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FLR, A Framework For Fisheries Management In R Using S4 Classes

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The various models for assessment of fisheries dynamics and evaluation of management strategies are currently implemented in separate software programs and their respective input and output formats are often incompatible although many are performing similar tasks. Most of these packages provide basic analysis tools (model estimation, graphing, result reporting) that are already available in various software platforms. Comparing the results of such models is difficult and requires exporting them to an environment that has more efficient analytical tools. Moreover, integration of such different models into a single simulation environment that allows evaluation of the whole fishery system has been impossible.

The EC project "FEMS" (Framework for Evaluation of Management Strategies), currently in its second year, has decided to use R, a common, feature-rich environment, both to run fishery models and to analyse their output. The latest object-oriented features of R (named S4 objects, or classes) allow for the definition of complex and flexible objects with a structure and arithmetic that is appropriate to fishery models. R also, allows access to objects (fishery models) already written in C/C++ or FORTRAN and recompilation of these objects into the R environment using a wrapper.

Currently FEMS has implemented selected key components of the framework including, FLQUANT, a flexible data object with key fishery dimensions (time, age, space and stock) and for example FLSTOCK, a collection of FLQUANTs for selected biological properties for a population (weight, catch, survival).

The current implementation of the FLR library has proved to be convenient, flexible and capable of using fisheries models in R. The FLR framework is currently being evaluated by international fisheries agencies, including the International Council for the Exploration of the Sea (ICES) and the International Commission for the Conservation of Atlantic Tunas (ICCAT). If this evaluation is successful, FLR may become an ideal environment for the evaluation of different fisheries models and management structures within a simulation framework including all the relevant components of the fishery system.