What's the catch? Designing and implementing statistically sound fishery sampling schemes in the real world

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Sampling schemes for estimating the species composition and size/age structure of fishery landings and discards are often the main source of data for reconstructing historical stock trends and fishing mortality rates for use by fisheries managers. Random and systematic errors in key estimates based on such data, measured in terms of precision and bias, depend on the initial sampling design, the success in implementing the sampling scheme as planned, and the estimators and data processing used to generate the input data for assessments. Any or all of these sources of errors in combination can degrade the quality of scientific assessments and advice on fish stocks.

Probability-based sampling methods, if successfully applied, minimize bias, support estimates with quantifiable precision, and allow sampling effort to be allocated across strata in the most cost-effective way to achieve the objectives of catch monitoring programmes. In contrast, *ad hoc* or judgment-based sampling can lead to severe bias and even the inability to reliably estimate precision. There are, however, major challenges in implementing statistically sound sampling designs for commercial fisheries because of the practical difficulties faced in taking representative samples from the target population. Vessels may land in remote areas, split catches between landing sites, fillet and freeze catches at sea, refuse access to scientists for sampling at sea or on shore, operate across different management areas in one trip, offload catches direct to lorries, or land in more than one country. Variables required for raising the sample data, and sample weights for estimation, may be inaccurate or unavailable.

As part of its Quality Assurance Framework, ICES runs planning groups, study groups, and workshops aimed at supporting the development of statistically sound catch sampling schemes, taking into account practical issues in designing and implementing such schemes, and evaluating the quality of the data in a way that will be helpful to end-users. The 2013 Annual Science Conference provides a timely and essential opportunity to review the development of such schemes in Europe and worldwide, and review the accumulated knowledge and experience to help improve and enhance them.

In this session we seek to bring together case studies from many different types of large-scale and small-scale fisheries to illustrate the state-of-the-art in the design and implementation of fishery sampling schemes and associated analytical methods. We invite papers on the following topics:

- Methodological approaches for the design of fishery sampling schemes and associated analytical methods (including on-shore sampling; at-sea sampling using observers or self sampling; reference fleet approaches; electronic-based monitoring systems such as CCTV);
- Case studies illustrating practical difficulties in sampling fisheries and how sampling schemes have been adapted to overcome these, and the effect on data quality of departures from "ideal" designs;
- Case studies where the use of sampling frames and probability-based selection of vessels/trips in catch sampling are tested;
- Methods of optimal allocation of sampling effort, including cost–benefit analysis;
- Direct comparisons of different probability, non-probability, and model-based sampling designs and estimators;
- Statistical methods for estimating catch-at-age and catch-at-length for cluster-correlated data (design-based, and model-based such as Bayesian hierarchal models);
- Methods to assess data quality (bias/precision) in catch sampling programmes and implications for sampling design;
- Demonstration of impacts of data quality on scientific assessments and advice.