



ICES Training programme

The International Council for the Exploration of the Sea (ICES) offers courses led by high-profile scientists and instructors. Visit the [ICES Training Webpage](#)

Introduction to Bayesian inference in fishery science

Objective and level

Management advice provided by ICES has its roots in the work of stock assessment working groups comprising of experts on the stocks to be assessed. In addition to their expertise on the stock of concern and the population models of the stock, another important part of the expertise is the knowledge about the population dynamic parameters and their relationships derived from other stocks and the historical experience in fisheries. Traditional stock assessment methods can only use the data available for the stock of interest, which means that all other knowledge has to be left out from the quantitative analysis. The Bayesian approach to scientific reasoning provides a mechanism to incorporate this other knowledge and experience. The Bayesian approach is a mathematical logic for quantifying and processing expert knowledge, which enables direct integration of the prior information possessed by experts and their interpretation of the observed data.

Bayesian methods also provide a mechanism for the quantification and computation of uncertainty that is directly applicable to decision making. Traditional statistical methods only describe the sampling process while assuming known state of nature; (stock size for instance) there is no measure of uncertainty about the state of nature itself. Thus, the scientists are not able to make probabilistic statements of uncertainty about the status of the stock or the population dynamic parameters. Bayesian analysis results in clear probability statements such as “there is a 90% probability the stock is between 1200 and 3000 tons”, and these probabilities can then be directly used in decision analysis to inform the management advice.



The Reverend Thomas Bayes, 1702 - 1761

The objective of this course is to familiarize the participants with the basic concepts of Bayesian inference and to provide skills for solving simple problems. The participants will have hands on experience about using MS Excel and OpenBUGS software for Bayesian computation. The topics to be covered include:

- Principles of the Bayesian reasoning
- Differences and similarities between the Bayesian approach and conventional statistics
- Numerical integration methods: Markov chain Monte Carlo (MCMC) and Sampling importance resampling (SIR)
- Bayesian regression analysis (or estimation of a mean)
- Bayesian Mark-Recapture analysis

Course dates

11-15 June 2012. The five-day course will run in morning and afternoon sessions.

Venue

International Council for the Exploration of the Sea
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info@ices.dk
 You can find more information about:
 ICES HQ [here](#)
 Hotels close to ICES [here](#)
 The hostel adjacent to ICES [here](#)

Organization and requirements

The course is organized by the ICES Secretariat as part of the ICES Training programme.

The course and course materials are provided by Ray Hilborn (University of Washington) and Samu Mäntyniemi (University of Helsinki). The course includes applied examples, case studies, and hand-on exercises on the computer.

Participants are expected to be familiar with normal biological statistics including hypothesis testing, regression, and likelihood.

Participants are required to bring their own laptops to connect to ICES network, with Excel, Excel Solver, and the program "OpenBUGS 3.2.1" installed.

Admission and registration

The course is designed for a maximum of 30 participants. The working language is English.

Please register online:

www.ices.dk/iceswork/training/registration/

You will receive a message acknowledging receipt of your application within one week.

The deadline for the submission of applications is 27 April 2012.

Fee

The fee for the course is €500. This covers only tuition.

Programme

Day		Topic
Monday	AM	Modes of inference: compare Bayesian concepts to p-values, likelihood profiles and confidence intervals
	PM	Modes of inference continued Bayesian computation part I: Excel grid
Tuesday	AM	Bayesian computation II: Introduction to MCMC: - Estimation of a mean - Convergence criteria
	PM	OpenBUGS: mean and linear regression
Wednesday	AM	Mark - Recapture using OpenBUGS
	PM	Hierarchical stock recruitment model
Thursday	AM	Hierarchical stock recruitment model
	PM	Bayesian computation III: - SIR and convergence criteria
Friday	AM	Student problems
	PM	Student problems Summary

Instructors

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