

Theme Session Z on How to Improve Environmental Monitoring and Biological Studies – Integrating Ecology and Statistics

Rob Fryer, UK and Johan Craeymeersch, the Netherlands

Background

The purpose of the Session was to:

... solicit papers dealing with environmental monitoring, environmental impact, and other biological studies using statistics such as:

- the probability of detecting environmental impacts and biological effects;
- methods for spatial and temporal trend studies;
- the probability of detecting point sources or episodic events;
- cost-effective sampling design using statistics.

The Session will document the essential use of a statistical approach to the design and assessment of environmental monitoring. Papers will be solicited that demonstrate the effective use of power analyses for sampling design to insure cost effectiveness while achieving the desired level of probability of detecting an impact. This session will provide practical examples of how statistics can be implemented in planning and assessing the results of monitoring programs.

Eight papers and three posters were presented. All described statistical or mathematical modelling techniques for use in the design of monitoring programmes or the analysis of monitoring data. The applications were diverse, including environmental monitoring programmes, environment impact studies, fish stock surveys, and fish tagging programmes.

The papers grouped into those on design and those on analysis, although they are inevitably linked since design requires some analysis, and analysis informs future design. The design papers included two examples of power studies, for detecting temporal trends in contaminant concentrations in sediments, and for investigating time trends and environmental impacts using fish catch per unit effort data. Both emphasised the importance of building on the experiences of previous studies when designing new monitoring programmes. The other design papers described how particle tracking methods might help locate monitoring stations, and how diagnostic tools can identify weaknesses or inefficiency in monitoring designs. The analysis papers considered methods for contaminant monitoring programmes in sediment, reducing variability in survey indices due to changes in survey design and (consequently) wind condition, modelling size-spectra in fish survey data to investigate biodiversity, and modelling the movements of cod using tagging data.

The Session probably does not contribute much to the ICES Science or Advisory function, other than to emphasise, once again, the importance of design to any study, and the benefits of providing adequate resource to the analysis of data. The Session was certainly a useful place to gather together a wide range of talks with statistics at their core.