



**SCIENTIFIC COMMITTEE
TWENTIETH REGULAR SESSION**

Manila, Philippines

14–21 August 2024

**Scoping the Next Generation of Tuna Stock Assessment Software:
Progress Report and Outline of Options (Project 123)**

WCPFC-SC20-2024/SA-WP-01

14 August 2024

A. Magnusson¹ and N. Davies²

¹Oceanic Fisheries Programme, The Pacific Community

²TeTakina Ltd

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1 Executive summary

2 Introduction

2.1 The need to migrate to new software

Following the retirement of the lead developer of MULTIFAN-CL (MFCL), Dave Fournier, future advances to the MFCL software are not expected to be as mathematically innovative as they were in the past. While this does not render MFCL obsolete in the medium-term, it flags the need to plan and identify whether alternative existing software exists, or new software must be developed in the longer-term, to continue to support the specificities and future requirements of WCPFC tuna stock assessments.

While MFCL continues to be improved to service the WCPFC tuna assessment needs over at least the next 5+ years, it is important to start on a phased approach to its replacement. An initial scoping phase is required to assess what features and capabilities will be important in future assessment software for tunas. This scoping phase will benefit from input from stock assessment scientists across global tuna RFMOs. Once this scoping phase is conducted, consideration of available software packages in relation to the desired features and capabilities can be conducted. This may identify suitable existing software that has potential to provide the desired features and/or has potential to be developed further. Alternatively, it may indicate whether embarking on development of a new software package is recommended.

There has also been discussion around the need to explore, through modeling/simulation exercises, the benefits of applying alternative assessment structures (i.e., length-age structured versus the traditional length-based age-structured approach of MFCL and Stock Synthesis) before embarking on major software developments or changing methodology. Similar can be said about exploring benefits of state-space models and their use of random variables. Simulation exercises to explore the benefits or drawbacks of alternative model structures or approaches will also require collaboration across tuna RFMOs and experienced practitioners using the alternative approaches and/or software.

An important outcome of this work would be to ultimately have a software package that has the desired functionality for tuna assessments, not only for WCPFC, but globally, thus creating a user community and ongoing development support capacity, so as to avoid the current situation we are facing with MFCL. Wider collaboration in this venture is essential to achieving this and is expected to be encouraged through this project.

2.2 Project outline

2.3 Existing software

2.4 Recent and ongoing software development

3 Possible tasks for SPC to prioritize

3.1 Migrating assessments to existing software

3.2 Developing new software

4 Timeline

4.1 International expert meeting 2024

4.1.1 Format

4.1.2 Outcomes

4.2 Workshop activities in 2024–2026

4.3 Launching the main project

5 Required resources

5.1 Collaboration with other tRFMOs

5.2 SPC staff positions, consultants

6 References

Fournier, D.A., J. Hampton, and J.R. Sibert. 1998. MULTIFAN-CL: a length-based, age-structured model for fisheries stock assessment, with application to South Pacific albacore, *Thunnus alalunga*. Can. J. Fish. Aquat. Sci. 55:2105–2116.