March 2019

Training Course
Bio-Economic Management Strategy Evaluation using FLBEIA

ICES TRAINING COURSE REPORT

ICES INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA
CIEM CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

Contents

1 Summary

The objective of this 5-day course was to provide the participants with a basic knowledge of MSE and present how MSE can be implemented in practice using FLR libraries in general and FLBEIA library in particular. The course was arranged in a series of presentations and tutorials. Most of the tutorials posed a series of exercises to be solved by the participants.

The beginning of the course was focused on MSE and an MSE algorithm was build using the functionalities of different FLR packages. Then, FLBEIA library was presented and using two contrasting examples its main characteristics were shown. One of the most important and difficult steps in the implementation of MSE simulations is the conditioning of the models. FLBEIA provides different ways of doing it. In the third day of the course, a whole morning was dedicated to condition the model using the functions available in the package. Then, we moved on to the management procedure component of the MSE algorithms and showed how to build the observation model, how to include different assessment models and how to test different management strategies, including harvest control rules and other tools like changes in selectivity or effort restrictions. The last part of the course was dedicated to the mixed fisheries simulations and bio-economic evaluation of management strategies. First, the data formats, based on the for-mats used by ICES working groups and databases, used to facilitate the conditioning of multistock and multifleet case studies were presented. Second, how to provide mixed-fisheries advice using FLBEIA was shown. Finally, the economic models available were presented and they were used in practice. Along the course, the results of the simulations run were analysed using the functions available in FLR/FLBEIA and a shiny application available in FLBEIAShiny package. Along the course there was time dedicated to the implementation of case studies.

2 Background

Management Strategy Evaluation (MSE) is increasingly used within ICES community and elsewhere to define management procedures for specific stocks, carry out impact assessment of prespecified multiannual management plans or conduct bioeconomic evaluation of management procedures in multistock and multifleet context. Furthermore, in ICES the number of working groups dealing with the economic and social aspects of fisheries management is increasingly growing.

FLBEIA is a multistock and multifleet bioeconomic simulation model that describes a fishery system under a Management Strategy Evaluation (MSE) approach. The model was designed with the aim to facilitate bioeconomic evaluation of management strategies. FLBEIA is presented as an R package and is built as part of FLR project.

This five-day course was designed to train fisheries management scientists and advi-sors in the implementation of MSE analysis using FLR and FLBEIA. It was organized into a series of sessions with alternating focus on theoretical concepts and hands-on work on examples. The aim of these sessions was to equip participants with the knowledge, skills, and quantitative tools to undertake MSEs on their own fisheries systems using FLR and FLBEIA. During the whole week, there was time to assist the participants in the implementation of their own case studies.

The course covered the following topics:

- Management Strategy Evaluation;
- Introduction to FLR;
- Conditioning of Operating models: from single-stock and single-fleet to multistock and multifleet metier case studies;
- Shiny interface;
- Evaluation of the performance of assessment models and harvest control rules in the management procedure;
- Mixed-Fisheries advice in ICES;
- Bioeconomic evaluation of management strategies for mixed-fisheries.

3 Context

3.1 Objectives

The objectives of the course are:

- To introduce the MSE approach so the participants have a general idea of what is MSE and what can be tested using MSE;
- To provide an overview of FLR framework so the participants know the functionalities it provides;
- To show how to use FLBEIA to conduct complete MSE evaluations and bioeconomic evaluations of multistock management strategies in a mixed-fisheries framework;

3.2 Level

The course was aimed at scientists who had a foundation in the fundamentals of stock assessments and management. Basic knowledge of R was also required.

4 Course Programme, Product, Deliverance, and Instructors

4.1 Programme

First Day – Management Strategy Evaluation

- Introduction:
  - Course generalities.
  - Management Strategy Evaluation (MSE)
  - FLR.
- Practice
  - Install FLR packages
  - Practice I: FLR in practice
  - Practice II: FLR-MSE toy.

Second Day – Introduction to FLBEIA

- Description of FLBEIA
- Practice
  - Install FLBEIA and FLBEIAShiny Packages.
  - Pratice III: FLBEIA Introductory Example.

Third Day - Practice Day

- Practice IV: FLBEIA "Smart Conditioning I"
- Practice V: Testing Observation Models & Stocks Assessments in the manage-ment procedure.
- Practice VI: Testing different management measures.

Fourth Day – Mixed-Fisheries and Economy

- Mixed Fisheries advice in ICES.
- Practice:
  - Practice VII: FLBEIA 'Smart Conditioning II'
  - Practive VIII: Mixed Fisheries Advice in ICES.
- Annual bioeconomic advice in fisheries management.
- Practice:
  - Practice IX: Bioeconomic simulation

Fifth Day – Last Day

- Continue with the practice from Day 4.
- Practice X: The script used in the bioeconomic STECF working group.
- Special requests from the group.

Course products

The course was organized in a series of presentations and practices. All the practices were carried out in R using FLR packages. The tutorials were build using Rmarkdown library, which allows mixing text with R code. These tutorials are available in the FLR webpage www.flr-project.org and the sharepoint of the course.

4.2 Course instructors

Dorleta Garcia – AZTI

Txatxarramendi Ugartea z/g

48395 Sukarrieta, Bizkaia

Spain

Sonia Sánchez – AZTI

Herrera Kaia, Portualdea z/g

20110 Pasaia, Gipuzkoa

Spain

Annex 1: List of participants

Name	Institute
Anneli Lofstedt	University of Aberdeen, UK
Audric Vigier	Queen's University of Belfast, UK
Bernhard Kuehn	Thünen-Institute of Sea Fisheries, Germany
Camilo Torres	Fisheries Development Institute – IFOP, Chile
Christoph Konrad	JRC
Edgar Josymar Torrejon	Centro Interdisciplinario de Ciencias Marinas (CICIMAR)
Esther Abad	IEO Vigo, Spain
Ghassen Halouani	Galway Mayo Institute of Technology, Ireland
Helge Berglann	Samfunns og næringslivsforskning, SNF, Norway
Julia Magdalena Wouters	University of Aberdeen
Matthew Smith	NOAA - Sustainable Fisheries Division Gulf and Caribbean Branch
Mauricio Ibarra	Instituto de Fomento Pesquero, Chile
Paul Bouch	Marine Institute, Ireland
Paz Sampedro	IEO A Coruña, Spain
Sarah Simons	Thünen-Institute of Sea Fisheries, Germany
Stephen Stohs	NOAA National Marine Fisheries Service Southwest Fisheries Science Center, USA

Annex 2: Results of the survey

How did you hear about this course?

12 out of 12 people answered this question

1	Word of mouth	7 / **58%**
2	ICES Website	4 / **33%**
3	E-mail	3 / **25%**
4	Other	1 / **8%**

Course content

Did the Training course meet your expectations?

12 out of 12 people answered this question

4.33 Average rating

1	☆☆☆☆☆	6 / **50%**
2	☆☆☆☆	4 / **33%**
3	☆☆☆	2 / **17%**

Was the level of instruction appropriate?

12 out of 12 people answered this question

4.42 Average rating

1	☆☆☆☆☆	7 / **58%**
2	☆☆☆☆	3 / **25%**
3	☆☆☆	2 / **17%**

Was the length of the training course appropriate?

12 out of 12 people answered this question

4.92 Average rating

1	☆☆☆☆☆	11 / **92%**
2	☆☆☆☆	1 / **8%**

Course Organization

Inscription to the training course and communication with organizers were efficient.

12 out of 12 people answered this question

4.83 Average rating

1	☆☆☆☆☆	10 / **83%**
2	☆☆☆☆	2 / **17%**

Teaching and Learning Support

The instructors were helpful, informative, and approachable.

12 out of 12 people answered this question

4.92 Average rating

1	☆☆☆☆☆	11 / **92%**
2	☆☆☆☆	1 / **8%**

The working documents were presented in a way that facilitated learning.

12 out of 12 people answered this question

4.67 Average rating

1	☆☆☆☆☆	10 / **83%**
2	☆☆☆	2 / **17%**

Overall Evaluation

How would you rate this training course?

12 out of 12 people answered this question

4.58 Average rating

1	☆☆☆☆☆	8 / **67%**
2	☆☆☆☆	3 / **25%**
3	☆☆☆	1 / **8%**

How would you rate the quality of the teaching?

12 out of 12 people answered this question

4.33 Average rating

1	☆☆☆☆☆	7 / **58%**
2	☆☆☆	3 / **25%**
3	☆☆☆☆	2 / **17%**

Have you taken any other ICES training courses?

12 out of 12 people answered this question

1	No	9 / **75%**
2	Not with ICES, but I have attended other training courses related to my expertise.	3 / **25%**
3	Yes	0 / **0%**

Would you be interested in another training course within ICES?

12 out of 12 people answered this question

1	Yes, both physical and online training courses	7 / **58%**
2	Yes, but not an online training course	3 / **25%**
3	Maybe	2 / **17%**
4	No	0 / **0%**

Social Event

Do you feel that you have benefited from networking opportunities on the course?

12 out of 12 people answered this question

1	Yes	9 / **75%**
2	Somewhat	3 / **25%**
3	No	0 / **0%**