

ICES REPORT OF TCSAI2010

Report of the Training Course: Stock Assessment Introduction (TCSAI2010)

14- 18 June 2010

ICES Headquarters, Copenhagen



ICES

International Council for
the Exploration of the Sea

CIEM

Conseil International pour
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Participants at the course “Introduction to Stock Assessment” conducted 14-18 June 2010 at ICES Headquarters in Copenhagen. The course was given by Steven Cadrin (#2 from left), NOAA, USA (instructor) and Iago Mosqueira (#5 from left), CEFAS, UK (assistant instructor).

Report of the ICES training course:

“Stock Assessment - Introduction”

by

Steven Cadrin and Iago Mosqueira

Summary

The third course in the ICES Training Programme was an introduction to stock assessment, conducted 14-18 June 2010 at ICES Headquarters in Copenhagen. The same course was offered in August 2009 and January 2010 by the same instructors. Nineteen students participated in the second course, and they all 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, stochastic long-term projection, harvest control rules and management strategy evaluation. 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 R.

The number of students was appropriate. Students represented 13 countries including young working group members, academic researchers. Most students in this third class were more experienced in modelling and statistics than students in previous classes, and the class completed more assignments and more difficult applications in Excel and R.

Feedback from students was solicited using a course evaluation questionnaire. Results indicate that the amount of material covered was “average,” degree of difficulty was “average” to “difficult,” course organization and the course description were “very good,” helpfulness of teaching staff, usefulness of course materials and clarity of presentation were “high.” Overall, the course content, organisation and quality of teaching were “good” to “very good.” Most students heard about the course from colleagues (69%), the ICES website (46%) or the Annual Science Conference (8%). Individual comments and suggestions from students were:

- “Extremely skilled and helpful teachers with a great amount of patience!”
- “This course was brilliant. It covered an amazing amount of material in a very short time in detail. It hit just the right balance of practicals and theory. The spreadsheet exercises were incredibly informative and a very good way of visualising the processes we were dealing with. I only have praise for the instructors both for their immense knowledge and experience on this topic and their willingness and also ability to pass on some of that knowledge. I don't have any suggestions for improvements; I thought they got it just right!”

- “Both Steve and Iago were great teachers. They were experts in their field with a great teaching style. They were friendly, helpful, cool guys who deserve a healthy raise. Overall a great learning experience.”
- “Overall I found the course to be an excellent experience and I look forward to using the methods that I learnt this week.”
- “Thank you very much for an extremely informative and well run course. The only suggestion I would make, and I understand it would be restricted by time: For R, I think it would be helpful to take separate tasks, such as "abundance at age" etc, and programme them from scratch. This might give a better idea of how the functions in R are constructed. Apart from that, I am very interested in R, but probably should get some rookie training in it for now!! Thanks again Iago and Steve!”
- “This course covered lots of material in a short period of time. This is good for an intense learning period or a good review. Any methods to "stretch out" the learning experience would help. For example, it's good to have lots of examples and solutions posted on the SharePoint. So I cannot finish all assignments, or if I wish to review materials later, web-posted information would be useful. Also, I appreciated the R teaching approach that introduced techniques after completing a similar assignment in Excel. So even though I did not understand all R concepts and syntax, I could more easily see how it worked based on a complementary example. This was difficult, but I appreciated the chance to learn more about R; through this method.”
- “The R presentations didn't give that much, but maybe later on. Maybe you could make a mix, make some part of the assignment in spreadsheet (which is 100times more conceptually easy to understand independent of the usefulness of R) and input some parts into R. I don't think half a day of training in inputting matrices will change really that much in working form but I'm not sure. Anyway, I liked, appreciated the R parts in this course and the fact that we were using something else than excel as a complement. Personally, I however would have appreciated working in a more semi graphic interface, i want a tool that also is easily accessible in terms of user face – i.e. that many more people can judge the code in terms of biology rather the programming.”
- “I found it difficult to keep up with the work in R and I felt that I wasn't learning that much by entering the pre-written code without understanding how it was composed. Although if I had a better knowledge of R then Iago's section would have been more productive for me.”
- “Telling people to make them self introduced to R before the course, doing some basic exercise before course starts.
- “some more time should be spent on telling how to get started with R”
- “make a separate course for R; it's impossible to use it when you're already struggling with the theory itself”
- “it would be better to spread the course over a longer time period, with a break in between in order to read over the notes and see if you have further questions.”
- “after the first three days of course, one day with no lectures and no assignments would be useful to allow people go through their notes”

- “I don't think it is part of the course, but a more complete vegetarian food option for the course dinner would have been nice.”

Students' preparation for programming in R continued to improve from the 1st, 2nd and 3rd course offerings. All students attempted all of the assignments in both Excel and R. If students come to future classes prepared for programming, R could be considered an essential aspect of the course. The greater use of programming in this class should help students to be better prepared for ICES work and the advanced ICES courses. One reason for the better preparation of students in the last two stock assessment courses may be that students who need a more conceptual and less quantitative understanding may be registering for the class for stakeholders “Opening the box: Stock assessment and fisheries advice for stakeholders, NGOs and policy-makers. 5-7 October 2010.”

A more detailed course schedule allowed refinement of the course material. Lectures were modified to be approximately one hour, and lectures were separated by a break, a demonstration of model application, or an assignment. The refined schedule helped to break up the long days into more tolerable portions, and to limit the amount of information material to the time available.

Revisions to the course also appeared to be effective. Communication with students before class regarding software installations, preparations for statistics and programming, and bringing example data helped to elevate the level of material and approaches used in the course. Students appeared to take advantage of having the lecture material available before the course. Given that early communication with students and access to the SharePoint appeared to help students, earlier review of applicants, acceptance and communications may help further.

Friday afternoon was reserved as a time for reviewing topics, general discussion on stock assessment issues and completing unfinished assignments from earlier in the week.

The partnership of instructors continues to be effective, with complementary skills for helping students to understand difficult topics and debugging various programming problems. Once again, the ICES secretariat gave the course participants a warm welcome, and provided a pleasant working environment that will help to promote future involvement in ICES by the students.

Recommendations

1. Start the process of student selection and acceptance earlier to give students a longer period to prepare for the course with access to the SharePoint and recommended readings.
2. Prepare willing students beforehand for the R part of the course by providing introductory material tailored to the R skills necessary to follow the assignments. The suggestion of concentrating some of the R teaching could be explored. Maybe dedicating to R one of the afternoon sessions, for example.

Course description

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 fisheries management.
- Be introduced to the application of methods for multigear and multispecies assessment.
- Develop knowledge on bioeconomic fisheries 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 fisheries 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 Modelling 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.

Course Programme and Instructors

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

The programme was designed with an about even split between lectures/discussions and tutorials. In summary form the programme was (details in Annex 2):

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

Instructors:

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Annex 1: List of participants

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Annex 2: Detailed course programme

Title: Stock Assessment (introduction)

Introduction: Søren Anker Pedersen

Lecturers: Steve Cadrin and Iago Mosqueira

PROGRAMME:

Time	Event
Monday, 14 June 2011	
9.00 – 10.00	Welcome About this course Introduction of participants and lecturers; expectations
10.00 – 10.30	Tea/Coffee
10.30 – 11:30	Lecture 1: Objectives of stock assessment and data for stock assessment
11:30-12:30	R Demonstration 1: Introduction to R
12:30-13:30	Lunch
13.30 – 14.30	Lecture 2: Fitting Models to Data
14.30 – 15.00	Tea/Coffee
15.00 – 16.00	Assignment 1: stock-recruitment relationships
17.00 – 20.00	<i>Icebreaker (optional)</i>

Time	Event	
Tuesday, 15 June 2011		
9.00 – 10.00	Lecture 3a: Components of production	
10.00 – 10.30	Tea/Coffee	
10.30 – 11:30	R Demonstration 2: Simulating Production	
11:30-12:30	Lecture 3b: Biological Production	
12:30-13:30	Lunch	
13.30 – 14.30	Lecture 4: Biomass Dynamics Models	
14.30 – 15.00	Tea/Coffee & Group photo	
15.00 – 16.00	Assignment 2: Biomass Dynamics Models	

Time	Event	
Wednesday, 16 June 2011		
9.00 – 10.00	Lecture 5: Age-Structured Models	
10.00 – 10.30	Tea/Coffee	
10.30 – 11:30	Lecture 6a: Virtual Population Analysis	
11:30-12:30	Assignment 3: VPA	
12:30-13:30	Lunch	
13.30 – 14.30	Lecture 6b: Calibrated VPA	
14.30 – 15.00	Tea/Coffee	
15.00 – 16.00	R Demonstration 3: FLR Demonstration	

Time	Event	
Thursday, 17 June 2011		
9.00 – 10.00	Lecture 7: Simulation	
10.00 – 10.30	Tea/Coffee	
10.30 – 11:30	R Demonstration 4: Simulation in R	
11:30-12:30	Assignment 4: Simulation	
12:30-13:30	Lunch	
13.30 – 14.30	R Demonstration 5: Management Strategy Evaluation	
14.30 – 15.00	Tea/Coffee	
15.00 – 16.00	Lecture 8: Statistical Catch-at-Age	
17.00 – 20.00	Course dinner (optional, expenses to be covered by participants)	

Time	Event	
Friday, 18 June 2011		
9.00 – 10.00	Lecture 9: Biological Reference Points	
10.00 – 10.30	Tea/Coffee	
10.30 – 11:30	Lecture 10: Projections	
11:30-12:30	Assignment 5: Maximum Sustainable Yield	
12:30-13:30	Lunch	
13.30 – 14.30	Question and answer session; discussion; evaluation (written)	
14.30 – 15.00	Tea/Coffee	
15.00 – 16.00	Closing	