Consideration on metarules, implementation issues and MP performance monitoring.

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管理方策の実施上の問題およびパフォーマンスの評価方法に関する考え
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Abstract: This document summarized our opinion on some issues in MP implementation. In particular, conditions for invoking metarules and how to monitor MP performance were considered. It is important to make judgments on metarule invocation and MP revision based on sufficient proof, because there will be many uncertainties in MP implementation.

要旨： 管理方策を実施するにあたって遭遇するであろう諸問題について考えをまとめた。特にメタルールの発動条件と、MP のパフォーマンスを評価する方法について考察した。MP の実施には数多くの不確実性がつきまとうが、十分な証拠に基づいて判断することが重要である。

The 4thMP workshop held in Canberra in May 2005 started its works to document metarules and MP review process (CCSBT, 2005). The point emphasized there was that establishing general decision process to invoke metarules is more important than developing a thorough list all possible, exceptional circumstances. The workshop also noted that metarules should be triggered based on adequate proof only when necessary. These basic concepts for metarules should be held in future discussion so that we can respond flexibly and properly when such exceptional circumstances may occur.

Although it is unrealistic to list all circumstances requiring an invocation of meta-rules, consideration on specific likely examples may be helpful to identify critical issues needed for decision-making process and to develop a common idea of what to be expected to discuss in advance. Also, we need to agree on how to monitor MP performance before implementing MP.

1. Conditions for invoking a metarule

First, the CCSBT already agreed that meta-rules would be invoked when unexpected exceptional circumstances occurred. Then, what do the "unexpected exceptional circumstances" exactly mean? We separate conditions requiring an invocation of meta-rule into the following categories:

1 When model assumptions used for MP testing turn out to be wrong;
This category can be further classified into two (conditioning and projection): 1A) all assumptions used to describe historical part of fish population dynamics and its uncertainty extent, and 1B) assumptions that estimated parameters and conditions will stay consistent or only change gradually and systematically in the future.

2 When actual population is found to totally deviate from the expected trajectory by MP.

3 When the selected MP turns to be inappropriate.

We consider it important to separate these issues and to consider category 1 prior to category 2 when deciding whether invoking a metarule. In many cases, category 1 events provide causes for category 2 events and are probably easier to evaluate. If some trouble is found after the implementation, it is necessary to specify causes of the trouble and make proper decisions based on them.

2. Possible examples requiring meta-rule consideration

a) Stock assessment results with additive data reveal that the stock is outside the expected range of OM, especially before the implementation of MP (1A):

We have tried to evaluate robustness of MPs to changes of important assumptions both in reference case including some uncertainty factors and robustness trials. Still, there are many other assumptions and premises yet to be examined. When considering sensitiveness of OM results to minor adjustment of key assumptions, especially in absolute term, we may have to accept this type of events as being probable. In reality, the CCSBT has experienced this situation once. If we change OM every time finding additional data or revised assessment result lying outside the originally expected ranges, the benefit of MPs will be totally ruined. So it is important to set some rules and common understandings on when and how to judge that OM needs to be revised. This issue is closely connected with the monitoring of MP performance and some additional speculation will be made in that section.

b) Distribution of catch among fisheries changed (1B):
During the MP testing, quota allocations among fisheries are assumed to be constant. However, in the reality, catch patterns can be easily shifted one fishery to the others according to various reasons including social and economic factors. There are probably two ways to handle this. One is to set quota by fisheries in addition to the current quota by nations and to prevent quota transfer among fisheries. However, if the CCSBT does not take this route, scientists need to foresee the potential impacts of this, whether a selected MP can handle this, and if not, scientists should propose remedy. The current catch monitoring system will detect if radical shifts of catch among fisheries occur.

c) Drastic changes in selectivity (1B):
Again, the current MP evaluation process assumes either consistent selectivity or gradual continuous changes in selectivity. However, changes in fishing patterns or development of new fisheries such as non-member activities can easily change overall selectivity of LL1. It should be noted that substantial reduction would almost inevitably lead to substantial changes in fishing pattern as a result for fishermen seeking for economically most efficient patterns. Selectivity change seems to be even easier for surface fisheries. Comparing to b) above, this is more difficult to control and more difficult to detect, since size or age composition of catch, the component to be monitored, is a combined result of selectivity and fish availability.

d) Changes in reliability of longline CPUE (1B):
Since both stock assessment including OM and all CMPs heavily rely on longline CPUE, consistency in reliability and representativeness of longline CPUE is critical for MP to be successful. However, as mentioned in c), substantial TAC reduction will induce changes in operating patterns, which is expected to seriously impact on CPUE reliability and interpretation. Some preliminary exercise to examine possible impacts of TAC reduction on CPUE is presented in Takahashi (2005), but this issue needs more intensive evaluation and discussion in collaboration with managers and industries.

e) Changes in demographic parameters of fish and environments (1B):
Only in-depth stock assessment and carefully designed intensive field surveys may provide this information. Generally speaking, it is quite rare to detect changes in demographic parameters promptly and with a level of confidence to be able to convert historical recognition. However, for example, historically low recruitments have been

experienced recently and some MPs are revised to handle this unexpected change. It is necessary to monitor carefully whether unexpected changes in population dynamics of fish and environments occur.

3. How to judge whether MP working as expected

After it is ascertained that there is no critical violation in any key model assumptions and premises described above, we need to evaluate MP (decision rule) performance, i.e. whether MP work as expected. Currently, the median of projection trajectories is tuned to a specific recovery target. This means half of expected projections will not achieve a recovery target. So, even if the realized stock trajectory shows totally different pattern from those presented with median value for each year, the stock may still well behave as planned with MP. Key characteristics of MP are its feed-back nature. Some way to evaluate an extent of feed-back effect might provide basis of judgment but we cannot figure out any specific way.

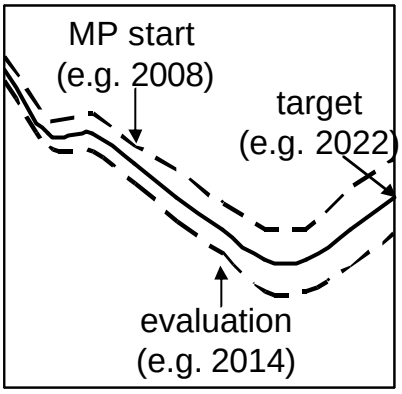
Nevertheless as the 4th MP workshop noted (CCSBT, 2005), it would be possible to show falsifiability, that is, to determine whether assessment results are outside bounds, which are predetermined in the MP development in advance. In conducting this monitoring, the problem will be selection of performance measures which can be reviewed. Ideally it would be desirable to check all model parameters and performance measures. However, it might be better to start from important measures such as recruitment, stock biomass, longline CPUE as conducted in regular stock assessments.

We would like to note that projection should be conducted to see whether our management objective will be able to be achieved, when in-depth stock assessment is done every few years. Although this does not intend to make a new OM and retune MP frequently, it will provide good information for making a decision for revision of OM and MP.

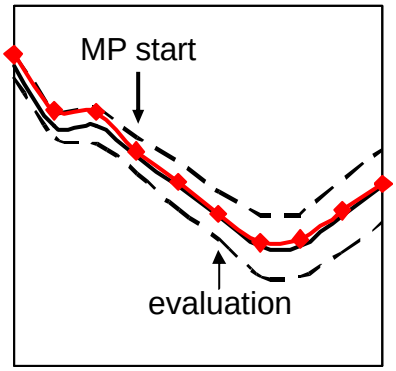
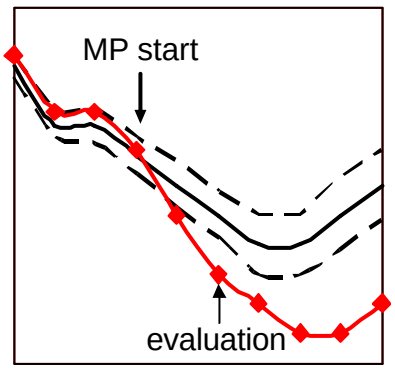
4. Practice exercise

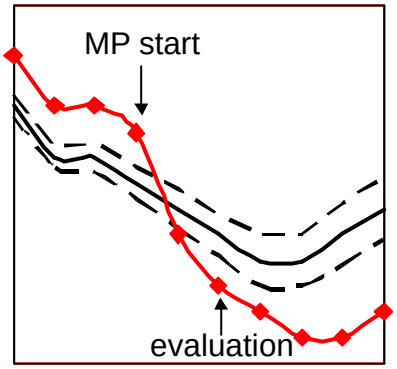
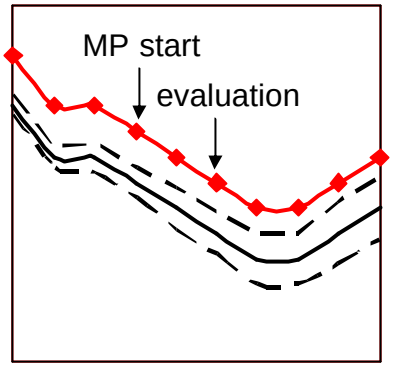
As we may have acknowledged from our bitter experiences for the mechanical update of the OM in 2004, it would be not straightforward to determine invocation of metarules and evaluate MP performance from stock assessment results. Here we would like to consider possible situations more concretely. This exercise is just an example to share common view to metarules and MP evaluation, not for making a detailed list to deal with each case.

Now consider a situation that we have projection results with the confidence interval regarding stock biomass before implementation of a MP (e.g. in 2008).



If the following in-depth stock assessment and projection results (red line with diamond; omitted the confidence interval) are obtained several years after the implementation of MP (e.g. in 2014), how should we determine whether invoking metarules and evaluate MP performance each case?

Case 1. Stock estimate is within MP bounds before and after MP implementation and a management objective will be achieved. (judgement) Everything is good? At least, nothing bad happens.	Case 2. Estimate is outside bounds after MP implementation. (judgement) MP is inappropriate? or Projection specification is wrong?
	

Case 3. Estimate is outside bounds before and after MP implementation and a management objective will not be achieved. (judgement) OM is wrong? How is MP? Is it sufficient only to retune the MP to a revised OM?	Case 4. Estimate is outside bounds before and after MP implementation, but a management objective will be achieved. (judgement) It is OK? or need to develop OM and MP again?
	

If actual stock assessment results in the future are outside MP bounds as seen in cases 2, 3 and 4, where should scientists restart from? We consider it important to make decisions about whether to retune, revise or redevelop OM or MP (or their combinations) based on causes of failure identified through metarule process and MP review process. Doing all development processes over again because of trivial failures should be avoided.

5. Implementation issues

a) Mismatch between TAC recommended by the MP and actual catches.

All current candidate MPs except CMP1 (Candidate MP; Australian one) calculate a new TAC from a previous TAC or catch. In such MPs, a large gap between TAC recommended by the MP and actual catches may influence MP performance significantly. Ideally it would be better that the impact of this mismatch can be examined in advance. From risk averse point of view, it will be preferable to use the lowest value between TAC and catch when determining TAC in the next phase. Occasionally, the Commission seeks adjustment of recommended TAC by scientists from socio-economic consideration. However, because arbitrary ad-hoc adjustment of MP based TAC simply leads to degradation of MP performances, scientists should strongly ask the Commission to respect and adapt TAC recommendation as it is. However, if still some adjustment were made, again, the lowest of the three (TAC recommended by the

MP, TAC agreed by the Commission and actual catch; Secretariat, 2005) should be used for calculation of the next TAC.

b) CPUE used as input data to MP: Japanese longline or LL1

Probably all CMPs assume to utilize Japanese longline CPUE of age 4+ as stock status indicator. However, in the current projection specification, longline CPUE available for MPs is not for Japanese fleet, but for LL1 fishery (longline by Japan, Korea, New Zealand and Taiwan). Considering data consistency, representativeness and catch dominance of Japanese fleet, it will be preferable to use Japanese longline CPUE as actual input data in the implementation of MP. However, if CPUE trends differ substantially among fleets and no apparent reason is detected, it may be necessary to consider metarule process. The same issue will be found when CPUE of age 4 is calculated as recruitment index.

References

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