

GBYP Steering Committee Meeting (Online, 9 December 2021 13:00-15:00)

Participants:

Steering Committee (SC) members: Gary Melvin (SCRS Chair), Camille Jean Pierre Manel (ICCAT Executive Secretary), John Walter (W-BFT Rapporteur), Enrique Rodriguez-Marín (E-BFT Rapporteur) and Ana Parma (SC External Member).

Invited: Haritz Arrizabalaga (SCRS Vice-chair), Miguel Neves dos Santos (ICCAT Assistant Executive Secretary), Francisco Alemany (GBYP Coordinator) and Alfonso Pagá García (GBYP Database specialist).

Background:

Since due to time constraints the SC could not take the final decisions on all scheduled items within the on-line meeting held on 4th November 2022, and considering the tight schedule of SC members in the following weeks due to ICCAT Commission meeting, it was decided that further decisions would be taken following an iterative process through email. Therefore, a reference document on pending issues elaborated by GBYP Coordinator was submitted to the Group on 9th November, besides the draft minutes from the two previous SC meeting sessions, for discussion and review. Further comments from SC members were incorporated into a new consolidated document. Agreements could be reached on most of items, but some discrepancies remained in relation to important issues, as the work plan for the elaboration of a proposal for the implementation of the Close Kin approach to the BFT Eastern stock. In addition, a document expressing some concerns and requesting some clarifications on many of the issues included in the reference document was received from EU. Therefore, it was decided to hold a third on-line session of this SC meeting, aiming to reach a consensus on the controversial pending issues and agree on the answers to be submitted to the EU. Consequently, two reference documents elaborated by the GBYP Coordinator, the aforementioned consolidated document incorporating the comments received by email from the SC members on each of the pending decisions and a draft answer to the EU concerns, were distributed among the group and discussed within an on-line meeting held on 9th December 2022, whose minutes are those included below.

Minutes:

The SCRS Chair opened the meeting welcomed the assistants, inviting the GBYP Coordinator to go through the document listing the pending decisions (ANNEX 1).

The point 1 on the list, to confirm a budget of 15,000€ to support the celebration of a presential (if possible) larval surveys coordination technical workshop within Phase 11 extension, was agreed and accepted without objections nor comments.

The point 2 dealt with the total budget to be dedicated to the biological sampling and genetic, microchemistry and ageing analytical activities in Phase 12. It was remembered that any double funding between the EU Data Collection Framework and GBYP sampling programs must be prevented. The GBYP Coordinator clarified that the final goal is that most of BFT sampling activities necessary for routine stock assessment be carried out by the CPCs and that GBYP program would cover only complementary additional sampling and analytical tasks requested by the SCRS to carry out specific studies. The GBYP Coordinator informed the SC that the budget initially assigned to sampling and analytical tasks was of 260000€, but that maybe the final amount could be higher, and that if some

presential meetings planned for phase 12 are finally cancelled some travel funds could be redirected to these activities. Finally, it was recommended to make further efforts to reduce the budget for biological sampling tasks and a maximum quantity of 300,000€ for biological sampling and analyses activities was set.

About the point 3, the proposal of contracting an external expert within phase 11 extension to model the relationships between observed growth rates in farms and environmental variables, the Steering Committee concluded that there is no need to contract an external expert because there is expertise enough in ICCAT Secretariat and SCRS to perform these analyses and that this activity is not a priority. So, the proposal was denied.

Concerning the point 4, the work-plan to assess the feasibility and elaborate a proposal for CKMR approach implementation, the GBYP Coordinator initiated the discussion explaining that there was a general agreement on the successive steps of the workplan designed taking into account the outputs from the first Close Kin workshop held in February 2021 the SCRS BFT species group meetings held after this date, it is: finishing a BFT epigenetic ageing feasibility desk study; design and develop a pilot study on BFT epigenetic ageing; elaborate background document on relevant and consolidated current knowledge on stock structure; provide CSIRO experts with gathered info on ABFT stock structure and epigenetic ageing feasibility and contract them to elaborate a guidance document on implementation of CKMR approach to BFT eastern stock; organize a Close Kin technical workshop focused on elaborating a concrete proposal, including sampling design and cost estimations, for the implementation of CKMR approach to BFT eastern stock, which should be presented to SCRS Plenary and Commission for final decisions. However, there were discrepancies among SC members about the best timing to carry out these activities, since some members proposed to speed up the process as much as possible, in order to present a final proposal to 2022 SCRS plenary meeting, whereas others considered that in the present circumstances it was impossible to complete all the planned preparatory tasks to elaborate a final proposal before September 2022, proposing to split the successive activities between GBYP phases 11 and 12 and then present the final proposal in 2023. The GBYP Coordinator remembered that the immediate objective is to develop a realistic proposal of CKMR implementation and to present it to the SCRS and the Commission, not to start implement directly CKMR.

After a general discussion about the pros and cons of the different options it was agreed that the first step (desk study on epigenetic ageing), already included as a specific task within the current GBYP biological studies and analyses contract, should be finished ASAP. Following, taking into account the results from such study, a pilot practical study would be designed and carried out within GBYP Phase 12 biological studies and analyses. In parallel, along 2022, a team of SCRS experts in BFT ecology and management, in coordination with CSIRO specialists in CKMR, including on-line meetings for general discussions, would elaborate the reference document on relevant and consolidated current knowledge on Atlantic BFT stock structure. These background documents will be first presented to the BFT Species group meeting in 2022 for discussion and approval, and then they be used as a reference by CSIRO and SCRS experts to elaborate an updated guidance document on the feasibility of CKMR approach implementation in the BFT Eastern stock within GBYP Phase 12. Finally, a second GBYP workshop on Close-Kin, presential if possible, will be held at the end of GBYP Phase 12, with the main objective of producing a concrete proposal for CKMR approach implementation in BFT Eastern stock, which would be presented and discussed within 2023 BFT Species Group meetings and, if the Group agrees, to the 2023 SCRS Plenary, and finally, depending on SCRS decisions, to 2023 ICCAT Commission meeting.

Concerning the point 5, the support to meetings of the SCRS subgroup on indices standardization, the Steering Committee, considering that the potential implementation of CKMR approach would have a strong impact on BFT Eastern stock sampling design, decided to postpone some months the celebration of the planned GBYP workshop on BFT biological sampling international coordination, till having a more precise idea about the feasibility and specific sampling needs for the application of the CKMR approach to the BFT Eastern stock, moving it from GBYP Phase 11 to GBYP Phase 12. Consequently, given that probably within Phase 12 there will be already chances to held presential meeting, it was decided to assign a budget of 25,000€ in Phase 12 proposal to support the organisation of a presential meeting on this topic.

About point 6, the support to meetings of the SCRS subgroup on indices standardization within GBYP Phase 11, the Steering Committee decided, considering that finally the meetings along the first semester 2022 will be still on-line, to remove the initially planned budget of 30,000€ for this activity.

As regards the point 7, the support to the development of alternative stock assessment models, the Steering Committee agreed that as a first step the GBYP Coordinator will provide a draft of the ToR, which will be further refined by the Steering Committee members, with the help of experts from the SCRS Group on stock assessment methods. Then, a Call on this topic will be launched within GBYP Phase 11 extension, with a maximum budget of 90000€.

Under point 8, about the GBYP support to MSE communication activities and MSE technical group meetings, the Secretariat representatives reiterated that considering the pandemic situation in Europe it will be very difficult to organize physical meetings along the first semester of 2022. Therefore, the SC decided to remove the envisaged budget for these activities in Phase 11, but to keep a budget of 20000€ within Phase 12 to fund attendance of experts to MSE technical group meetings.

In relation to point 9, dealing with the support to MSE implementation process, the Steering Committee decided to keep the total cost of the MSE developer contract in 2022 at the same level than in 2021. Part of these costs will be funded within the extension of Phase 11 through an extension of 2021 contract, and once finished it the remaining activities will be charged to Phase 12 budget. It was also decided to assign a budget of 30,000€ to MSE process global review in Phase 12.

In item 10, the Steering Committee rejected to assign a total budget of 40,000€ in Phase 12 to support the travels of experts related to Eastern BFT stock assessment meetings because, since probably most of meetings will be held on-line and in any case the experts should be funded by their own CPCs.

Regarding point 11, the different external requests for GBYP data, the Steering Committee approved to share such data, whenever the ICCAT GBYP data police be respected.

The last point of the agenda was to agree on the answers to the questions posed by the EU, through a document submitted previously by EU to GBYP Coordinator, on these items. A draft version of these answers, elaborated by the GBYP coordinator, was reviewed, but to the lack of time the final text could not be agreed yet. So, it was concluded that the W-BFT Rapporteur would provide shortly a new version incorporating the new comments from the rest of the Steering Committee and then the GBYP Coordinator would combine all comments in a final version that would be distributed among the Steering Committee members for a final revision. The definitive agreed version of these answers to the Commission is attached as Annex 1.

ANNEX I ANSWERS TO EC CONCERNS

3 Should an external expert to be contracted within phase 11 extension, with a maximum budget of 20000€, to model the relationships between observed growth rates in farms and environmental variables?

EC: This kind of study would go beyond what had been requested by the Commission, whose goal was essentially related to close possible loopholes against compliance. Refined scientific analysis could be also done at no cost provided that access to data is granted to research teams/scientists willing to do peer review publication. The more GBYP information is scientifically exploited, the better. However, we shall avoid a long concatenation of emerging scientific needs of limited or null utility to the Commission. As general comment that applies across the GBYP activities, as also restated at the last ICCAT AM, in short-term perspective the GBYP budget should be further reduced at least for what concern the EU direct contribution.

ANSWER: Understood. Maybe we went too far interpreting what was behind the phrase “the SCRS shall also consider the difference among geographic areas (including Atlantic and Mediterranean) in updating the table” in the paragraph 28, since we thought that it included not only to quantify the differences, but also to investigate the reasons behind such differences. For that reason, within the field studies funded by GBYP we asked the contractors to gather not only key physical environmental variables affecting the growth rates, such as temperature, but also other variables we know can influence the fish growth (e.g. amount and quality of food supply; cage dimensions and fish density). These data would allow performing statistical analyses to determine what variables are relevant, as well their functional relationships with growth rates. These studies were not conceived as “academical” ones, but having also in mind compliance issues, it is, to prevent that environmental factors could be invoked by some CPCs as the cause of unusually high growth rates, as has happened sometimes in the past.

However, in the light of these further clarifications from your side, we will not use any funds for this activity, but we’ll try to conduct some “in home” analyses, which was in fact the original plan.

4 Confirm short term workplan to assess the feasibility and elaborate a proposal for Close Kin approach implementation, which is:

- a) Finalizing ASAP the desk study on feasibility of applying epigenetic ageing on Eastern BFT (already ongoing within current biological studies contract).**
- b) Depending on the results of feasibility study, design and develop, as soon as possible, a pilot study on BFT epigenetic ageing.**
- c) In parallel to aforementioned activities, elaborate background document on relevant and consolidated current knowledge on stock structure (guidance from CSIRO required). It would be a desk work carried out by GBYP coordination with the help of SCRS specialists, no budget required**

EC: We understand that, even if carried out in 2022, this is already covered by Ph.11. Could you pls confirm?

ANSWER: Yes, this is a zero-cost activity planned within phase 11 extension

d) Provide CSIRO experts with gathered info on ABFT stock structure and epigenetic ageing feasibility and contract them to elaborate a guidance document on implementation of CKMR approach to BFT eastern stock (budget available within Phase 11 extension, 60000€ for contract and workshop organization)

EC: The thematic and chronological link between epigenetic ageing studies (feasibility/pilot) and CKMR is not clear to us. We understand that the former comes first simply because it is more advanced in its conception to evaluate the implications in terms of tissues sampling that could benefit also the subsequent CKMR analysis. Or are there other thematic issues linking the two analysis? We understand that the epigenetic analyses need to be validated through an agreed biological clock established through the traditional ageing; is the latter clearly available?

ANSWER: The link between epigenetic ageing and CKMR is that the epigenetic ageing would allow to know the age of parents and descendants, which is indispensable for applying this approach, at a much lower cost and time frame than usual sclerochronological methods, such as otoliths or spines. So, to present a realistic and concrete proposal to SCRS and then to Commission, including time and cost estimations, on the potential implementation of CKMR to E-BFT stock, it is necessary to know first if the use of epigenetic ageing techniques in Atlantic BFT is feasible and accurate enough. In other words, given the high level of sampling required and the costs of sampling and analyzing otoliths, the epigenetic ageing can be considered a game changer, making the CKMR feasible within reasonable costs.

The answer to the second question is yes. Epigenetic ageing results should be validated against "classic" age determinations from sclerochronological studies, which in its turn must be validated. Regarding the latter, BFT otolith ageing criteria were validated by radiocarbon techniques (Neilson and Campana, 2008). In addition, indirect or semi-direct validation methods, as detection along successive years of especially strong cohorts, have been also applied. Moreover, along the last years GBYP have been supporting the efforts of SCRS ageing specialists to improve the accuracy of age determinations based on otoliths, through intercalibration workshops and supporting the application of methods such as the Marginal Increment Analysis to fix objective reading criteria. Therefore, it can be concluded that current "classic" age estimations are reasonably accurate, and hence can be used as reference to validate epigenetic ageing.

EC: Albeit the 60k€ budget might be available, we invite the coordinator and the SC to be highly vigilant on the costs forecast for this action, particularly if the workshop is on-line (hence, limited costs involved).

ANSWER: The proposed amount of 60000€ was only a first rough estimation, based on having an in-person workshop. If in the end the pandemic precludes an in-person workshop, this figure will be revised.

EC: A GBYP guidance document on BFT-CKMR had been already done in recent past, ongoing work on the WBFT is certainly useful and further knowledge and expertise are already available in several documents presented by CSIRO in other RFMO finally a CKMR workshop was already organized last February 2021

We hope that the new workshop will be useful beyond just a discussion of the CSIRO proposal only. We should avoid paying for the already available information more than once.

ANSWER: This new guidance document from CSIRO would be an updated and more complete version of what CSIRO experts presented for free in the previous close kin workshop. Moreover, it will be elaborated taking into account the new inputs from the SCRS experts, as the reference document on “confirmed” knowledge on stock structure, as well as the ongoing CKMR studies in the Western stock. The CSIRO experts would also provide advice/guidance for the elaboration of a realistic and scientifically sound proposal for the implementation of the CKMR approach for the Eastern and Mediterranean BFT stock, including cost estimations and detailed sampling plan. The latter will be produced considering all the available background information and the conclusions from the discussions held during the next workshop. In any case, the amount of the contract for CSIRO contribution would be fixed considering that they do not start from scratch, but should take advantage of the work they already carried out under GBYP contracts several years ago.

EC: It would be useful that the reasons in support of the CKMR approach to estimate absolute abundance/biomass are indicated and justified.

ANSWER: Few methods in fisheries provide absolute estimates of total abundance. Even the aerial survey only provides us with a relative abundance. Hence a method that can give us this absolute biomass value, as can CKMR, is critical to addressing the key question for BFT of how many we can sustainably catch. Furthermore, in mixed stock fisheries, the ability to partition out and identify individual stock components [e.g. Eastern and Western (or more)] stocks, which happens within CKMR approach, as it is based on genetics, allows us to finely tune management advice.

EC: What are the reasons why the traditional stock assessment is not able to measure with precision and accuracy the abundance/biomass at sea?

ANSWER -In most stock assessments, the magnitude of total abundance comes mostly from the magnitude of the assumed landings. For EBFT we have had to assume the magnitude of the highest catches for about a 13-year time period (e.g. the ‘inflated’ catch series during years 1995-2008). For much of the time, the catch was assumed to be fixed at 50,000t but, in reality, SCRS does not actually know the total magnitude, which could be higher or lower. Assessments also rely on contrast between the indices and the landings time series. In the case of EBFT, we see little of the necessary response of the indices to removals, either due to incomplete or short index time series, or as a result of incomplete landings data. Hence no traditional stock assessment will give us a total abundance for EBFT that is not dependent on these assumed catches.

EC: Moreover, we would like to understand in which specific point(s) of the stock assessment/MSE processes the results of this analyses enter.

In fact, it would be useful that such a document is comprehensible not only for the scientists but also for the managers. This kind of documents shall be readable and comprehensible also

for managers. There are a lot of assumptions and modelling choices introduced during the scientific process. This makes it less and less comprehensible for the managers to understand the scientific approaches underpinning their fisheries management choices. We should certainly aim at bridging that gap.

ANSWER: An absolute abundance estimate from CKMR would enter the MSE process by allowing the operating models to know the scale of the stock. Please note that there is the scale axis of uncertainty in the Oms - which is, by far, the greatest source of uncertainty in the OMs and the most influential axis on maximum sustainable yields - a bigger population gives a higher MSY and vice-versa. Hence for us to get information on absolute abundance from CKMR will allow the management procedures developed through the MSE to be much more finely tuned aiming the maximum sustainable yield from the stock. An example is that the incorporation of CKMR data into the Southern Bluefin Tuna assessment indicated that the stock was substantially larger than estimated by the conventional stock assessment model. We cannot predict what we will find with EBFT but it is certainly possible that we may find that the stock is larger than we have simply assumed in the scale axes in the MSE.

In the longer term, genomic methods such as CKMR and possibly genetic mark recapture tagging (tag fish, genotype them and then recapture them 2 years later) may provide additional indicators to drive management procedures. The new management procedure developed by CCSBT incorporates results from gene tagging and CKMR as additional inputs. Once we develop the CKMR there will be a number of options for using these data in the management procedure. The benefit is that genomics is the only scientific activity we do for which the costs are rapidly decreasing due to an economy outside of fisheries and the power is rapidly increasing. Hence this is why it is such a good investment.

- e) **Organize a Close Kin technical workshop focused on elaborating a concrete proposal, including sampling design and cost estimations, for the implementation of CKMR approach to BFT eastern stock (budget available within Phase 11 extension, 60000€ for contract and workshop organization, and 25000€ within Phase 12 if further meetings are required)**

EC: We would like to understand the difference between (and the value added of) this workshop and the CKMR workshops organized last February 2021?

ANSWER: As mentioned above, the first workshop aimed at exploring the feasibility of implementing the close kin approach in the BFT eastern stock. However, from the workshop discussions it became evident that a synthesis of available information on stock structure and migration, agreed upon in a working document prepared prior to the workshop, should be needed to get sound conclusions.

So, this second workshop would represent a clear step further, whose goal would be to elaborate, based on a deep analysis of the new background information listed in previous paragraphs (document on consolidated knowledge on stock structure, the updated guidance document elaborated by CSIRO in close collaboration with SCRS experts, results from epigenetic ageing feasibility studies etc.), a more precise work plan for the potential implementation of close kin to EBFT, which then should be submitted to the SCRS for consideration, and finally to Commission.

EC: See above comment on the need to clarify the link between epigenetic and CKMR.

Is it matter of sampling effectiveness and efficiency or are there other reason?

It is important that this clarity is available in the different GBYP documents (e.g. minutes of SC meeting, reports etc.) in order to allow the managers to have a better understanding on the way the money is going to be invested.

ANSWER: The link between epigenetic and CKMR has been explained above. Regarding the specific questions, it is mostly a cost effectiveness issue. The real need is to know the age of fish included in the analyses, no matter the method used, but the advantage of epigenetics is that it allows to age the very high number of fish required by CKMR approach in due time and at a much lower relative cost. Please note that getting otoliths from farmed fish (the main source of spawner samples) is difficult and where possible, very costly, which will be a challenging issue to the ambitious sampling plan required for CKMR. This could be overcome with epigenetic aging.

EC: It would be important that the guidance document is elaborated not only by the team which has all the interest in promoting the system.

We tend to agree with Ana that an enlarged panel of scientists should be involved.

In order to mitigate the risk of conflict of interest, the call for tender or expression of interest shall require that the applications is done by a consortium of teams.

ANSWER: As explained above, the initial plan is that the ToRs require CSIRO to take into account the inputs from SCRS experts. However, if to grant the total “objectivity” of this guidance document, including both the advantages and the disadvantages of this approach, the GBYP SC can request the formal involvement of SCRS experts, either by include a set of experts under contract (possibly sub-contractors, which would have a financial impact) or making mandatory the inclusion of a set of SCRS experts (“non-CSIRO” experts) to become engaged in drafting the of the “CSIRO” guidance document. These could be a pre-requisite in the ToRs. However, please note that this is only a guidance document and that the most important tangible deliverable from all the planned activities will be the aforementioned proposal for CKMR approach implementation in the BFT Eastern stock, which will be produced by the BFT Species Group, based on the advice of CSIRO experts.

EC: By the way, there is also a risk of conflict of interests affecting not only the CKMR but also the MSE calls.

ANSWER: We are aware of the potential conflicts, but you can be confident in that GBYP SC and GBYP coordination team always do their best to prevent that somebody could make an undue use of his/her position to promote specific lines of research or actions that are not in line with SCRS and Commission needs. This has been done in relation to MSE implementation, and for sure we would do the same in relation to CKMR. As mentioned above, there is no problem in including in this CKMR related ToRs a specific mention to the need of including a consortium of teams/experts.

Regarding BFT MSE, unfortunately the expertise to conduct an MSE and an assessment of this complexity is rare and leads to only a small pool of applicants. However, following GBYP standard practice, the implementation of BFT MSE was initiated in 2013-2014 through a series

of open Calls, to carry out the initial planning, contract a modelling coordinator and, finally, an expert to initiate the design and development of the MSE framework under the guidance of the Modelling Coordinator, the ICCAT population dynamics specialists and the MSE Core Modelling Steering Group. From then, the contract of the first MSE developer has been renewed, following the SCRS MSE Technical Group (former MSE Core Modelling Group) and GBYP SC recommendations, because it has been considered that the contractor has developed an excellent work, always accomplishing the objectives stated in the ToRs of the successive contracts, which have been set every year following the recommendations from the BFT MSE Technical Group.

It is also worth mentioning that this year GBYP has funded a thorough review of all the code by an external expert, who has carried out an exhaustive work. It is worth noting that there has not been found any major error in the code developed in previous years by the MSE contractor. The definitive final report will be available in the forthcoming days and as usual published in the GBYP documents webpage.

7)Decide if the budget assigned within Phase 11 to the development of alternative stock assessment models should be increased to 90000€. Specific ToR should be defined ASAP.

EC: We have strong concerns on the way the development of the MSE has progressed over time with a lot of recurrent delays and imprecision also in the documents circulated at the very last minute of BFT WG meetings etc.

The reference MSE documents have been regularly affected by several errors just to quote the last example where the TSD and the Operating Model Comparison Reports (<https://iccat.github.io/abft-mse>) contained persisting errors (e.g. mismatching between some subheadings and actual content; n° of tagged animals used for the transitions; etc.); they should have been corrected right now. Although both are living documents we would expect that each published document is always correct and update.

The detailed correctness of those documents is fundamental for future work to be carried out by a wider pool of SCRS scientists.

Finally, an issue that is worth of mentioning is about the actual availability to the SCRS scientific community of the updated MSE master code and its detailed description so to allow any SCRS scientist, with the right expertise, to take the tool and contribute to its further development. We have the feeling that unfortunately SCRS is somehow trapped with a single service provider that is not useful in terms of either cost or time.

The forthcoming calls will hopefully address this problem.

ANSWER: This 'development of alternative assessment models' does not deal directly with ongoing MSE activities, but with the development of improved stock assessment models going into the future. However, we will try to answer your concerns on the MSE process.

We agree that the process has been affected by recurrent delays, but considering the complexity inherent to this species, its fisheries and the Operating Models, it is the reality. Maybe the problem is that initial previsions were too optimistic. The main reason behind the

delays along the last years is that once the first phase of model development, carried out years ago under the supervision of the SCRS “core modelling group” was finished, and the outputs were open to the revision and discussion of a wider group of SCRS experts (the so called BFT MSE Technical Group), around three years ago, the feedback from this group, which include the colleagues developing the operating models, have resulted in continuous refinements and, consequently, in further delays. In addition, the complexity of the operating models complicated judging their plausibility by the SCRS community. In fact, the late submission of input information and/or guidance from the BFT MSE Technical group and/or the BFT SG, as been an issue that the consultant has faced and worked hard to reduce the consequent delays. Accordingly, it is our understanding that the delays cannot be attributed to the consultant.

Regarding the 'errors' in the TSD, these are good points. We note that SCRS experts and the contractor have been so focused on getting the quantitative details correct that not as much attention has been paid to the TSD living document. However, that does not make these errors acceptable, and hence we are doing our best to correct these and to ensure that in the future the contractor makes the TSD and all supporting material 100% correct at the time of upload in the Github. We would want also to point out that the documents that can be really considered as the official reports are not the living documents accessible through the Github, but those formally submitted by the contractor to GBYP coordination team and then uploaded in the GBYP webpage. Finally, please note that, as mentioned in a previous answer, a complete external review of all the code developed along the last years by the MSE contractor has been performed in 2021, and no major errors in this code have been found.

Regarding transparency and accessibility of the MSE code, the code has been available for several years to anyone who inquired. In fact, SCRS experts, as Dr. Carmen Fernandez, spent a lot of time with it at the outset looking into the code and offering suggestions. We are aware that a high level of expertise is required, but the code is freely available from the developer and we welcome any additional revision by any experts or interested parties. Accordingly, if you are aware of anyone willing to review the code and who do not know how to get it, send us his/her contacts and we will provide the code.

9) Confirm if the budget for MSE developer contractor in 2022 should be kept as previous years (105000€) and that if a budget of 30000€ should be assigned to MSE process global review in Phase 12. Also, decide if a budget of 20000€ would be adequate to fund attendance of experts to MSE technical group meetings in Phase 12 (second semester 2022)

EC: See the above comment. How much of this budget is already included in the forecast under item 7?

ANSWER: As explained above, the stock assessment models mentioned in item 7 are, in spite they are related, independent of MSE issues addressed in this item 9. So, the budgets mentioned in both points are independent. Moreover, item 7 budget would be under phase 11, whereas item 9 would correspond to the phase 12 budget. However, if finally any or almost none travel are to be funded under phase 11 due to Covid situation, part of the cost of the MSE contractor could be covered with remaining phase 11 funds, and hence the MSE

budget planned initially for phase 12 would decrease proportionally. Accordingly, those funds could be redirected to other items, as might be required by the Steering Committee.