The Australian Centre for Environmetrics

Bayesian Ecotoxicology

A 1-day Primer

THE UNIVERSITY OF MELBOURNE

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The Australian Centre for Environmetrics is pleased to offer this special introductory workshop on ***Bayesian Ecotoxicology***.

Developed and presented by Prof. David Fox, Director of the Australian Centre for Environmentrics and co-author of the ANZECC/ ARMCANZ (2000) National Water Quality Guidelines, this unique workshop will equip you with the basic skills necessary to analyse ecotoxicological data within a newly-developed Bayesian framework.

How Safe is a 'safe' concentration?

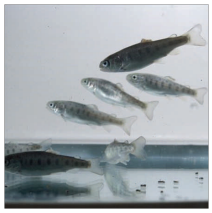
What's it about?

The Species Sensitivity Distribution (SSD) is a cornerstone of modern ecotoxicology and provides a basis for establishing guidelines, trigger values, and limits on concentrations of hazardous chemicals in animals and the receiving environment. Using advanced statistical tools and concepts, experimental dose-response data are used to *infer* a concentration that, it is claimed, will protect some arbitrarily high fraction of all species in an ecosystem. The methodology is widely used in Australia to determine 'trigger' values and a software tool known as 'BurrliOz' is distributed with the National Water Quality Guidelines to facilitate the complex computations. While the technique is regarded by most as a significant improvement on the use of 'assessment factors', it is not without its problems and limitations. One of the most severe shortcomings is its reliance on the largely discredited NOEC. In a recent paper, Fox (2009) describes an alternative (Bayesian) paradigm for the estimation of the *no effect concentration* (NEC) and the *hazardous concentration* (HC_x) as an alternative to conventional methods based on NOECs.

What does it cover?

In this 1-day introductory workshop you will:

- Be gently introduced to the basic concepts behind Bayesian inference with distinguishing points of difference with 'conventional' (Frequentist) statistics explained;
- Be walked through the process of MCMC simulation;
- Be shown how to set-up the flexible dose-response model and define *prior* distributions for the model parameters (one of which is the NEC);
- Use WinBUGS to estimate the *posterior* densities of the model parameters and to place Bayesian *credibility* bounds around the estimated NEC;
- Be shown how to incorporate uncertainty in a collection of NECs to derive a more realistic HCx.



Who's the presenter?

The workshop presenter is Prof. David Fox. Prof. Fox is Director of the Australian Centre for Environmetrics and one of the country's leading environmental statisticians. He was a co-author of the ANZECC/ARMCANZ (2000) water quality guidelines and was instrumental in the development of the BurrliOz tool. He has worked at universities around the world and between 1992 and 2006 held a number of senior positions in CSIRO. He has participated in a number of large environmental studies including the Port Philip Bay Environmental Study (member of Technical Group), Melbourne Water's Effluent Management Study (Director), the Adelaide Coastal Waters Study (Director), and the North-West Shelf Joint Environmental Management Study (member of Technical Group). Prof. Fox is an active researcher in and campaigner for new methods of *statistical ecotoxicology*.

What do I need to bring?

Prof. Fox has a long-standing and well-earned reputation for be able to make complex statistical concepts accessible to non-statisticians. This 1-day workshop makes minimal assumptions about your statistical expertise: the only requirement is that you are at least familiar with basic concepts in probability, estimation (e.g. t-tests, confidence intervals) and inference (hypothesis testing, ANOVA). Other than this, all you will need is:

- laptop computer with WinBUGS installed (download from http://mathstat.helsinki.fi/openbugs/OpenBUGS.zip).

Printed notes and prepared data sets will be supplied.

Fox, D.R. (2009) "A Bayesian approach for determining the no effect concentration and hazardous concentration in ecotoxicology", *Ecotoxicology and Environmental Safety* (in press)