

**A modular framework for the generic application of fisheries management strategy evaluation.**

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**Abstract**

Management strategy evaluation (MSE) is a complex closed loop simulation and forecasting procedure that takes into account structural and observational uncertainty of both stock dynamics (growth, recruitment, maturity) and exploitation by fishing fleets (selectivity, effort). The MSE paradigm leads to the articulation of a decision-making framework for fisheries management under uncertainty. Within the ‘assessment for all’ (a4a) initiative, the European Commission’s Joint Research Centre has developed a modular MSE, built with the R programming language and implemented in the Fisheries Library in R (FLR) toolbox. The a4a MSE algorithm includes the most common elements of uncertainty and allows, among others, the formulation of alternative management procedures and harvest control rules, testing the robustness of reference points, etc, within a reasonable operational time frame. The a4a MSE has a modular design, meaning that the system components are divided into smaller, independent, parts (modules). These modules link back to the MSE model parts, so that each element of the model refers to a single module. Here, we present the a4a MSE algorithm and describe its application to a range of case studies. These applications illustrate the flexibility of the a4a MSE algorithm and its potential to support the evaluation of multi-annual management plans, identification and testing of management procedures for data poor stocks, development of harvest control rules, etc.

**Keywords:**

Fisheries Library in R (FLR), harvest control rules, multi-annual plans, uncertainty, MSE, a4a

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