

CHAIR AND RAPPORTEURS' REPORT OF BLUEFIN MSE TECHNICAL GROUP MEETING OVER 24-25 SEPTEMBER 2018

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SUMMARY

This document provides the authors' summary of discussion that took place during a meeting of the bluefin MSE technical group held on 24-25 September. The primary issues addressed were a review of work conducted since the April 2018 meeting, a revision of existing Operating Models (OMs), and specifying the basis upon which the acceptability of subsequently reconditioned OMs would be evaluated. A road map for completing the process of developing and adopting an Atlantic bluefin Management Procedure by November 2020 was also agreed.

KEYWORDS

Bluefin tuna, MSE

Background and preliminaries

This document provides an update on developments in the Atlantic bluefin (ABFT) MSE and MP development process since the April 2018 meeting (Anon. 2018), as well as summarizing discussion at the meeting held at ICCAT headquarters over 24-25 September, 2018.

While the authors have attempted a faithful and balanced reflection of the discussions at that September meeting, this document remains a reflection of their views. Although comments sought from members of the bluefin working group on an earlier version have been taken into account where considered appropriate, the document has not been formally “adopted” by the bluefin working group, so does not necessarily everywhere reflect their consensus views.

Before commencing discussions, the meeting took note of the recommendations agreed by the joint t_RFMO MSE group at its meeting in Seattle in June, 2018.

Progress on update of OMs

The GBYP modelling expert gave a presentation on updates implemented since the April 2018 BFT MSE meeting, following from what had been agreed at that meeting. The main aspects addressed in the presentation and in the ensuing discussion are summarised below.

The GBYP modelling expert explained that, following from the April meeting, there had been several foundational changes to the structure of the OMs and that these had required a considerable amount of work to implement. These include, e.g., the way stock-recruitment (SR) is treated in the conditioning of OMs (now shifting between different SR forms in certain past years – 1975 for the West stock and 1988 for the East stock – and then shifting again 10 years into the projection period in some of the OMs), the implementation of dynamic SSB0 and dynamic SSBmsy concepts (to achieve a smooth transition when the productivity changes just noted occur), alternative OMs that aim to produce closer results to those from the agreed 2017 ICCAT VPA assessments, the extension of the conditioning period to start in 1965 instead of the previous 1983 (which required changing the relative weights of different datasets as well as changes to the form of some likelihoods in order to be able to fit the models), and a change to the spatial resolution of the OMs from 10 to 7 geographical areas, primarily because the data were insufficient to support the finer 10-area spatial scale (see further discussion below).

a) Updated data now used

The changes to the indices used for conditioning OMs and for the projection part of the OMs agreed in the April meeting were implemented.

There was discussion concerning whether the US RR 66-114 cm index, available in the OMs for developing MPs, was the one intended in April. In 2017, that index had been chosen so that the set of future indices available included one for small fish (more closely related to recent recruitment). The GBYP modelling expert explained that the April meeting’s report was not too clear on this point, but the OM fits (provided in OM fit report files) were better for the 66-114 cm than for the 115-144 cm index, and that was a main reason why he chose to go with the 66-114 cm index. No objections were raised by the group.

b) Revision of spatial structure for OMs

The OMs now have seven spatial areas instead of the ten areas in the previous OMs. Some meeting participants expressed concerns that some areas would then be inappropriately large, having too much of a north-south extension (e.g. in the Eastern Atlantic the fractions of eastern and western origin are different north and south of Gibraltar). The GBYP modelling expert explained that a compromise had been needed, because the data that inform on movement and spatial distribution of the stocks, and mixing between stocks, are very sparse, and the ten-area models were unstable with convergence difficulties, and could produce unrealistic results for some areas. The conclusion reached on this item is provided in the “Review and Revision of OMs” section of this document.

c) Evaluation of mixing data

The GBYP modelling expert explained that the stock-of-origin (SOO) assignment data had been reinterpreted using a mixture-model approach, with the details of the method and its implementation provided in Carruthers and Butterworth (2018). Assignment data are from genetics and microchemistry (it was confirmed that both sources of data were incorporated in the present analysis). The data analysed correspond to a probability $P(\text{assigned to East stock})$. Assuming that fish in the GoM are all from the West stock and fish in the Med are all from the East stock, the degree of error/uncertainty in these assignments can be inferred and taken into account in the analysis of the assignment data from other areas. If the uncertainty in assignment is not taken into account, as was the case in previous OM, the model strongly overestimates mixing between the two stocks. The mixture-model approach implemented now estimates less mixing and results in tighter confidence intervals than the methods previously considered, because it makes better use of the data. It was noted that this modelling approach is similar to that applied in genetic analyses of allele frequencies to determine stock proportions in an area.

In the ensuing discussion, comments were made that the new approach makes considerable difference to the results for the GSL, where $P(\text{East stock})$ increased from 23% to 46%. This needs to be examined more carefully, to try to understand the reasons better.

Some participants commented that in some areas and quarters no BFT would be expected to be present, and that the OM should not be estimating substantial fish abundances in those strata. The GBYP model expert noted that, as per request from the April meeting, estimates of BFT biomass by quarter and area are now displayed in the OM fits report files, so that OM outputs can be checked there. This issue is revisited in the “Basis for determining OM acceptability” section of this document.

In the course of the discussion, it was also explained that the OM consider a whole range of datasets, not just the assignment data, that inform about stock dynamics and mixing to various degrees; for example, there are also electronic tagging data, that inform about movement. The OM integrate the different types of data as these are all incorporated in the OM conditioning. It was also clarified during the discussion that the electronic tagging data used in the movement model corresponded to fish of known stock of origin only.

The OM assume constant movement rates from year to year and some concerns were raised that this was not realistic. The GBYP modelling expert indicated that it would be far too complicated to include interannual variability in movement rates in the OM, primarily because the data are far too sparse to be able to inform about this. It was noted that, although movement rates are assumed to be the same from year to year (dependent on quarter and age group, with three age groups), the resulting mixing (i.e. proportions of each stock in any given stratum) vary over the years because of the differently changing abundances of the west and east stocks.

Indications were given that more SOO data are most likely available. After discussion, there was agreement to include those additional data in an updated conditioning of OM scheduled to take place in the next few weeks. However, the high importance of having “guillotine dates” for data inclusion in MSE processes was also stressed, because otherwise the conditioning process never ends and it becomes impossible to make progress. It was agreed to have October 15, 2018 as guillotine date for data inclusion (see “Review and revision of OM” section of this document).

There was one exception agreed to this date. Questions arose as to whether the data provided for the process had included catches of small fish taken in the vicinity of the Balearic Islands in the Mediterranean prior to the late-1980s. An urgent exercise to check this would be instituted, for completion by the end of the year. The results would be considered at meetings scheduled for the early months of 2019 (see subsequent “Road map” section) to determine whether modifying the catch data for conditioning the Reference set of OM was necessary.

d) Other

The stock-recruitment (SR) specifications implemented in the OM after April were discussed and it was agreed to implement further changes over the next few weeks (see “Review and Revision of OM” section of this document below).

Note that the simulation of annual recruitment over the projection period incorporates both variance and autocorrelation in “residuals” as estimated for the historical period. The same procedure is applied to the indices simulated for potential use in MPs.

As agreed at the April meeting, the software package was updated to reflect that, when a TAC is set for year y , the last year of finalised data at the time of setting the TAC is $y-2$ for surveys and CPUE indices and $y-3$ for catch data (for years $y-2$ and $y-1$ the catch are assumed in the software to be equal to the TAC). This would mean that, e.g. when setting a TAC for year 2021 (which would normally be done in year 2020), the survey and CPUE indices would be available up to year 2019 and the catch data up to year 2018. The Trial Specifications Document (TSD) lists the eight indices that are currently projected in OM for potential use in MPs (these are GoM larval index of spawning stock abundance, US RR 66-114 cm index of exploitable abundance, JLL_W CPUE index of exploitable abundance, Canadian acoustic survey index, JLL_NEA CPUE index of exploitable abundance, Western Mediterranean larval index of spawning stock abundance, GBYP aerial survey of adults, and Juvenile aerial survey in the Gulf of Lyon). The issue was raised at this meeting that not all of these indices may be available up to year $y-2$ when setting the TAC for year y . Given the very high relevance this issue has for the development of CMPs, the GBYP modelling expert will check each of these indices with the appropriate scientist(s) to ensure the situation is clarified and correctly represented in the MSE software and TSD.

Dynamic SSB0 and SSBmsy:

A main difference with respect to the OM available in April is that dynamic SSB0 and SSBmsy concepts were introduced, to deal with changes in the stock recruitment relationship, and hence R_0 , in a smooth way. The dynamic SSB0 is calculated starting from the per-recruit age structure of the unfished population in equilibrium; when a change in the stock-recruitment relationship, and hence R_0 value, occurs (“regime shift”), the population age structure is iteratively modified through a series of years as would occur for the real population had no catches ever occurred, until equilibrium is reached with the new R_0 value. In this way, the dynamic SSB0 will transition smoothly over a series of years, instead of having sudden changes in SSB0 from one year to the next. Dynamic SSBmsy was defined as a constant fraction of SSB0, with the proportionality constant computed using the specifications (SR, fisheries selectivity and biological parameters) for the final year included in the OM conditioning (currently, this is year 2015, although this will be changed to 2016: see “Review and Revision of OM” section of this document).

In the discussion, it was noted that the ratio $SSBmsy/SSB0$ depends on various factors that are not time-invariant, chiefly the SR specifications (mainly steepness) and the selection pattern at age of the entire combined fishery. This could be relevant particularly in OM using Recruitment level 3, which incorporates productivity changes in future projection years. It may be that the $SSBmsy/SSB0$ ratio does not change much from year to year, in which case using the same ratio throughout the time series is adequate, but this should be checked, particularly for OM using Recruitment level 3.

It was agreed that the dynamic SSB0 and SSBmsy concepts, as implemented in the OM, should be explained in the TSD.

Review and Revision of OM

The GBYP modelling expert presented the results from conditioning the OM (i.e. the OM fits) in the Reference set. A report file for each OM fit is produced by the BFT software and the group was requested to go through them and comment on key aspects they might note.

The GBYP modelling expert and meeting chair stressed that the role of OM in an MSE is not to find a “best possible representation of reality” (as one would attempt in a single stock assessment paradigm) but to capture a “plausible range of realities”, in order to test performance of MPs under a realistic range of plausible situations, while also allowing for some departures from “commonly held views” arising from previous stock assessments.

It was also stressed, when reviewing the results of OM for BFT, to keep in mind that the (age-based) OM developed for the BFT MSE are spatially and quarterly structured, and incorporate both East and West stocks as well as mixing between them. Therefore, several of the results from OM fitting (e.g. population abundance) can

be examined by stock or area. On the other hand, the BFT assessments agreed by ICCAT in 2017 consist of separate assessments for the East and West areas, not for the East and West stocks.

When examining diagnostics from OM fits, it should also be kept in mind that abundance indices, and composition data, relate to particular areas and quarters; similarly, the selectivity-at-length estimated for each fleet relates to the fish present in the area where the fleet's catches were effectuated and not to the entire stock.

After reviewing the outputs from OM fits, the group agreed several changes to the OMs, as described below, and that updated conditioning of the OMs would take place in the near future (next few weeks).

Data used in OMs:

The OMs are currently conditioned based on data until 2015. The group agreed that data up to 2016 will be included in the updated conditioning of OMs as all these data currently exist, provided they are made available by October 15, 2018, so that their inclusion does not create delays in the work. Data for 2017 will not be used for conditioning OMs, because it is not clear when they will be finalised (particularly the CATDIS data).

The group also agreed that any indices already agreed and available (i.e. by 15th October) for years after the OM conditioning years (i.e. after 2016) will be used in the OM projections, instead of simulating those values. Similarly, it was agreed that known catches and TACs that have already been set for years after the OM conditioning years (i.e. after 2016) will be used in the OM projections. TACs have already been set until 2020, so MP options will be applied starting from year 2021. Performance statistics will be redefined accordingly.

It was also noted that additional SOO data are most likely available and it was agreed that these data, if they correspond to the OM conditioning years (i.e. up to 2016), will be included if the conditioning of OMs, provided they are supplied before October 15 2018. The OMs do not use SOO data in the projections.

Recruitment scenarios included in OMs:

"Recruitment" is one of the uncertainty axes included in the reference set of OMs, with three scenarios considered in the current set of OMs (these are the so-called Recruitment "levels" 1, 2 and 3, and are described in the TSD). Each of the three recruitment levels consists of a particular recruitment scenario for the West stock paired with another recruitment scenario for the East stock.

The GBYP modelling expert presented the outputs from the current set of reference OMs. On reviewing the outputs, it was observed that, for the East stock, the current specification of Recruitment level 2 resulted in extremely high estimates of R_0 for the 1988+ period, which were not considered realistic.

The original intention of the Recruitment level 2 for the East stock was to have a reduction in recruitment at low stock size, but the implementation used to date to accommodate this idea for the 1988+ period (a BH SR form with $h=0.7$) resulted in extremely high R_0 estimates for the that period. In order to avoid this problem with R_0 , the group agreed instead to use, for the East stock in the 1988+ period, a hockey-stick SR with hinge-point at the lowest SSB estimated for that period. After developing this "first stage" modification, a "second stage" modification is to be attempted (and adopted, if successful), consisting of having a single hockey-stick SR form since 1967 (i.e. no productivity change in 1988). The intention is to retain only the OM resulting from the "second stage" modification. However, there are some technical issues that may affect the viability of implementing this modification, so that if this fails, the OM resulting from the "first stage" modification will be retained instead.

All other recruitment scenarios currently implemented in the OMs (i.e. Recruitment levels 1 and 3 for both West and East stocks, and Recruitment level 2 for the West stock) seemed appropriate to the group and it was agreed that they did not need further modification.

Abundance scenarios included in OMs:

"Abundance" is also one of the uncertainty axes included in the reference set of OMs, with 3 scenarios considered in the current set of OMs (these are the so-called Abundance "levels" A, B and C, and are described in the TSD). Abundance level A corresponds to the best estimates of abundance for the OM, whereas abundance levels B and C induce "forcing" of the OM fits so as to more closely match the results of the BFT VPA assessments conducted in ICCAT in 2017, or the BFT experts' understanding of past and current depletion levels.

Levels A and B have been implemented so far by the GBYP modelling expert. On reviewing the outputs, the group agreed to make the following changes in the OM's corresponding to abundance level B.

- The most recent VPA assessment, which is from the September 2017 species group meeting, should be used for the East.
- Additionally, the weight given to the term forcing fits to the VPA trends will be reduced from what has been used at present to allow more flexibility.

It is yet to be decided if OM's corresponding to abundance level C will be required, given that the results from fitting OM's with abundance levels A and B together span a wide range of plausible "realities". This decision is deferred to the next meeting of the technical group. It was noted that if that meeting does not agree that OM abundance levels A and B span a sufficient range, then it should make proposals for how level C should be developed.

Spawning Fraction and Natural Mortality scenarios included in OM's:

This is the final uncertainty axis included in the reference set of OM's, consisting of levels I, II, III, IV, each of which is a combination of a "Younger" or "Older" scenario for spawning fraction and a "High" or "Low" scenario for natural mortality, as described in the TSD.

It was observed that some of the levels appeared to provide fits to historical data and values of reference points which were quite similar to some other levels. On this basis, the possibility of removing some of the levels from the OM set was entertained. However, the meeting as a whole was reluctant to remove any level at this stage, because of ongoing work on BFT reproduction (with a meeting scheduled in two months time), which may provide further insights on these biological parameters, and because they could be relevant in possible future management discussions on size limits and allocations.

Robustness tests:

Two possible robustness tests were identified by the group and are described below.

- Examination of minimum log-likelihoods values indicates that OM's with abundance level A fit better than OM's with abundance level B (as would be expected). The fits for level A have been "optimised" through the manner in which weights were assigned to the various contributions, but this has not been done for level B fits. It was agreed to explore sensitivity to different weightings of components in the log likelihoods as robustness tests (details were left for the GBYP modelling expert to decide).
- The seven geographical areas in the OM's will be kept as defined presently. Any changes here would imply major work and thus delay the process considerably. A robustness test will be attempted where the boundary between the South Atlantic (SATL) and the North Atlantic (NATL) and East Atlantic (EATL) geographical areas will be shifted southwards by 5°, so that data from southern Portugal would be allocated to the East Atlantic instead of the Eastern South Atlantic area. The motivation suggested is differing proportions of West and East origin bluefin north and south of Gibraltar.

Basis for determining OM acceptability

It was agreed that two types of issues should be considered for assessing acceptability of OM's.

- (1) The quality of the statistical fit to available data.
- (2) Evaluation of other information not included in the likelihood, which would be used to check whether OM results appear plausible ("red face tests"). This type of test may also apply to some projection results, not just to the historical results from conditioning OM's.

The work to decide on the acceptability of each of the OM's under consideration will be very detailed, technical and time-consuming, and it was agreed that it would be best done by a smaller technical group later, once the agreed changes to OM's have been implemented and their reconditioning has taken place. The following issues were agreed by the meeting for guidance regarding aspects that the technical group should consider.

- The table with log-likelihood values to identify possible major differences in the statistical quality of fits.
- The OM should result in a spatial and seasonal distribution of fish that is not in strong contradiction with the understanding of experts familiar with BFT seasonal presence in different areas. For example, indications were offered that there should be no fish in the GoM in Q3 and Q4. It was agreed to include flags in the OM output noting if “forbidden” conditions (for spatial distribution or for certain features of movement) have occurred; this will be done provided the “forbidden” conditions are supplied by scientists by October 15 2018, accompanied by a paragraph explaining their basis for suggesting that this should be a “forbidden” condition. Later in the process the technical group will review these flag instances and determine if they constitute a basis for excluding the OM from further consideration, or whether the OM should be once again reconditioned in order to include the “forbidden” conditions as constraints. One concern that has been raised is that there can be a tendency with models of this type, if movement parameters are very flexible, to improve the fit to catch indices by placing (cryptic) biomass in regions for which data are limited.
- In the OM, mature fish should move to their spawning grounds at some stage of the year, both for East and West stocks (spawning is assumed to occur in GoM, W Atlantic and Med in Q2). This will be examined in a similar fashion to that set out immediately above.
- The proportion of fish from West or East stocks estimated by the OM in different spatial strata should be examined and addressed in a similar fashion to that set out immediately above.
- At least some of the OM should result in each stock having been depleted at some point in the past (at least below SSB_{msy}).
- The OM estimates of relative biomass of the two stocks in the earlier period of the fishery will be examined.
- The OM should reflect some of the recruitment patterns estimated in the past assessments. Patterns in the estimates from the OM fits are consequently to be checked against estimates from agreed ICCAT assessments.
- Bad fits to historical catches for some OM are to be rechecked. It was noted that the catches input included estimates of illegal catches, but also that those estimates were not that well determined.

Trials specification document (TSD)

a) Update

The TSD is being revised to reflect the trial modifications and additions that were agreed and are reflected above.

The group stressed the importance of keeping the TSD up to date.

The group noted that the split of the French aerial survey into two time periods, as agreed in the April meeting and implemented in the OM available at this meeting, should be reflected in the TSD. A check should also be made that all other changes recommended at the April meeting and already included in the updated conditioning had been recorded in the TSD.

It was agreed that the dynamic SSB₀ and SSB_{msy} concepts, as implemented in the OM, should be explained in the TSD.

b) Document template development for other ICCAT MSE exercises

There was insufficient time to draft and consider a general template for such a document, intended to be developed for any other species undergoing MSE in ICCAT.

Plausibility weighting of OM – initial discussion

There was limited discussion under this item, linked mainly to clarifying the difference between Reference set and robustness trials.

The Reference set trials should incorporate only those uncertainty factors which are both certainly plausible and which may have a major impact on MP performance. Typically the set should include relatively few such factors, and relatively few levels for such factors (generally not exceeding about four in both respects). MP selection is primarily based on performance for this Reference set, with both the individual trials and an average over those

trials being considered, where a “plausibility weighting” may be accorded to those trials in some way for such an average.

Once an MP has been preliminarily selected, its performance should be checked against robustness trials which, distinct from reference case trials, are either are considered to be of lower plausibility in respect of their likelihood to reflect the actual underlying situation, or originally seemed unlikely to have much impact on MP performance.

Plausibility weighting may be based on statistical measures (e.g. AIC weighting based on the goodness of the fit of the OM to the data) and/or “red face tests” based on compatibility with other information not taken into account in the model-fitting process. If such weights are sufficiently low for an OM in either the Reference set or the Robustness tests, that OM may be removed from further consideration.

Plausibility weighting assignments will be considered at the next meeting.

Review of Package for CMP developers

The GBYP modelling expert had already received advice on some glitches in earlier versions of this package which had been circulated, and had implemented the necessary corrections. The current package is version 3.4.1. This version will be further updated once he has implemented the agreed OM changes indicated above.

A number of suggestions for further output were put forward. These included graphical output of the contributions from various components of the objective function minimised in the OM fits, time trajectories of fishing mortality for each OM, a graph comparing fits to observed index values across different OMs (similar to Figure 3 of Carruthers and Butterworth 2018b, but showing observed and fitted index values instead of residuals), and fits to the movement matrix. The expert will attempt to implement these.

Initial runs of developers refined CMPs on new package

A number of papers listing results for CMPs based on the Packages circulated were tabled (Merino et al. 2018, Butterworth et al. 2018, Rice 2018). The GBYP modelling expert used some of the MPs specified in these documents, as well as others whose specifications were provided by other developers present at the meeting, to rerun all for the current version of the OMs (Package v3.4.1), and then gave a brief presentation of the results as conveniently compared using a shiny app. Time constraints allowed for a short period of discussion only.

That presentation and discussion did serve to illustrate the difficulty of comparing performance of different CMPs that had been tuned to different trade-offs between catch and extent of stock recovery. Agreement on standard tuning for use in making comparisons during further CMP development was deferred to the next meeting.

Format for presentation of results (including template)

Discussion of this topic was deferred to the next meeting, both for reasons of shortage of time, and because choices are dependent in part on what turn out to be the key performance factors that have importantly different values across further refined CMPs.

Preparation of presentation on progress to SCRS and thereafter Commission/stakeholders in some form

For reasons of time, discussion of this item not possible. It was referred to the SCRS chair to take forward as he considered best.

Update of future plans/roadmap

The following schedule for future meetings, with associated items for consideration and delivery, was agreed.

2018 (remainder)

SCRS (October)

Review progress on the MSE and recommend revisions

Commission (November)

Ideally the Commission would continue developing the conceptual management objectives proposed at SWGSM. This would be assisted by a presentation from the SCRS Chair.

2019

BMSE TT¹ (January)

Propose final reference set of OMs² with acceptable conditioning, and review progress on CMP³. Development. Initially propose key performance statistics⁴.

BFT WG⁵ (February/March)

Approve final set of OMs and review progress to provide advice on CMP development. Provide input to SCRS Chair on content of MSE presentation to Panel 2.

Panel 2 (March)

Receive update on MSE and structure of CMPs so that they can provide feedback and suggest refinements. Develop initial operational Management Objectives for Commission approval

BMSE TT (May/June)

Review further development of CMPs refined to take account of Panel 2 inputs

BMSE TT (September – 1-day pre-meeting)

Compile summary of updated CMP results to facilitate BFT WG discussion.

BFT WG (September)⁶

Review progress including inputs from Panel 2 for possible comment. Review current proposed CMPs, and then recommend CMPs to be retained for further refinement in the light of subsequent Commission-approved operational objectives. Provide feedback on possible operational Management Objectives. Initiate discussion on Exceptional Circumstances⁷ provisions.

SCRS (October)

Endorse final set of OMs for the MSE and recommended CMPs to be further explored. Provide feedback on possible operational Management Objectives.

¹ The Bluefin MSE Technical Team, consisting of core members and CMP developers, but open to attendance by other members of the BFT WG

² An Operating Model (OM) is a mathematical–statistical model used to describe the fishery dynamics in simulation trials, including the specifications for generating simulated resource monitoring data when projecting forward in time. Multiple models will usually be considered to reflect the uncertainties about the dynamics of the resource and fishery.

³ A Management Procedure (MP) is formally specified, and is a combination of monitoring data, analysis method, harvest control rule and management measure that has been simulation tested to demonstrate adequately robust performance in the face of plausible uncertainties about stock and fishery dynamics. CMP refers to a candidate Management Procedure (i.e. proposed but not as yet adopted).

⁴ A performance statistic relates to a quantity (e.g. average catch over projection period) evaluated in a simulation trial of one CMP under one OM.

⁵ The Bluefin Working Group, being the group that regularly meets each year in the week before the SCRS meeting.

⁶ If MSE progress inadequate, develop workplan to provide assessment-based TAC advice for 2021 during Sept 2020 BFT WG meeting.

⁷ These are specifications of circumstances (primarily related to future monitoring data falling outside the range covered by simulation testing) where overriding of the output from a Management Procedure should be considered, together with broad principles to govern the action to take in such an event.

Panel 2 (November 1-day before Commission meeting)

Prepare draft operational Management Objectives for consideration by Commission, taking account of input from SCRS.

Commission (November)

Commission to be updated on CMP structures, including projected performance of CMPs to provide feedback to SCRS and its subgroups. Finalize operational Management Objectives.

2020

BMSE TT (January)

Review further development of CMPs refined to take account of Commission inputs

BFT WG (February/March)

Review progress to provide advice on CMP development. Provide input to SCRS Chair on content of MSE presentation to Panel 2. Develop proposals for Exceptional Circumstances provisions. Consideration of an independent review of the MSE process.

Panel 2 (March)

Receive update on MSE and structure of CMPs and on Exceptional Circumstances provisions, so that they can provide feedback and suggest refinements.

BMSE TT (July)

Review further development of CMPs refined to take account of Panel 2 inputs

BFT WG (September)

Compile list of final CMP options for consideration for adoption, together with providing draft Exceptional Circumstances text. Make preparations to compute TAC recommendations for the options put forward.

SCRS (October)

Review and finalize proposals from BFT WG for CMP options to be considered for adoption, and for Exceptional Circumstances text.

Panel 2 (November 1-day before Commission meeting)

Prepare final proposals to the Commission for CMP options to consider and Exceptional Circumstances text. The CMP options put forward by the SCRS may be reduced in number, possibly to a single option.

Commission (November)

Adopt a MP together with the period for which this will apply before revision and associated Exceptional Circumstances provisions. Consider adoption of TAC recommendations provided by that MP.

Some examples of different levels of Management Objectives (MOs) were also tabled.

Conceptual MOs

- Maximise catches
- Minimise risk of reducing stocks to unproductive levels
- Industrial stability
- Achieve MSY

Initial Operational MOs

- Modify TACs after periods of X or of Y years

- Minimise the extent of TAC change
- Have stocks at or above Bmsy after XX years for most Reference case OMs
- Have a low probability of stocks below around YY-ZZ% of Bmsy for each Reference case OM

Operational MOs

- Modify TACs after periods of X years
- Seek to avoid TAC changes exceeding Z%
- The biomass distribution after Y years, under a plausibility weighted average over all Reference case OMs, must have a XX% probability of exceeding Bmsy.
- The biomass distribution for each Reference case OM after Y years must have an YY% probability of exceeding 0.ZZ*Bmsy.

NB: Numeric values for X, Y, Z, XX, YY, ZZ etc. would be specified at the time these MOs were discussed and agreed.

As a final note, the issue was raised by some of the meeting participants that MSE, as a tool, can also help in matters other than developing a MP. In particular, MSE could be used to assist evaluate the ability of different types of data to provide information useful for management, which could help set research priorities. This is a matter which might be usefully discussed further at future meetings of the bluefin working group.

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