Report of the Training Course: Stock Assessment Introduction (TCSAI09)

3- 7 August 2009

ICES Headquarters, Copenhagen

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Contents

Summary **1**

Recommendations **3**

Course Programme and Instructors **3**

Course Objective **4**

ICES Training Programme **5**

Annex 1: List of participants **6**

Participants at the course "Introduction to Stock Assessment" conducted 3-7 August 2009 at ICES Headqarters in Copenhagen. The course was given by Steve Cadrin, NOAA, USA (instructor) and Iago Mosqueira, CEFAS, UK (assistant instructor).

Report of the ICES training course:

"Stock Assessment - Introduction"

by

Steve Cadrin and Iago Mosqueira

Summary

The first course in the ICES Training Programme was an introduction to stock assessment, conducted 3-7 August 2009 at ICES Headqarters in Copenhagen. Thirty-two students participated in the course, and all but one attended all lectures and completed all assignments. From the perspective of the instructors, the course was a success.

An ambitious outline of topics was taught, from simple model fitting and biological production to commonly used stock assessment methods (biomass dynamics model, virtual population analysis and statistical catch-at-age model) as well as biological reference points through stochastic long-term projection. Each day was scheduled with lectures on stock assessment concepts each morning and application of stock assessment models during afternoon assignments. Students completed assignments by programming in Excel, and the same assignments were demonstrated in R.

The number of students was appropriate. Students represented 15 countries had diverse backgrounds, representing young working group members, academic researchers, fishery organizations and conservation groups (Appendix 1). Despite a wide range of experience in modelling and statistics, all students who completed the course mastered the spreadsheet assignments. Students with more experience developed models beyond the assigned tasks.

Students who completed the introductory stock assessment class will need to further develop their programming skills to participate in the more advanced courses in the ICES training programme (e.g., advanced stock assessment, Bayesian techniques, management strategy evaluation, ecosystem modelling). Given the diversity of experience in the introductory class and the ambitious agenda, few students programmed in R to complete afternoon assignments. Therefore, ICES should consider an intermediate course on stock assessment in which assignments are completed in R and FLR, to allow transition from the Excel programming in the introductory course to the R, WINBUGS and ADMB programming in the advanced courses. Alternatively, students who completed the introductory stock assessment class would be expected to develop required skills on their own before taking advanced courses.

Feedback from students was solicited using a course evaluation questionnaire. Results indicate that the amount of material covered and degree of difficulty was "average" to "too much/too difficult," course organization was "very good," helpfulness of teaching staff and clarity of presentation were "high," and usefulness of course materials was "average" to "high." Overall, the course content, organisation and quality of teaching were "very good." Individual feedback included:

- "Very good structure and balance of theory and exercises."
- "Excellent job by the teachers!"
- "Maybe too intensive (hard to stay concentrated for 8h per day)."
- "A very nicely presented course. Days were an hour or two too long. Content developed in a good logical order and tied together all the basic aspects of stock assessment efficiently. Good balance of lectures and exercises. Knowledgeable, approachable and helpful presenters."
- "The course fulfilled all my expectations. As a 'self-taught' stock assessment scientist, I wanted confirmation that I had understood things correctly and to answer several outstanding areas where I had not been able to work out how things worked from the books e.g. tuning VPA analyses. All these questions were very well answered. Now I just have to learn how to do it all in R! Many thanks."
- "The course was really good and focused on Stock assessment. I found it very helpful."

One student thought that the course material was too technical for her needs and dropped out of the class. She expected a course based more on management strategy and policy. The false expectations are difficult to comprehend, because the course description explicitly included population modelling and quantitative exercises, and lectures were available on the course sharepoint for over a month. To avoid future misunderstandings and better prepare students, required skills could be added to the course description, with suggested readings for students to review or develop skills needed for the course:

- Fisheries – Jennings et al. (Marine Fisheries Ecology)
- Statistics – Hilborn & Mangel (The Ecological Detective)
- Programming – Braun & Murdoch (A First Course in Statistical Programming) or Zuur et al. (A Beginner's Guide to R).

The course description should also be revised to advise students to install Excel Solver and R before the course. Students can also be encouraged to bring their own stock assessment data to use in class assignments.

Students, instructors and the training coordinator discussed possible revisions for future offerings of the introductory stock assessment course. Students felt that R demonstrations should include applications of FLR programs and perhaps demonstrations of other stock assessment software (e.g., NOAA Fisheries Toolbox, ASPIC, etc.). Presentation of alternative stock assessment techniques for a wider range of life histories (e.g., cephalopods, marine mammals) would provide a broader perspective on stock assessment applications.

The students were energetic and worked hard. The partnership of instructors was effective, with complimentary skills for helping students to understand difficult topics and debugging various programming problems. The hospitality of the ICES secretariat gave the course a human touch that will help to foster a lasting relationship between the students and ICES.

Recommendations

- Required skills should be added to the course description, with suggested readings for students to review or develop skills needed for the course.
- The course description should also be revised to advise students to install Excel Solver and R before the course. Students can also be encouraged to bring their own stock assessment data to use in class assignments.
- Applications of FLR programs and other stock assessment software (e.g., NOAA Fisheries Toolbox, ASPIC, etc.) should be demonstrated.
- Description of alternative stock assessment techniques for a wider range of life histories (e.g., cephalopods, marine mammals) should be included.

Course Programme and Instructors

The course programme, lecture notes and exercises are available from the course share point site (TCSAI09): http://groupnet.ices.dk/TCSAI09/default.aspx (The responses to a Course Evaluation Questionnaire are found in the lower left corner of the course share point site.)

The five-day course was organized as a series of morning sessions that were focused on theoretical concepts and afternoon sessions on more applied concepts associated with assignments and work sessions. All of the assignments were to be completed in Excel, but the same analyses were also demonstrated in R, an open-source, statistical programming language (see flr-project.org).

Day	Lecture	Topic
Monday	1	Introduction & objectives
	2	Model fitting
		assignment: stock-recruit
Tuesday	3	Biological Production
	4	Biomass dynamics
		assignment: production
Wednesday	5	Demographics
	6	Virtual population analysis
		assignment: VPA
Thursday	7	Simulation
	8	Statistical catch at age
		assignment: SCAA
Friday	9	Reference points
	10	Projection
		assignment: MSY

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Course Objective

The general objective of the course is to train stock assessment scientists and advisors in basic population dynamics and stock assessment. The course is intended not only to present the theoretical elements but also to guide participants on how to put theory into practice through case studies and hands-on exercises on the computer. Specific objectives are:

1) Understanding the role of stock assessment in fisheries science

2) Familiarity with conventional stock assessment models

3) Experience in basic model building and parameter estimation

By the end of the course, the participants will:

- Be aware of single species assessment methods as applied to North Atlantic fisheries.
- Understand the data collection needs for different assessment methods.
- Be familiar with indicators and reference points, both biological and economic, as tools in fishery management.
- Be introduced to the application of methods for multigear and multispecies assessment.
- Develop knowledge of bioeconomic fishery processes by using simulation models to improve scientific advice for managers.

This course provides instruction, demonstration and exercises in population modelling, as applied to fishery resources. Stock assessment synthesizes information on life-history, fishery monitoring and resource surveys using mathematical models of population dynamics. Results from stock assessments are used to determine stock size, sustainability of the fishery and evaluate the consequences of alternative fishery management actions. First principles of population dynamics are reviewed from the perspective of model building, and several dimensions of complexity are explored. A wide range of conventional stock assessment methods are introduced.

There are two general goals of the course. The first is to provide a sound foundation in the fundamentals of stock assessment. Stock assessment modelling continues to advance at a rapid pace. However, understanding the basics of population dynamics is necessary to develop an intuition for fishery models, for accurate interpretation

and model development. Therefore we will emphasize a conceptual understanding, supported by quantitative applications that are designed to illustrate model properties.

The second goal of the course is to prepare students to take the next steps in a stock assessment career: learning the advanced aspects needed for their particular applications.

The ICES Training Programme also includes courses in advanced stock assessment, Bayesian techniques for stock assessment, Management Strategy Evaluation and Ecosystem Modeling for Fisheries Management. Therefore, advanced topics and programming skills will be introduced in preparation for more advanced ICES courses or to approach the same topics through self-learning.

ICES Training Programme

To help build capacity in ICES and especially to support the scientists involved in the advisory process, ICES offers training courses by high- profile scientists and instructors.

For more information visit the ICES training web-page:

www.ices.dk/iceswork/training/training.asp

or

Contact ICES Secretariat for more information

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Annex 1: List of participants

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