Theme session J

Survey data products for stock and ecosystem assessments; challenges and future directions

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Stock and ecosystem assessments rely heavily on abundance indices and other data products from surveys using a variety of observation methods, including egg sampling, trawling, longlines, pots, acoustics, and video. In Europe and elsewhere extensive coordinated survey programs have been put into place to collect these data. Recently assessment methods have been evolving rapidly, leading to the need for a wider range of information and for development of new methods for obtaining survey data products. Another major challenge and emerging field for surveys is obtaining abundance indices for species that require multiple surveys or survey methods to cover the full extent of their distribution. This happens when stocks are distributed across multiple countries and surveyed by multiple national surveys, stocks are found across multiple habitats and require habitat specific survey methods, vertical distribution requires sampling with trawls and acoustics, different life stages require different methods, and survey methodologies such as gears, vessels or sampling designs change through time or multiple information sources exist. These cases likely encompass most commercially fished species. Ecosystem assessments have their own set of requirements for survey derived data products such as data on non-commercial species, habitat and environment. As these fields develop, the need for standardized survey data treatment methods, defining best practice guidelines and more fundamentally evaluating whether survey products are fit for purpose will arise.

This session had 24 oral presentations and eight posters and brought together around 80 scientists to discuss a wide range of issues around scientific surveys and their use in assessments, which can be coarsely grouped in 3 categories:

Data collection methodology and sample analysis:

This included, video, dredging, trawling, longlining and acoustics, the egg production method. The session demonstrated that methodological developments continue in the ICES community, an example being the presentation of a trawl with a video camera and an open codend which was successfully used to estimate cod abundance. Optimal and efficient survey design and estimating catchability were recurrent themes in many talks. Presenters of these session indicated the need to improve methods for survey evaluation, for propagating survey uncertainty and for communicating uncertainty to managers. Considerations and challenges around designing new surveys were also presented. For video surveys automatic image analysis remains a challenge and machine learning methods are increasingly used with success. The usefulness of survey data was demonstrated by applications using the data to elicit spatial distributions, habitat suitability and biological processes such as growth and feeding preferences. Beyond survey indices how many otoliths to sample remains a debated question to which there is no general answer.

Survey products in single species stock assessments.

The issues covered ranged from the necessary resolution of survey indices in the case of stock mixing, survey effort needed to achieve sufficient precision in survey abundance index estimates, conflicting trends from different surveys and the impact of various assumptions and biological effects on bias and variance of survey estimates. It was pointed out that understanding survey catchability and addressing issues associated with survey catchability is one of the major challenges for survey scientists and for stock assessment authors. One message which emerged clearly was that survey scientists and stock assessment modelers need to work in close collaboration to ensure correct model specification and interpretation.

Ecosystem approach from surveys

Only a few talks considered the information provided by surveys on wider ecosystem characteristics, such as food-web parameterization, biodiversity or other community indices. This might indicate that the current surveys cover the needs of integrated ecosystem assessments or alternatively that this topic attracts less research attention in the ICES scientific community.

Overall the session showed that the challenges around efficient and appropriate use of surveys for stock and ecosystem assessments are less in terms of knowledge gaps but higher in relation to how to bring together information regarding the interaction between survey design, survey products estimation, and the biological nature of species. Challenges also arise from different surveys covering stocks partially in space or time or covering only certain age stages of the population. It has been recognized that surveys are limited in time and space. Therefore, better methods for evaluation of survey usefulness are needed to ensure that the most valuable surveys are being conducted. With respect to ICES is would be useful if a structured dialogue between survey groups and stock assessment groups was initiated. In certain cases this happens automatically if the same people take part in both groups but this is not the case in general. To ensure efficient and best use of survey information by assessment groups it might be useful to develop a short formulary for each survey-stock combination regarding general aspects such as expected spatial and vertical coverage of the stock by the survey, resulting expected catchability (overall and at age), variation in catchability, and information for given years (partial coverage due to bad weather, ship breakdown,..). It might also be good to define the statistics and plots to be used to evaluate model fit to survey indices, i.e. the appropriateness of model assumptions. Guidelines on how to combine multiple survey indices would also be useful (various working groups have considered the question in the past).