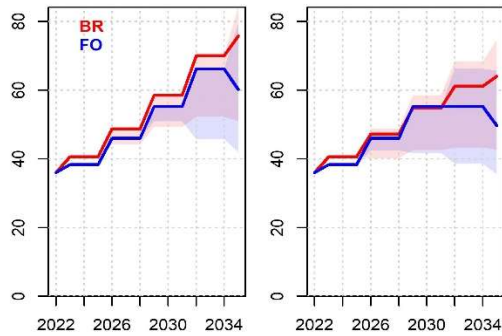


Evaluating Management Strategies for Atlantic Bluefin Tuna

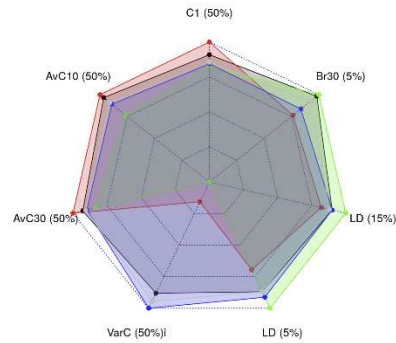
Report 10: CMP performance comparisons, MP adoption.

December 20th 2022

SHORT-TERM CONTRACT FOR THE
 MODELLING APPROACHES: SUPPORT TO BLUEFIN TUNA STOCK ASSESSMENT
 (GBYP 08/2022) OF THE ATLANTIC-WIDE RESEARCH PROGRAMME FOR BLUEFIN TUNA (ICCAT
 GBYP – Phase 12)
-FINAL REPORT-



<https://apps.bluematterscience.com/ABTMSE>



https://apps.bluematterscience.com/ABTMSE_Performance

Tuning	Variant	West					East					Tot
		PGK (Mean)	AvC10 (50%)	AvC30 (50%)	VarC (50%)	LD (15%)	PGK (Mean)	AvC10 (50%)	AvC30 (50%)	VarC (50%)	LD (15%)	
6	5	0.65	2.67	2.32	8.38	0.44	0.65	49.3	39.78	15.17	0.48	0.33
6	5	0.65	2.69	2.33	9.7	0.44	0.66	49.27	39.72	15.57	0.48	0.38
6	5	0.66	2.79	2.5	14.95	0.4	0.65	45.02	35.42	16.52	0.49	0.61
6	5	0.66	2.78	2.5	15.3	0.41	0.65	44.95	35.44	17.02	0.49	0.63

https://apps.bluematterscience.com/ABTMSE_Performance2

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Executive Summary

This contract included the final stages of MSE development in support of MP adoption including final tuning of CMPs, rescaling of latest index data, drafting of exceptional circumstances protocols and additional presentation materials in support of MP selection.

All tasks and deliverables listed in the contract were completed on time with the exception of a presentation of example exceptional circumstances protocols (insufficient time at September species group meeting).

Principal developments

- Finalization of shiny apps
- Finalization of TSD
- Rescaling analyses allowing for update in indices
- A variety of presentation and communications materials in support of MP adoption.

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1 Review of contract activities

1.1 Retune TC and AI CMPs to the biomass limit reference point of LD 15% = 0.4

The design and tuning of CMPs was in constant flux in response to feedback from the Bluefin Working Group and Panel 2. The tuning to LD 15% was temporarily replaced with tuning to PGK (Probability Green Kobe) following the availability of FMSY-related performance metrics. All CMPs, including AI and TC were retuned to PGK 60 and PGK 70 and these results were consolidated, uploaded to the ABTMSE, ABTMSE_Performance and ABTMSE_Performance2 apps and then presented to the MSE technical team in September (Appendix A).

Subsequently, during the September species group meeting LD 15% statistics were presented to the group to show their equivalence with Br30 and PGK tunings (Appendix B).

1.2 Present comparative results of 2- and 3-year update intervals for the TC and AI CMPs

Code to remap operating models to have 3 year management update intervals was added to a revised CMP developers guide (Appendix B) and posted on the ABTMSE splash page (<https://iccat.github.io/abft-mse/>). All CMPs were tuned for both 2- and 3-year update intervals, the results consolidated, uploaded to the various Apps and the results presented to the species working group in September (Appendix C).

1.3 Develop methods for reducing variability in catch advice and evaluate trade-offs when reducing variability in catches (VarC)

Code to reduce the variability in CMP TAC recommendations was provided in a revised CMP developers guide (Appendix B) and posted to the splash page.

1.4 Automatic report for the shiny app (a report is build based on your current selections including all figures and tables)

The shiny app was adapted to allow for the downloading of CMP performance data and tables as interactive .html reports (Appendix D) (see the new 'Reports' dropdown menu in https://apps.bluematterscience.com/ABTMSE_Performance2)

1.5 Updating the MSE splash page to include new reports and existing CMP descriptions

The splash page (<https://iccat.github.io/abft-mse/>) was updated several times to include new reports and CMP descriptions in support of the species group consideration and Panel 2 decision making.

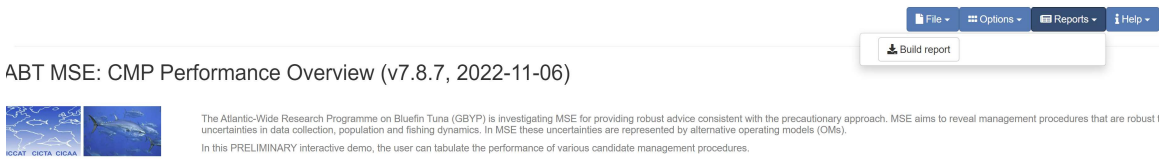
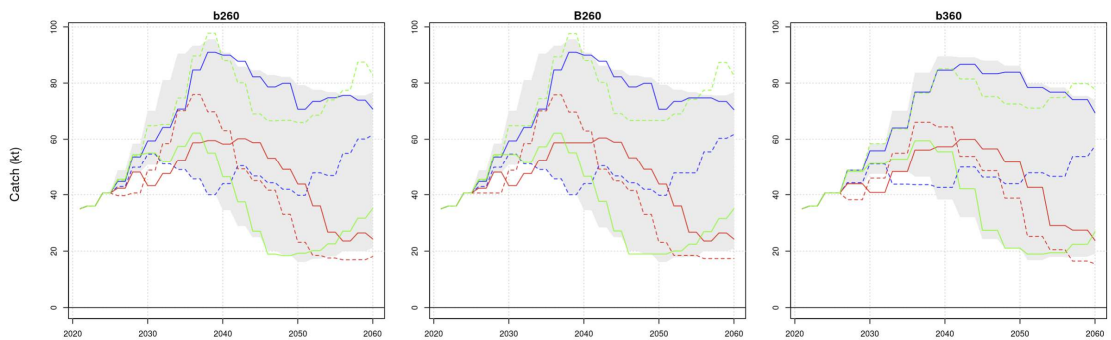
1.6 Preliminary investigation of exceptional circumstances protocols / indicator systems

A demonstration of exceptional circumstances protocols was provided in an SCRS paper (Carruthers 2022, Appendix E). The paper showed how rates of false positive and true positive could be calculated using posterior predicted data. Unfortunately, there was not sufficient time to present the paper at the September Species Group meeting where the priority was other analyses in support of Panel 2 presentations.

1.7 Continue to meet the requirements of the working group developing new analyses and diagnostics in support of MSE presentation and CMP performance evaluation (e.g., new performance metrics, MSE projection figures and SCRS papers)

A large number of analyses were undertaken arising from working group requests and in support of panel 2 decision making. These included changes to shiny apps and index rescaling to ensure comparability of new indices with those used in reconditioning (see Table 1).

Table 1. Miscellaneous analyses and new additions to the Shiny apps in response to working group requests (<https://apps.bluematterscience.com/ABTMSE/> and https://apps.bluematterscience.com/ABTMSE_Performance2/)

<p>Addition to File dropdown menu - Downloading of results data</p>	
<p>Revised worm plots</p>	<p>Results plotted for OMset 1</p> <p>Metric: Catch(area) Number of simulations to plot: 6 Median: <input type="checkbox"/> CMP 1: b260 CMP 2: B260 CMP 3: b360</p> <p>East area / eastern stock</p> 

CMP sorting and filtering by Tuning level, Variant and Type

ABT MSE: CMP Performance Overview (v7.8.7, 2022-11-06)



The Atlantic-Wide Research Programme on Bluefin Tuna (GBYP) is investigating MSE for providing robust advice consistent with the precautionary approach, collection, population and fishing dynamics. In MSE these uncertainties are represented by alternative operating models (OMs). In this PRELIMINARY interactive demo, the user can tabulate the performance of various candidate management procedures.

Tuning
 60 65 70

Variant
 2 3

Type
 b B f F

Recruitment
 1

Primary Performance Quilt Plot

CMP	Type	Tuning	Variant	West					East					Tot
				PGK (Mean)	AvC10 (50%)	AvC30 (50%)	VarC (50%)	LD (15%)	PGK (Mean)	AvC10 (50%)	AvC30 (50%)	VarC (50%)	LD (15%)	
b270	b	70	2	0.71	2.58	2.2	8.21	0.45	0.7	46.5	38.17	14.63	0.51	0.25
b265	b	65	2	0.65	2.67	2.32	8.38	0.44	0.65	49.3	39.78	15.17	0.48	0.26
B265	B	65	2	0.65	2.69	2.33	9.71	0.44	0.66	49.27	39.73	15.57	0.48	0.29
B270	B	70	2	0.71	2.59	2.2	9.61	0.45	0.71	46.45	38.09	15.18	0.51	0.29
b260	b	60	2	0.6	2.77	2.43	8.81	0.42	0.6	51.99	41.43	15.6	0.45	0.31
B260	B	60	2	0.6	2.78	2.44	10	0.42	0.6	51.97	41.36	15.98	0.45	0.34

New TAC sensitivity app for checking catch year 1 (C1) calculations and demonstrating CMP responsiveness

ABT MSE: INDEX-CMP-TAC



The Atlantic-Wide Research Programme on Bluefin Tuna (GBYP) is investigating MSE for providing robust advice consistent with the precautionary approach. MSE aims to reveal management procedures that account for uncertainties in data collection, population and fishing dynamics. In MSE these uncertainties are represented by alternative operating models (OMs). In this PRELIMINARY interactive demo, the user can create data scenarios and see what the CMP would calculate if used once in a single year.

Indices C1 Sensitivity

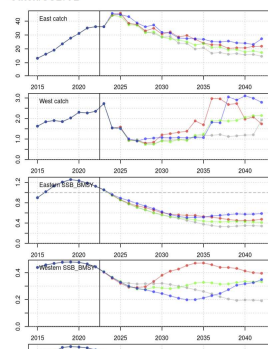
DATA SIMULATION SCENARIO

Operating model

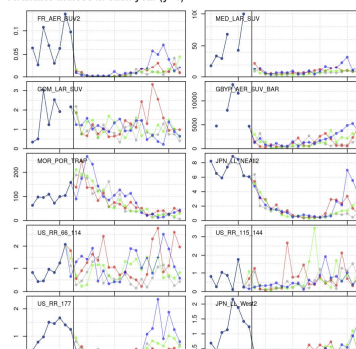
Exploitation

Here, a set of projections have already been run for fixed harvest rates. These create data simulations - OM trajectories in catch and indices that are internally consistent. Indices are staggered by one year to show the data that was available at the time that TAC recommendations were calculated (to better show responsiveness). If in any year, the CMP were to be used once, these figures show how it would set a TAC. Hence these plots show the sensitivity to varying conditions. THESE ARE NOT CLOSED LOOP TESTS OF THE CMPS.

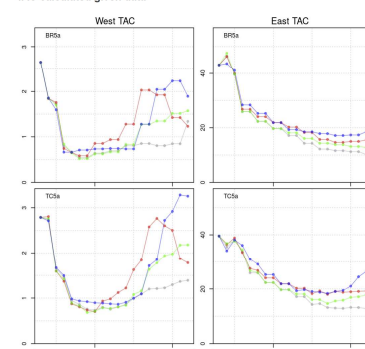
Catch/SSB/VB



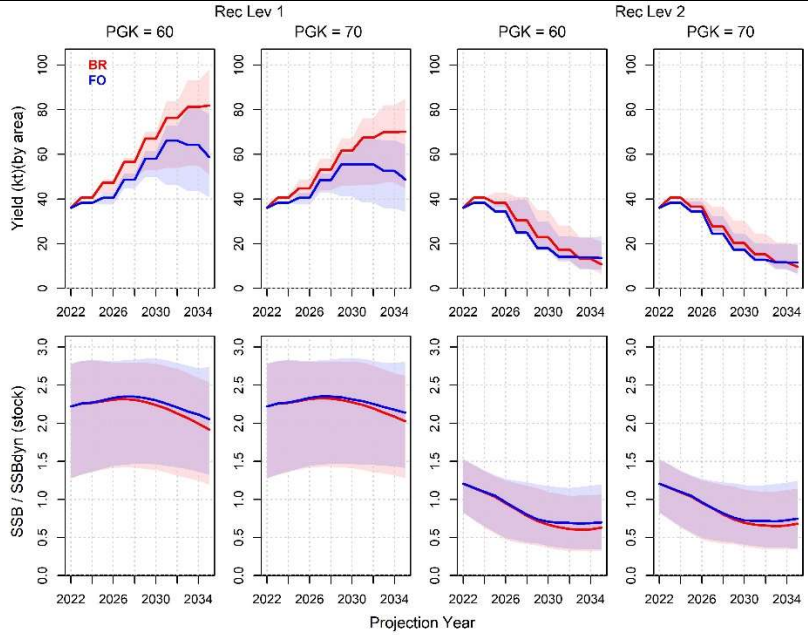
Available indices in each year (y+1)



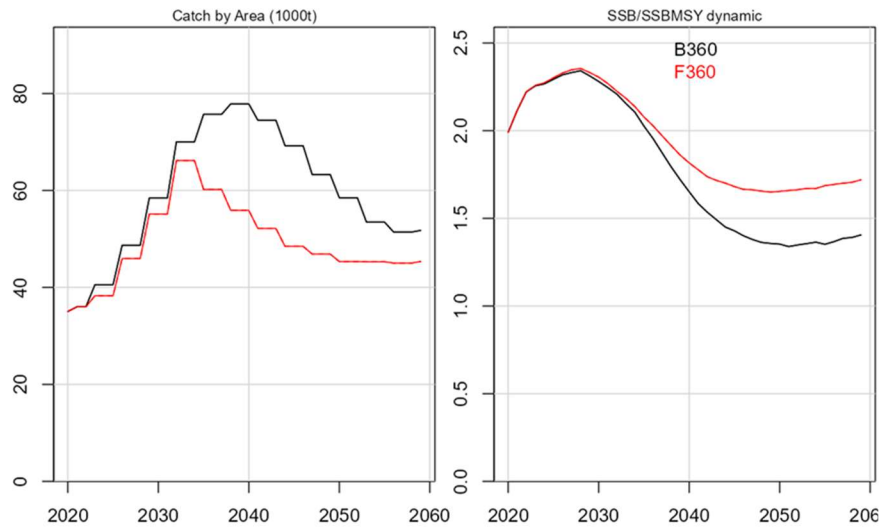
TAC calculated given data



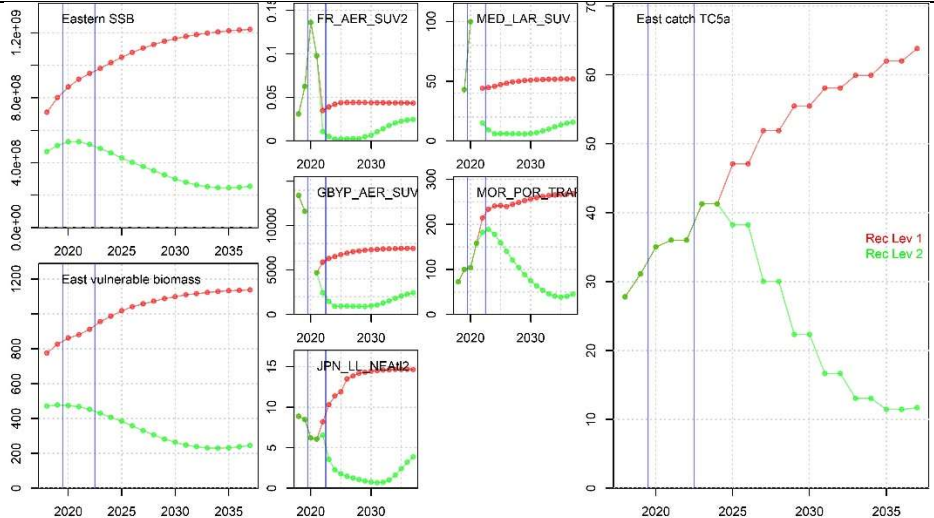
Simplified yield and biomass projection plots in support of Decision point 4.



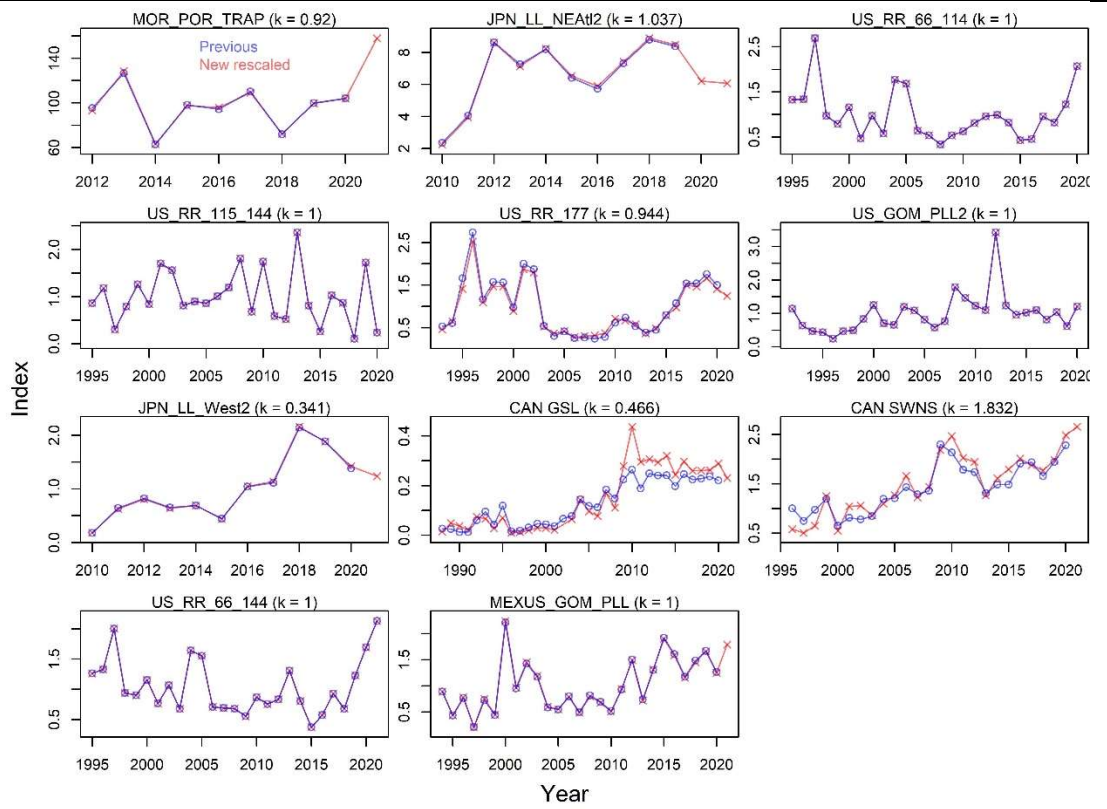
Simplified median projection plots for comparing remaining CMPs.



Index projection plots to demonstrate data responsiveness given recruitment scenarios.



Index rescaling exercise to ensure new index data have comparable scale to those used in reconditioning.



2 Progress with respect to tasks and deliverables

All contracted tasks (Table 2) and deliverables (Table 3) were completed on time.

The exception to this was Deliverable 10 regarding the specification and fitting of operating models. Of the 11 robustness tests (44 OMs in total) all were completed except for 1 (4 OMs) – the non-linear indices OM would not converge and an alternative is being investigated where only future changes in index linearity are simulated.

Table 2. Status of 2021 contract tasks/activities. Green denotes a completed task.

Task / activity	Status
September 5:	
1. Updated Shiny App with latest CMP results and downloadable automatic CMP performance summary report	Appendix D https://apps.bluematterscience.com/ABTMSE_Performance2
2. Updated TSD	Appendix F
3. Updated ICCAT BFT MSE splash page	https://iccat.github.io/abft-mse/
4. Draft SCRS paper including all CMP results to date.	Appendices A and C
5. SCRS presentation comparing 2 and 3 year update intervals for CMPs and evaluating the impact of reducing VarC.	Appendices A and C
6. SCRS on possible exceptional circumstances	Appendix E
7. Presentation to accompany SCRS paper on exceptional circumstances protocols	Not presented
October 14:	
8. SCRS paper with revised CMP performance figures and tables	Appendices A and C
9. Shiny App updated to include live CMP satisficing and latest CMP performance figures and tables	https://apps.bluematterscience.com/ABTMSE_Performance2
December 25:	
10. Submission of draft final Report on 2022 contract activities	This report

3 MSE status

All MSE processes upstream of MP adoption are complete. Identification of exceptional circumstances protocols is outstanding and provides a link back to operating model specification if triggered (Figure 1).

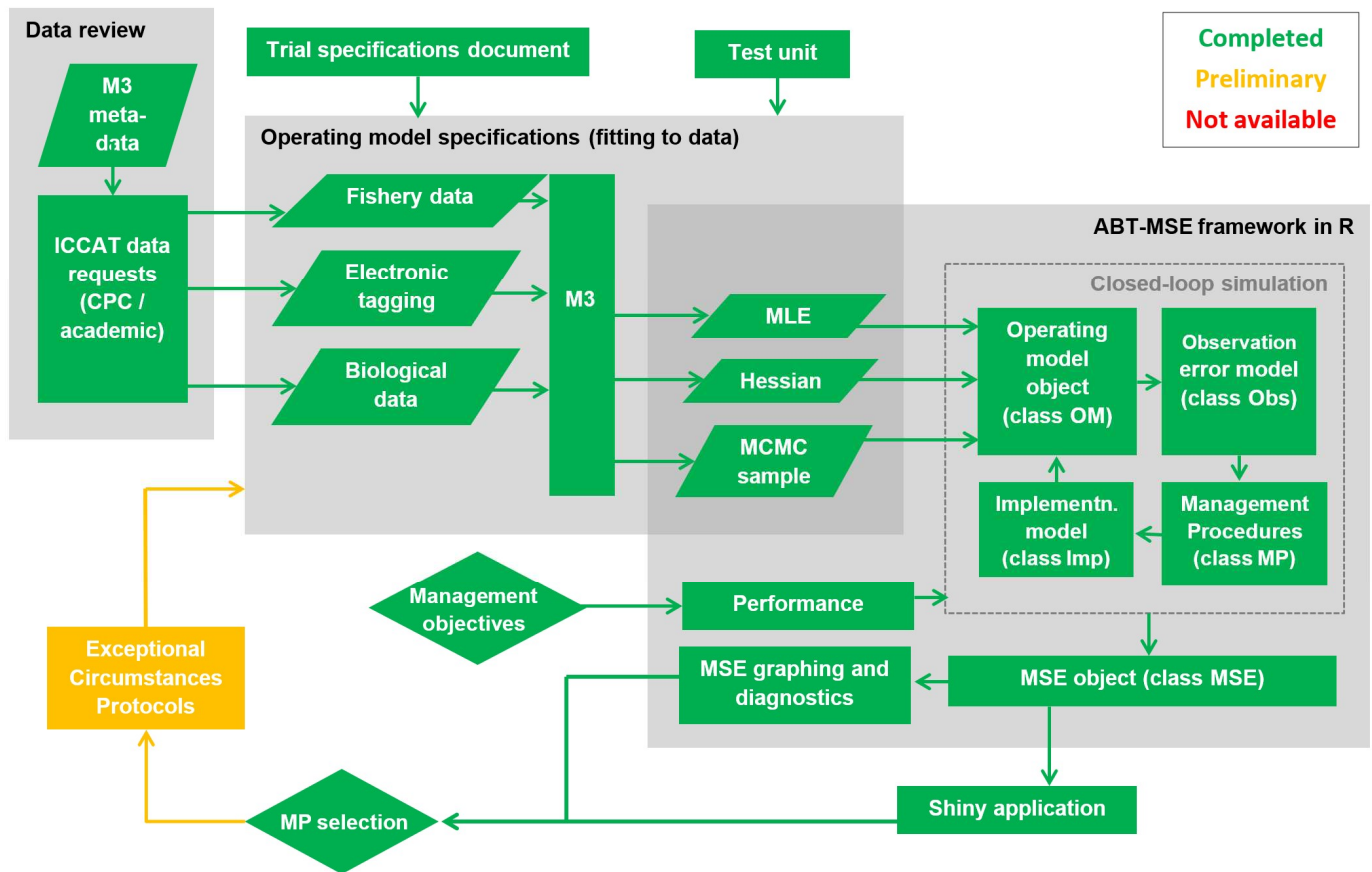


Figure 1. All components of the ABT MSE framework components upstream of MP adoption are now completed.

Acknowledgments

Many thanks in particular to Ai Kimoto for working hard to provide data for the OM reconditioning, Mauricio Ortiz for technical support, Francisco Alemany for directing the project, and to Doug Butterworth for organizing all aspects of MSE framework development. Thanks also to the various CMP developer teams for their willingness to take on computational work and submit results.

This work was carried out under the provision of the ICCAT Atlantic-Wide Research Programme for Bluefin Tuna (GBYP), funded by the European Union, by several ICCAT CPCs, the ICCAT Secretariat and by other entities (see: <http://www.iccat.int/GBYP/en/Budget.htm>). The content of this report does not necessarily reflect the point of view of ICCAT or of the other funders, which have no responsibility for it, neither does it necessarily reflect the views of the funders and in no way anticipates the Commission's future policy in this area.

4 Appendices

Appendix A - MSE Tech - Updated CMP results_Sept_5_2022_v3.pptx
Appendix B - CMP-Developers-Guide.html
Appendix C - SG - CMP results_Sept_20_2022_v5.pptx
Appendix D - ABTMSE Performance Table Report.html
Appendix E - SCRS_2022_xx Exceptional Circumstances Carruthers.docx
Appendix F - BFTMSE_TSD22-04_29Sept2022.docx