方法に関する考察、2006 年または 2008 年に MP 導入するために必要なスケジュールなどを含む。

### Performance of the current operating model:

#### Recruitments of 2000 cohort

The Management Procedure Technical Workshop noted that the current OM might provide unreasonably low recruitments estimates for recent years. In order to evaluate a performance of the current reference set OM, population of age 4 before exploitation with longline was examined. This exercise was made for the 2000 cohort that consistently showed substantial decline in recruitment from previous level and only removal by surface fishery and natural mortality was considered. Frequency distribution of resulted population at age 4 is shown in Fig. 1.

The 2000 cohort would become age 4 in 2004. Catch taken by Japanese longline in 2004 was 8507. 20.6% of reference set scenarios suggests lower number of age 4 fish in 2004 than actually caught and 14.16% indicating negative values. When considering additional removal occurring through longline catch before reaching age 4 and catch taken by other members, this again suggests the recruitments estimated by the current OM for 2000 cohort to be too low.

The level of reduction of 2000 cohort by the current OM was about 25 % in average. When examining relative strength by cohorts with Japanese longline CPUE by ages, this level of decline seems to be within a reasonable range, although substantial decline of cohort strength observed in longline CPUE started from 1999 cohort. One of suspicion is that the current OM may underestimate overall recruitment level in recent years. This corresponds to our concerns that the OM seems to react more efficiently react to TAC adjustment rule than we expects from historical experience on stock and CPUE reaction to alternative catch level. Although this feeling does not have solid quantitative base, it should be worth

for noting that overall underestimation of recent recruitment and future stock level would lead to assess overly an extent of effectiveness of adaptive TAC adjustment rules, i.e. MPs.

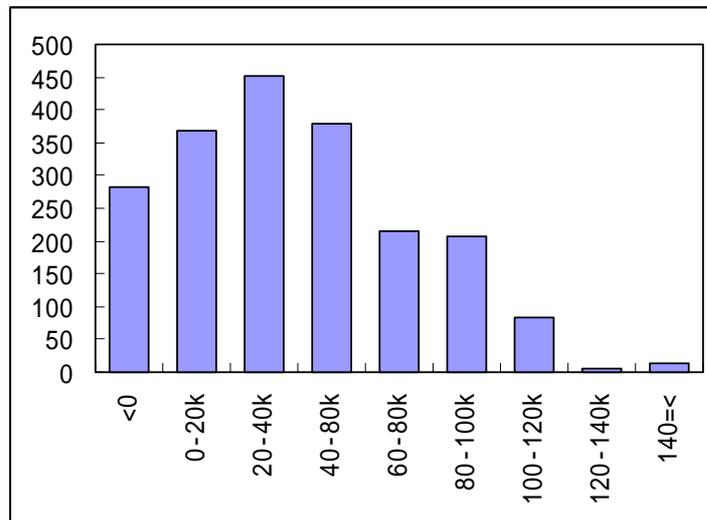


Fig. 1. Frequency distribution of population at age 4 before exploitation with longline based on reference set of the current OM when assuming reduction of population only with surface fishery and natural mortality.

'EXPL' option in robustness set tried to address unrealistically high mortality at age 3 for those cohorts with low recruitments. Fig. 2 shows a comparison of recruitment from 1990 to 2003 cohorts between reference set and 'EXPL' option. Three lines in the figure correspond to minimum, maximum and median values of recruitments. Figure shows that 'EXPL' option failed to raise recruitment level of 2000 and 2001 cohorts but worked on 2002 and 2003 cohorts which were not subject to exploitation by surface fishery prior to projection. Also, it worked to raise maximum recruitment estimates of 2000 and 2001 cohorts but not to lower half of estimated recruitments. These performances were considered to contradict from what was intended at the Technical Workshop. Further consideration is needed to address unrealistically low recruitments for 2000 and 2001 cohorts.

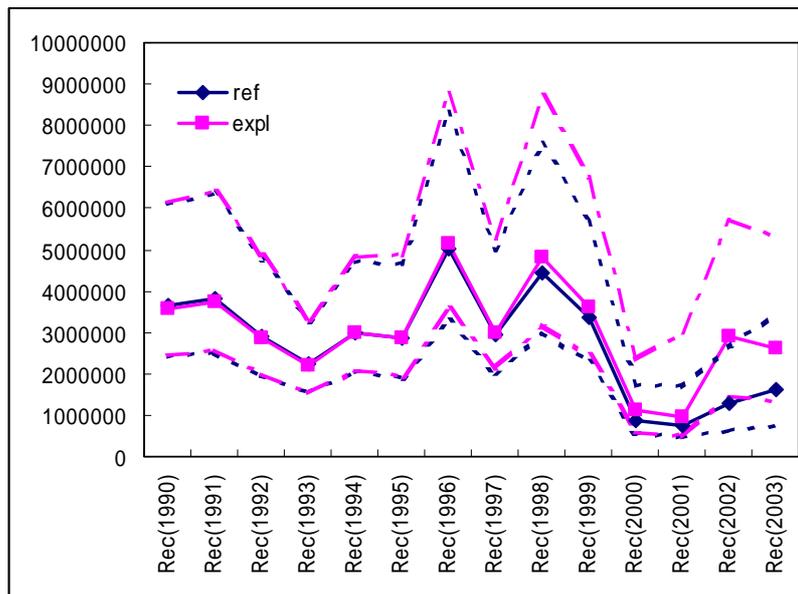


Fig. 2. Comparison of recruitment estimates for 1990-2003 cohorts between reference set and 'EXPL' option.

### 2004 CPUE

As there was a concern raised at the 3<sup>rd</sup> MP workshop that observed age 4+ CPUE for the most recent year was out of a CPUE range which OM reference case projected, we checked whether observed age 4+ CPUE for 2004 fell in a range of projected CPUE for the current reference case. Since CPUE index series were not available except for nominal CPUE, only nominal CPUE was considered. Nominal CPUE for 2004 was prepared from catch at age data by 5x5 month of Japanese longline (April-September, Area 4-9). Japan-NZ joint venture data were not available, thus these data were not included. (Difference in CPUE caused by these data is considered very small. For example, in 2003 case, there is only 1% decrease between with- and without the joint venture data.) This observed nominal CPUE for age 4+ was compared with a range of projected CPUE for Cfull2 reference case conditioned on nominal CPUE, under constant catch (14930t). Result is shown in Fig. 3. Observed nominal CPUE for 2004 fell within a range of projected CPUE. Thus, Cfull2 referenced case is considered plausible to account for future uncertainty in stock dynamics.

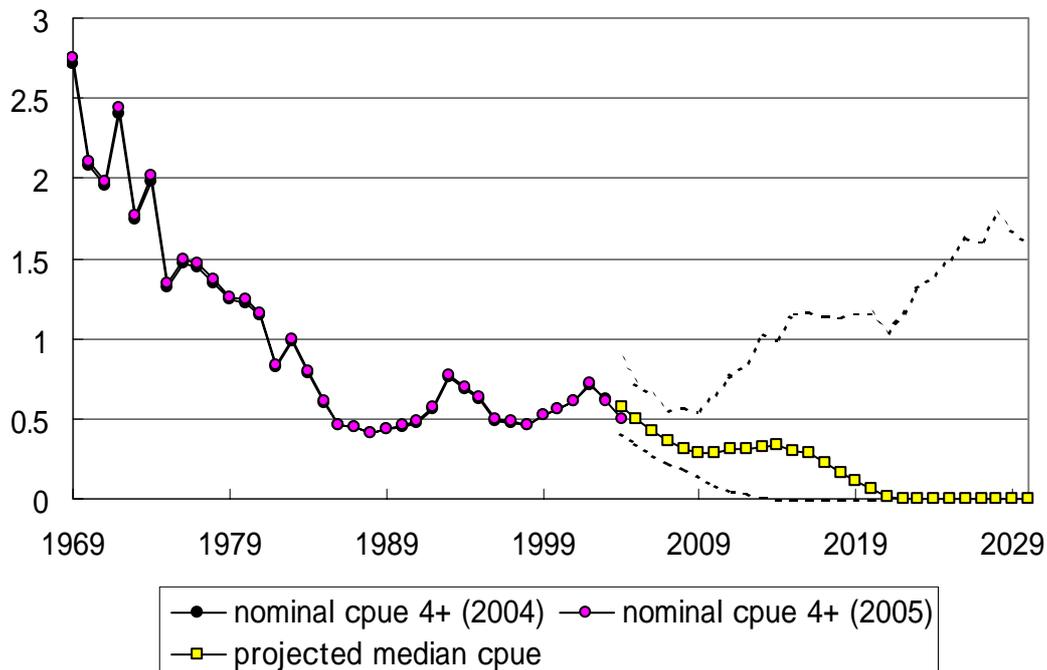


Fig. 3. Series of observed nominal CPUE and projected CPUE for Cfull2 reference case (conditioned on nominal CPUE).

### **Selection of Management Procedures:**

#### Evaluation trials held at the CCSBT11

Some participants of the CCSBT11 conducted individual rating of candidate MPs following to the Scientific Committee. The SC Chair summarized and distributed the results to the members. When comparing rating results with several key characteristics of MP performances, MPs giving higher TAC and lower biomass in 2032 within a set tended to gain higher ratings. Emphases to be given to biomass level in 2032 and initial pain substantially varied among participants. As indicated in CCSBT-ESC/0409/45, high level of similarities was observed among participants, though there was a general tendency for having problems in distinguishing relative performance of MPs in pessimistic scenarios.

We believe that an examination of worm plots will be only possible way for managers and industries to grab a range of complexities and various trade-offs involved in MP evaluations. Although we are not sure how and who will conduct final selection of MP, one possible way might be for restricted participants form members and Advisory Panel to examine adequate number of worm plots together to evaluate relative performances of candidates after removing identification of MPs by allocating different colors randomly.

#### Consideration on general criteria of good performance of MPs

The current set of candidate MPs can be classified along two different axes, either empirical or model-based, and whether using recruitment information as CPUE of age 4 or

not. We consider it critical to include some over-riding rules responding to recruitments either within MP or as a meta-rule as indicated in meta-rule section. Regarding to the first axis, we consider that both empirical and model-based MPs can be adjusted to achieve quite similar performance, in principle. Both are based on the same information in essence and only difference between them is whether using a kind of filtering process in a form of 'production model'. Empirical model are simple, direct, sensitive to signals, easy to understand, and less likely to calculation problems. We believe that transparency and easy and simple interpretation are key factors for MP to be accepted by industries. In that sense, we prefer empirical MP to model-based MP.

Some of MP candidates developed by Japan included asymmetric TAC adjustment rule with lower increase rate and higher reduction rate. This type of asymmetry generally results in quick reduction of TAC but slow in responding to stock recovery. It was planned that MP would be reviewed and modified if necessary after certain period time when additional data and experiences would be further accumulated. Then, it would be important to select MP that is effective in preventing stock collapse when situation would be really bad, under the current condition with serious concerns on recent recruitments. In that sense, it may be useful to utilize some of pessimistic scenarios in robustness set to evaluate robustness of MPs in terms of preventing potential stock collapse.

#### **Meta-rules:**

##### Meta rule relating to recruitments in general

Among candidate MPs currently selected, some are using recruitment information and some are not. With the current fishing pattern, majority of SBT is captured before reaching maturity at age 8-12. When MP is set to respond only to overall longline CPUE for age 4 and older or estimated status and/or trend of parental biomass, it tends to react rather slowly to recruitment fluctuation. Slow response to sequential unexpectedly high recruitments would only cause a delay in TAC increase, which works more conservative direction. However, a delay in taking necessary management action can be destructive for stock if sequential poor recruitments would occur especially under the low parental biomass as it is now. We consider it critical to incorporate some overriding rule responding to poor recruitments either by including within MP or as through a meta-rule.

This overriding rule must be sensitive enough to detect a sequence of poor recruitment at the earliest possible timing. It should be noted that the earliest recruitment information available in the current OM is age 4 CPUE which already carries five years' lag in picking up recruitment signal. It would be advisable to develop criteria of implementation of this recruitments meta-rule based on overall consideration of multiple information including acoustic and aerial survey data, tagging information, and surface catch rate in addition to age 4 longline CPUE.

##### Low recruitments scenarios for MP and/or meta-rule evaluation

Acoustic survey conducted in 2005 found some SBT schools but not a lot. Although still underway an analysis, we are considering the recruitment level for 2004 cohort about comparable to, or slightly lower than the 1999 cohort that was already substantially lower

than previous several years' level judging from the Japanese longline CPUE. The most updated Japanese longline CPUE indicated that the cohorts since 1999 had almost totally disappeared from at least the waters around Australia, i.e. Area 4 and 7. Absence of cohorts seemed to extend to the 2002 cohort. In summary, these preliminary information suggested that substantially low level of recruitments could be expected at least six years in sequence, which need to be considered when selecting scenarios for evaluating a impacts of number of low recruitments. We would like to include the case with six low recruitments in sequence with autocorrelation as a central case for consideration.

### Implementation problems:

#### Timetable of required tasks to implement MP in targeted time

The Scientific Committee received the instruction from the Commission to evaluate MP with initial TAC change in 2006 in addition to the initial application in 2008 at the Special Meeting in 2004. The following table indicates required timing for key decisions that need to be taken in order to implement MP in 2006 and 2008 respectively, under the assumption to maintain one year time lag for warning between TAC decision year and implementation year.

	Start in 2006	Start in 2008	By who
New TAC based on MP	Nov. of 2005 for the earliest	Nov. of 2007 for the earliest	Members
TAC agreement	CCSBT12	CCSBT13	COM
TAC calculation with selected MP	prior to CCSBT12	SC11	to be decided
Agree to details in implementation	prior to CCSBT12	prior to CCSBT13	SC
Decision of tuning level	prior to CCSBT12	CCSBT12	COM
Final selection of MP	prior to CCSBT12	CCSBT12	COM or SC?

It should be noted that if the Commission would desire to implement MP-based TAC from 2006 Fishing Season, MP and tuning level must be chosen prior to the CCSBT12, preferably prior to the next Scientific Meeting. Otherwise, the Commission needs to seek pragmatic procedures to shorten a period between TAC decision and implementation or to alter their national quotas after initiation of fishing year especially for Australia and New Zealand.

The current stock may require an immediate action according to recruitment status of recent years which would be evaluated at the forthcoming SAG/SC. Possible ways to implement TAC adjustment would include a) to implement MP-based TAC from 2006, b) to apply ad-hoc TAC adjustment in 2006 and move to MP-based TAC adjustment from 2008, and c) to implement MP-based TAC from 2007. It should be noted that the agreement on MP and tuning level at the CCSBT12 as the latest is critical to make any of those plans workable. Consideration on relative benefits and disadvantage among different schedules should be initiated from logistic and pragmatic points as well as from scientific view point in relating to stock management risks. This would be consideration on trade-off between rushing decision and potential risks to stock.

The 2006 TAC with the current program was based on data up to 2003. All candidate MPs heavily rely on the LL1 CPUE information for age 4 and older. Since the first cohort with substantially low recruitment estimated in the OM would be age 3 in 2003, impacts of low recruitments would not be reflected into TAC decision yet for 2006 TAC decision. Then, MP may often recommend TAC increase in 2006. If option a) mentioned above would be chosen, special attention would be needed for possible impacts of sequential low recruitments. This may in fact indicate the need of over-riding ad-hoc rule for 2006 TAC in the case of option a).

#### Consideration on future fishing patterns

Substantial TAC reduction is more or less anticipated when assuming the first MP based TAC implementation year in 2008. Generally speaking, fishing pattern will change rapidly corresponding to available TAC and fish availability. There is a high potential for industries to abandon some time/area of less economically profitable when TAC would be reduced and/or introduction of time/area closure. It is urgently need to evaluate an extent of reliability of CPUE when fishing patterns would substantially alter and to develop strategy to maintain CPUE as robust as possible to changes in fishing pattern. Also, some criteria need to be developed to judge whether available CPUEs and fishing pattern would be still within a reasonable range considered by the OM.