ICES TCSAA REPORT 2012

Report of the ICES Training Course: Stock Assessment (Advanced) (TCSAA)

15–19 October 2012

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK–1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2012. Report of the ICES Training Course: Stock Assessment (Advanced) (TCSAA), 15–19 October 2012, 17 pp.

The document is an ICES Training course report

Contents

1 Summary 2

2 Recommendations 5

3 Course description 6

4 Course programme and instructors 7

Annex 1: List of participants 8

Annex 2: Course Programme 14

Participants at the course "Stock Assessment (Advanced)", 15–19 October 2012, ICES HQ, Copenhagen. The course was given by Jan Jaap Poos, IMARES, the Netherlands (#1 sitting from right) and Arni Magnusson, Marine Institute, Iceland (in the middle with blue admb T-shirt).

Report of the ICES Training Course Stock Assessment (Advanced) 15–19 October, 2012

by

Jan Jaap Poos and Arni Magnusson

1 Summary

The course was developed and prepared by Jan Jaap Poos and Richard Hillary. Unfortunately Richard Hillary was food poisoned on his travel from Hobart, Australia to ICES, Copenhagen. He was hospitalized in Singapore to recover. Fortunately he did recover but several days later. Arni Magnusson from the Marine Institute agree to come to Copenhagen in short notice to replace Richard Hillary during the three last course days 17-19 October. Also, participants who were ahead of others helped out in explaining exercises and one participant helped in instructing a 30 minutes session on tagging data.

This was the first offering of the training course "Stock Assessment (Advanced)" under the ICES Training Programme. 25 students from 10 countries participated in the course (Annex 1). From the perspective of the instructors, the course was a success. Overall, the participants rated the course very positively, although some adjustments can improve the knowledge and skill transfer to the trainees (see 2 Recommendations).

The course is taught in R and ADMB. Practically speaking, R has become the lingua franca for statistical computation and most participants had experience with R. To help the participants in obtaining sufficient background knowledge on R, a short introductory course in R was sent around before the course. Still, some students arrived at the course with little knowledge on R. For these students, the course was probably hard to follow, but much care was taken that everybody managed to do all exercises in R. The course consisted of a number of elements:

1) An introduction to population dynamics in stock assessments
2) Explanation on how observations follow from the population dynamics, including the Baranov equation, survey time series, and plus-group dynamics
3) Exploratory data analysis for stock assessment data
4) An introduction to likelihoods
5) An introduction to optimizers
6) Creating a simple assessment in R and ADMB
7) Reference point estimation
8) Estimating parameter uncertainty in stock assessments
9) Using the stock assessment on participants' fish stock data

Because the first two days were only offered by a single instructor and the change in instructor for the last three days, the originally planned program had to be altered slightly. For instance, multi-species stock assessments were not covered and using tagging data was covered in limited detail.

Feedback from students was solicited using a course evaluation questionnaire (Annex 2). Results indicate that the amount of material covered and degree of difficulty was "average" to "too much", course outline and organization (i.e. document detailing course aims, content, organization of teaching, assignments, reading, assessment, etc.) was "average" to "very good,". The quality of the course outline, the teaching material and the helpfulness of teaching staff was thought to be "very good" on average. Overall, the course was thought to be "good" to "very good."

Individual feedback from trainees to the question "Good features of this course/suggestions for improvement" resulted in:

- The course gave a good opportunity to understand the theoretical background, and see how the 'craft' aspects of model building would be undertaken; that is how do the experts build up their understanding of a dataset. There was a point where one of the instructors started in Excel and worked upwards to more sophisticated techniques; for the stock recruitment relationship. I found that particularly instructive, and suggest that such an approach be built into the course. However it is clear that those with a better knowledge of R may not need this. A problem for me was that R is not a part of my daily life, but you have got to start somewhere!
- Maybe working through some more examples, inform about differences between applicability of different software's to various computer brands in advance. The assignments were really good. It would have been useful to have more time to look into the results.
- It was a very useful course and I really learned a lot. After a, to my mind, slow start we then got going and I think the course covered a broad range of topics. What I also liked very much was that a lot of hints were given and topics were touched that could not be discussed in depth by this course, but I now know what I might search for. I also appreciate very much that the concept was to provide us with the code and so let us understand what the philosophy behind the procedures is, instead of just showing us how to apply finished software. The only suggestion I have for improvement is that I would have liked more precise exercises. A lot of times this was only "have a look at the code", and I would have liked to have more tasks like "implement this or that feature" as they tell me better what I have understood and what not.
- Perhaps more communication between the introductory course and this one. As it was now I felt I had little use of the introduction course. I would have prefered to work either in r or in ADMB. Hard to keep track of both at the same time. And I would have liked to have more explanations within the code, as I will use these for reference. That is, are the variables, what do the functions do and suchlike.
- The course was well structured and the objectives were clear. Each day, instructors would provide participants with the programme and course materials. There were different subjects covered over the five days and the lab sessions did complement the theory very well. I felt that we spent a considerable amount of time in some of the lab sessions. While this gave participants the opportunity to explore the code and try new things I believe it would have been more useful to keep them shorter and spend more time in plenary. This would allow more time to the instructors to explain the exercises and potentially have more exercises. The instructors did an excellent job and were always available and very approachable to answer any questions.
- The course could be a bit more stuctured, but that is not the fault of the teachers, but because one of the teachers went ill just before the course. I think it is great that Arni could come on such a short notice.
- The course was very well run. The approach taken by the instructors was exactly what I wanted i.e. systematic, covering all the main aspects of as-

sessement models (including optimisation and other processes that are often internal in software packages).

- The exercises were highly informative (though I have programmed in both R and C/C++ before).
- I can't think of any improvements (sorry!).
- I appreciate that the course needed to be re-organized on short notice due to the illness of an instructor, and ICES staff & the other instructors handled this very well under the circumstances.
- A suggestion I have is to engage more quickly in essential course material, and spend less time on "soft" group exercises like writing down lists of data sources or rolling dice. Given a course duration of only 5 days, this took up a significant proportion of time.
- I think that the "simple_assessment" example is an excellent way of gaining an understanding of all steps in the assessment. Using it throughout the week gives you some steady ground in all the complex concepts shaking your world... :-)

In response to the feedback, the instructors have the following considerations: The comment about "more communication between the introductory course and this one" is worth thinking about. Before the course, the introductory course program was studied and the advanced course was tailored to follow the introductory course. We still think the content of TCSAA was well chosen. There is of course some overlap and we consider it good practice to reiterate the basics at the beginning of an advanced course, especially because not everyone had completed TCSAI before TCSAA. After the introduction we went straight to the advanced aspects of each topic. The immediate feedback of the participants indicated that they were familiar with the basic aspects and were interested in the advanced aspects and caveats. The questionnaire further indicates that on average participants though the course to be on the difficult side.

Moving from R slowly to ADMB on Wednesday, and essentially staying in ADMB for the rest of the course, is the essence of "advanced stock assessment". Some might argue that the course could start in ADMB on Monday - to avoid confusion and repetition - but the current approach is beneficial for the majority of participants, who were experienced in R and were happy to see how ADMB gave them the same answers, and more.

Finally, fitting the model to real fisheries data that participants brought from their work raised many issues of interest and instilled confidence in the participants, that they were now ready to do stock assessment.

2 Recommendations

From the comments in the questionnaires the following recommendations can be taken

1) Spend less time in the "soft" group exercises.
2) More commenting in the example code, so that examples are easier to read for people with limited experience in R
3) Create more descriptive exercises in the form of assignments in addition to the slightly "open-ended" exercises for the fast participants that are already available.

3 Course description

Contexts and level

This is an advanced course in fisheries stock assessment modelling where we show the generic properties of various methods used to generate historical stock abundance and mortality rate estimates. The course includes uncertainty estimation of relevant parameters. It is aimed at scientists who have some foundation in the fundamentals of stock assessments.

We examine various assumptions as well as strength and weaknesses of different methods. The course will take you through the different steps that are part of any stock assessment. First: exploratory data analysis and the potential information content in the available data; Second: we discuss setting up structured population dynamic models. As a third step, we link these population dynamics models to existing data by calculating model predictions for catch, survey, and other relevant types of data. Finally, we discuss and demonstrate several tools that can help in fitting the models to data, such as different optimizing/sampling tools, and importantly, we discuss how to estimate and present uncertainties in the stock assessment models.

Objectives

The general objective of the course is to train stock-assessment scientists and advisors in population dynamics and advanced stock assessment. The course intends to put theory into practice as much as possible by working on examples from different angles.

4 Course programme and instructors

The five-day course is organized as a series of morning sessions that focus on theoretical concepts and afternoon work sessions. These work sessions will be completed in different software environments such as R and AD model builder (see flr-project.org and admb-project.org). Programme in Annex 3.

Instructors:

Jan Jaap Poos,
Wageningen IMARES
PO Box 68
1970 AB IJmuiden
janjaap.poos@wur.nl

Richard Hillary,
CSIRO Marine and Atmospheric Research
Castray Esplanade
Hobart 7001,
Australia
Rich.Hillary@csiro.au

Arni Magnusson, Marine Research Institute,
Skulagata 4, PO Box 1390,
121 Reykjavik, Iceland
Tel.: (+354) 575 2000
Email: arnima@hafro.is

Annex 1: List of participants

NAME	ADDRESS	E-MAIL
Jan Jaap Poos **Instructor**	Wageningen IMARES PO Box 68 1970 AB IJmuiden The Netherlands	janjaap.poos@wur.nl
Arni Magnusson **Instructor**	MRI Skulagata 4 121 Reykjavik Iceland	arnima@hafro.is
Richard Hillary **Instructor**	CSIRO Marine and Atmospheric Research Castray Esplanade Hobart, Tasmania 7001 Australia	Rich.Hillary@csiro.au
Xinhua Zhu	Fisheries and Oceans Canada Arctic Aquatic Research Division 501 University Crescent Winnipeg, Manitoba R3T 2N6 Canada	Xinhua.Zhu@dfo-mpo.gc.ca
Timo Arula	Estonian Marine Institute, University of Tartu Ecosystem dynamics Lootsi 2a, Pärnu City 80012, Estonia	timo.arula@ut.ee
Holger Haslob	von Thünen Institute for Sea Fisheries Assessment Palmaille 9, 22767 Hamburg, Germany	holger.haslob@vti.bund.de
Hagen Radtke	Leibniz Institute for Baltic Sea Research Warnemünde Section: Physical Oceanography and Instrumentation Seestrasse 15 D-18119 Rostock Germany	hagen.radtke@io-warnemuende.de
Deirdre Hoare	Independent Consultant 265 Boulevard Mt. Eustace, Tyrrelstown, Dublin 15 Ireland	deirdrehoare@gmail.com

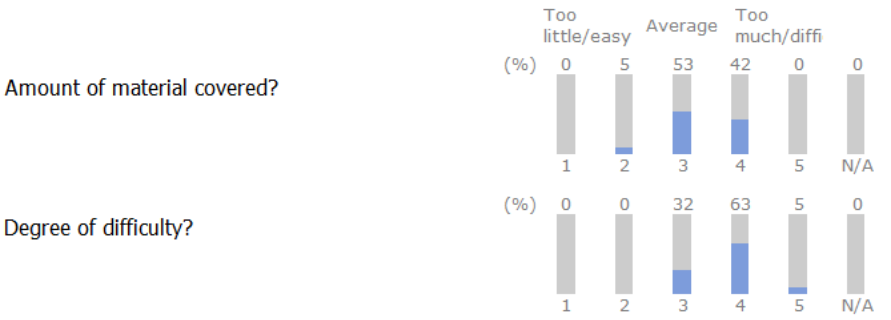
NAME	ADDRESS	E-MAIL
James Keating	Galway Mayo Institute of Technology Commercial Fisheries Research Group Marine and Freshwater Research Centre Dublin Rd Galway Ireland	jameskeating@galwaydiving.com
Giuseppe Scarcella	CNR–ISMAR Ancona L.go Fiera della Pesca Italy	g.scarcella@ismar.cnr.it
Silvia Angelini	ISMAR–CNR, Ancona Fish and Aquaculture Largo Fiera della Pesca, 2 60125 Ancona Italy	silvia.angelini@an.ismar.cnr.it
Piera Carpi	Università Politecnica delle Marche CNR-ISMAR (Ancona) - Marine Science - Population Dynamics Unit CNR-ISMAR, Largo Fiera Della Pesca, 2 60125, Ancona Italy	piera.carpi@an.ismar.cnr.it
Alessandro Ligas	Agri-Food and Biosciences Institute (AFBI) Fisheries and Aquatic Ecosystems 18a Newforge Lane, Belfast, BT9 5PX, Northern Ireland UK	ligas@cibm.it; Alessandro.Ligas@afbini.gov.uk.
Tessa van der Hammen	IMARES Fish Ecology PO Box 68, 1970 AB IJmuiden, The Netherlands	tessa.vanderhammen@wur.nl
Aukje Coers	IMARES Fisheries PO Box 86 1970 AB Ijmuiden The Netherlands	aukje.coers@wur.nl

Name	Address	E-mail
Irene Huse	Institute of Marine Research Ground fish group P.O.Box 1870 Nordnes, NO-5870 Bergen, Norway	irene.huse@imr.no
Gersom Costas	Instituto Español de Oceanografía Centro Ocenográfico de Vigo Fisheries Subida a Radio Faro, 50-52 36390 Vigo Pontevedra Spain	gersom.costas@vi.ieo.es
Esther Abad	Instituto Español de Oceanografia (IEO) Stock Assessment. Demersal fisheries Centro Oceanografico de Vigo. Cabo Estai - Canido. 36200 Vigo Spain	esther.abad@vi.ieo.es
Agurtzane Urtizberea	Azti-Tecnalia Marine Research Division Txatxarramendi ugartea z/g E-48395 Sukarrieta, Bizkaia Spain	agurtzane.urtizberea@azti.es
Henrik Svedäng	Swedish University of Agricultural Sciences Department of Aquatic Resources Institute of Marine Research Turistgatan 5, S-453 30 Lysekil Sweden	henrik.svedang@slu.se
Henrik Ragnarsson Stabo	Swedish University of Agricultural sciences Department of Aquatic Resources Institute of Freshwater Research Stångholmsvägen 2, SE-17893 Drottningholm Sweden	henrik.ragnarsson-stabo@slu.se

NAME	ADDRESS	E-MAIL
Andreas Winter	Falkland Islands Government Directorate of Natural Resources Fisheries Department PO Box 598 Stanley, Falkland Islands FIQQ 1ZZ	awinter@fisheries.gov.fk
William (Bill) Lart	Sea Fish Industry Authority Origin Way Europarc Grimsby DN37 9TZ UK	W_Lart@seafish.co.uk
Carlos Mesquita	Marine Scotland Science, Marine Laboratory Sustainable Fisheries Programme Inshore Ecosystems Team P.O. Box 101, 375 Victoria Road Aberdeen AB11 9DB UK	carlos.mesquita@scotland.gsi.gov.uk
Gwladys Lambert	Bangor University School of Ocean Sciences Askew Street Menai Bridge LL595AB UK	osp801@bangor.ac.uk
Lee Murray	Bangor University School of Ocean Sciences Askew Street Menai Bridge LL59 5AB UK	l.murray@bangor.ac.uk
Tom Peatman	MRAG Ltd 18 Queen Street London W1J 5PN UK	t.peatman@mrag.co.uk
Norbert Rohlf	Institute of Sea Fisheries Palmaille 9 22767 Hamburg Germany	norbert.rohlf@vti.bund.de

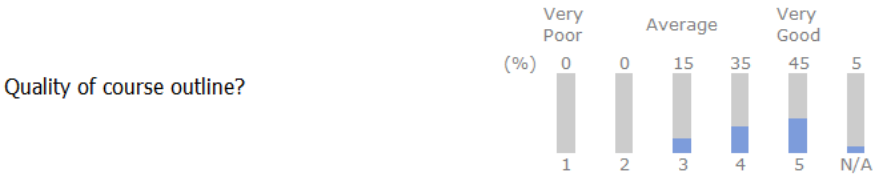
Annex 2: Response on the course evaluation questionnaire

2. Course Content



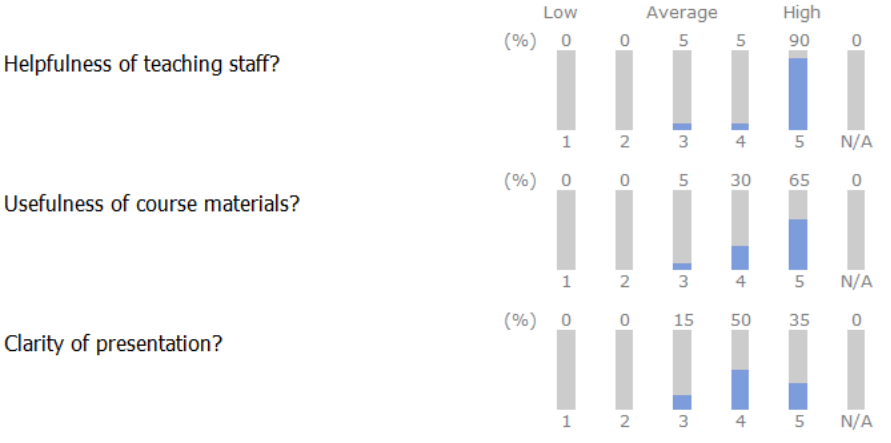
Total: 19

3. Course Organization



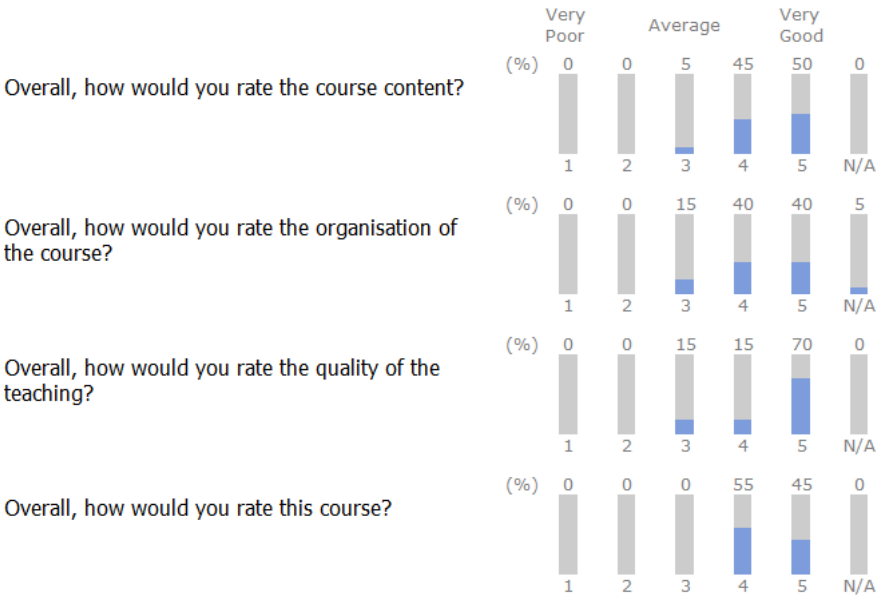
Total: 20

4. Teaching and Learning Support



Total: 20

5. Overall Evaluation



Total: 20

Annex 3: Course Programme

Monday, 15 October 2012	
9.00 – 10.00	Welcome ICES Staff
10.00 – 10.30	**Tea/Coffee**
10.30 – 11:30	Lecture introduction to stock assessment
11:30-13:00	Lecture population dynamics
13:00-14:00	**Lunch**
14.00 – 15.30	Lab population dynamics
15.30 – 16.00	**Tea/Coffee**
16.00 – 18.00	Lab population dynamics
18.00 – 20.00	*Icebreaker*
Tuesday, 16 October 2012	
9. 00 – 10.15	Lecture on basic stock assessments
10.15 – 10.45	**Tea/Coffee**
10.45 – 13.00	Lecture likelihood estimations and optimizers
13.00 – 14.00	**Lunch**
14.00 – 15.00	Lab likelihood estimation and optimizers
15.00 – 15.30	**Tea/Coffee**
15.30 – 17.30	Lab stock assessment in R
Wednesday, 17 October 2012	
9.00 – 10.15	Lecture uncertainty estimation in likelihood approaches
10.15– 10.45	**Tea/Coffee**
10.45 – 13.00	Lecture ADMB for maximum likelihood estimation
13.00 – 14.00	**Lunch**
14.00 – 15.00	Lab growth estimation and S-R relationships in ADMB
15.00 – 15.30	**Tea/Coffee**
15.30 – 16.30	Lecture Bayesian techniques for stock assessment
16.30 – 18.00	Lab Bayesian stock assessments

Thursday, 18 October 2012	
9.00 – 10.15	Lab assessment in ADMB, estimating M from data
10.15 – 10.45	**Tea/Coffee**
10.45 – 13.00	Lab MCMC in ADMB
13.00 – 14.00	**Lunch** & Group photo
14.00 – 15.00	Lecture on reference points and Harvest Control Rules
15.00 – 15.30	**Tea/Coffee**
15.30 – 18.00	Lab on reference points
18.15 – 22.00	Course dinner (optional, expenses to be covered by participants)
Friday, 19 October 2012	
9.00 – 10.15	Lecture on functional forms
10.15 – 10.45	**Tea/Coffee**
10.45 – 13.00	Lab on using the assessment for your own data
13.00 – 14.00	**Lunch**
14.00 – 15.00	Question and answer session; discussion; evaluation (written)
15.00 – 15.30	**Tea/Coffee**
15.30 – 16.00	Closing