Sessions

SESSION 4: Incorporating Knowledge on Trade-Offs and Conflicting Objectives into Decision Making

Conveners: Cathy Dichmont (CSIRO) and Niels Hintzen (IMARES)

Session contents

This session will focus on approaches to incorporating scientific advice on trade-offs and conflicting objectives into decision-making. Of importance are implemented examples that can be applied by other fisheries as well as techniques used to convey complex information from scientists to managers and other stakeholders. As a result, both successes and failures are equally important. Furthermore, the session will include case studies that articulate how scientifically based decision-making has been supported while still articulating uncertainty, trade-offs and conflicts and those that place these conflicting objectives into broad contexts (whether over species and ecosystem, or across the whole socio-ecological system).

Cathy Dichmont

Cathy Dichmont has a national and international reputation in stock assessment, modelling natural systems, natural resource management, shared fisheries stocks, and management strategy evaluation (MSE) and has led numerous collaborative and multi-disciplinary projects. She has more 20 years of experience in temperate and tropical marine ecosystems at international and regional levels. She was a key contributor to bio-economic modelling that rejuvenated prawn fishing in the Gulf of Carpentaria, received the CSIRO Medal for Research Achievement and leads the Resource Use and Assessment Research Stream in the CSIRO Wealth from Oceans Flagship. Read more about Cathy Dichmont here:
www.csiro.au/Organisation-Structure/Divisions/Marine--Atmospheric-Research/CathyDichmont.aspx

Niels Hintzen

Niels Hintzen works with translating results from data analyses to mathematical models, performing statistical analyses and using this to simulate future management scenarios. He is lead scientist on assessments of herring stocks in Europe and horse mackerel in the South Pacific and he currently chairs the ICES working group on herring assessment. Read more about Niels Hintzen here:
www.wageningenur.nl/en/Persons/Niels-Hintzen.htm

Session 4: Incorporating knowledge on trade-offs and conflicting objectives into decision making

Strategic Management Decision Making in a Complex World: Quantifying, Understanding and Using Trade-offs

André E. Punt

Use of Management Strategy Evaluation (MSE) techniques to inform strategic decision making is now standard in fisheries management, and is increasingly being recommended for use in terrestrial systems. The technical aspects of MSE, including how to design the operating models that represent the managed system and how to simulate future use of management strategies, are well understood and can be readily applied, especially for single-species targeted fisheries. However, MSE evaluations seldom identify strategies that will satisfy all of the objectives of the decision makers simultaneously, i.e. each strategy will achieve a different trade-off amongst the objectives. We examine the basis for identifying management objectives and representing them mathematically, as well as how the trade-offs can be illustrated to the various audiences who provide input into decision making. To the extent feasible, how the trade-offs were accounted for in decision making is also outlined. The approaches and experiences are illustrated using case studies on sardine from Australia and the west coast of North America, commercial and aboriginal harvesting of baleen whales, and other examples of single- and multi-species fisheries. The case studies are restricted to where a management strategy, or at least a harvest control rule, is formally adopted. The examples highlight the wide variety of types of objectives that can be considered in an MSE, but that traditional single-species considerations continue to dominate decision making. The desirability and consequences of minimum performance standards ('satisficing') as well as the difficulties assigning plausibility ranks to alternative states of nature are found to be amongst the major challenges to effective provision of strategic advice on trade-offs among management strategies.

What is it we want to maximise and sustain in Maximum Sustainable Yield?

Anna Rindorf, John Mumford, Lotte Worsøe Clausen, Louize Hill, Niels Hintzen, Ellen Hoefnagel, John Holt, Alexander Kempf, Adrian Leach, Polina Levontin, Pamela Mace, Steve Mackinson, Christian Olesen, Clive Potter, Raúl Prellezo, Axel Rossberg, George Tserpes, Rudiger Voss and Dave Reid

Trade-offs between catches of different species and between long term average yield and stability produce a situation where maximising long term average yield in tonnes of each species separately may not be the most desirable aim for fisheries management. Working with stakeholders, We investigated whether a wider interpretation of MSY capable of addressing the shortcomings of the current strict definitions of MSY as maximum tonnes taken on an individual species basis can be attained. We approached this through a three-year interactive process involving scientists, industry, NGOs and managers in five different European regions. All regions showed a pronounced preference for being inclusive in the setting of targets and for introducing constraints to ensure ecosystem sustainability, However, the preferences for other targets varied between regions according to whether fish stocks and fisheries were considered as isolated or interlinked and according to the conditions in the surrounding societies. Regions which considered fish stocks or fisheries as interlinked showed a low preference for interpreting MSY as the total summed catch of all species. Northern regions tended to focus less on employment and more on economic factors such as rent return than southern regions. Beyond maximising inclusive governance, targets aiming at maximising some form of social yield rather than biomass or economic yield were seen as not being operational and hence received a low preference. Options for maximising yield in weight or value received higher scores. Over the three years of the study, a procedure to operationalise inclusive governance in scientific advice emerged. Ranges providing outcomes close to MSY were defined to provide room for trade-off of different considerations in a more adaptable way than through automatic maximisation of different versions of yield.

myfish
Maximising yield of fisheries while balancing ecosystem, economic and social concerns

ICES SYMPOSIUM
TARGETS AND LIMITS FOR LONG TERM FISHERIES MANAGEMENT

Session 4

On the role of visualization in the management of fisheries

Polina Levontin, John D. Mumford, Adrian W. Leach, Paul Baranowski, Laurence T. Kell and John Holt

Environmental change has focused the attention of scientists, policy makers and the wider public on risk and uncertainty in interactions between people and the environment. Governance in fisheries has shifted to become more open to stakeholder participation and more inclusive in its remit, which is no longer limited to ensuring a Maximum Sustainable Yield from a single stock but considers species and habitat interactions, as well as social and economic issues. The increase in scope, complexity and awareness of uncertainty in fisheries management has brought methodological and institutional changes globally. Progress towards comprehensive, explicit and participatory risk management in fisheries depends on effective communication. We present examples from outside the field of various visualisation techniques that have potential for wide applications within fisheries. We tested some of these visualisation methods within stakeholder workshops and used feedback to make improvements. We experiment with new formats and discuss way of presenting results of management strategy evaluations that might be more effective as forms of communication than those currently in use.

A framework for managing fisheries with multiple economic, ecosystem and social objectives

John D. Mumford, Anna Rindorf, David Reid, Axel Rossberg, Christine Röckmann, Alexander Kempf, George Tserpes, Christos Maravelias, Christopher C.E. Hopkins and Maria Hadjimichael

The maximisation of sustainable “yield” (MSY) is an immediately appealing concept which seems to hold promises of long-term fisheries value. However, practical implementation has led to substantial criticism of MSY as a management goal, in part because of the focus on yield as the single management dimension. Here, we address this criticism by determining general guidelines which can be used by European policy-makers in the implementation of fisheries management based on multiple objectives. General guidelines are produced on the type of systems for which MSY variants are likely to be appropriate and relevant, along with an evaluation of applicable model types for different systems depending on complexity, uncertainty and data availability. The resulting guidelines are organized in a framework to support the implementation of MSY and variants in a wider range of European Union (EU) fisheries. Fisheries reviews identified examples of current good practice in several fisheries outside the EU, broadly in relation to science, governance and rights. Well-communicated, comprehensive policies employing science in structured systems, with predictable staged rules, durable ownership and co-management are examples of practices that appear to give good outcomes. These examples provided guidance on the design of inclusive multi-dimensional fisheries management through the application of the proposed framework. The framework describes a good practice approach to new multi-dimensional fisheries management cases. This includes sixteen steps in problem framing, agreeing options, addressing potential stakeholder outcomes resulting from implementation and evaluation to ensure a relevant and effective plan for governance and management is developed. Stakeholder participation is an essential element in the process. The framework has been validated in part through application of the process to a series of regional case studies with mixed groups of stakeholders.

myfish

Maximising yield of fisheries while balancing ecosystem, economic and social concerns

ICES SYMPOSIUM

TARGETS AND LIMITS FOR LONG TERM FISHERIES MANAGEMENT

Session 4

Accounting for socio-economic constraints to define the path to sustainability: European examples

Katell G. Hamon, Heleen Bartelings, Jose Maria Da Rocha, Dorletta Garcia, Ayoe Hoff, Alexander Kempf, Stephanie Mahevas, Christos Maravelias, Gorka Merino, George Tserpes, Clara Ulrich, Rudi Voss

One objective of the EU project Myfish, involved identifying the trade-offs between the ecological, economic and social aspects of sustainability of fisheries. Once the sustainability objectives and associated targets are defined, managers must still decide of the pace to reach them. While it is recognised that acting fast is more likely to lead to environmental sustainability, this can have undesirable economic consequences for the fleets dependent on the managed resource and deeply affect local communities. To account for the socio-economic dimensions of fisheries, constraints can be and have been set to the speed at which the target must be reached. This can for example be defined as a maximum variability of quota or effort limit between consecutive years. Here, examples ranging from the Baltic Sea, the North Sea, the Bay of Biscay to the Mediterranean Sea illustrate how the socio-economic dimensions can be integrated in bio-economic models to define acceptable paths to the targeted sustainability level. A set of common indicators is used to measure the performances of different harvest control rules in the case studies.

DAMARA: Science to support management decisions for the multi-fleet multi-stock fisheries of the Celtic Sea

Paul Dolder, Cóilín Minto, Marianne Robert, Simon Mardle, Dorleta Garcia, David Goldsborough, Norman Graham

Reforms to Europe's Common Fisheries Policy place regionally based Multi-Annual Plans at the centre of delivering biologically and economically sustainable fisheries. Plans require fishing levels to be consistent with MSY for all stocks, which is a challenge in multi-stock multi-fleet fisheries where biological and technical interactions persist. The combination of approaches for managing fishing pressure through input and output controls, (e.g. TACs, effort, selectivity or spatio-temporal measures) has consequence for all stocks and the fisheries that depend on them. Trade-offs are complex, fleet specific and driven by differing multi-sectoral priorities with consequences for the economic viability of fleets in the short term and long term. DAMARA (DemersAl Mixed fishery Analysis tool for Regional Advice) is a Decision Support Tool (DST) designed to support regional stakeholders in evaluating trade-offs between management choices that are consistent with the CFP's biological, economic and social goals. It combines a fully coupled bio-economic model (FLBEIA; the Fisheries Library Bioeconomic Impact Assessment in R) with a user-friendly interface (based around Shiny), the design of which has been driven by the stakeholders. The DST can be used by stakeholders to compare scenarios to achieve specific targets and assess the biological and economic implications (at multiple levels from country to given fleet segments) of choosing different paths to these goals. Uncertainty in model parameters can be incorporated in the simulations, with the model built around a modular framework allowing more detailed consideration of aspects of the fishery of concern (e.g. recruitment dynamics, price dynamics, fleet structure, effort distribution etc..). DAMARA shows science, industry and authorities jointly developing a DST that uses the best available information to compare trade-offs between management choices. The model has been developed to be generic and could in future also be applied to other regional seas.

myfish
Maximising yield of fisheries while balancing ecosystem, economic and social concerns

ICES SYMPOSIUM
TARGETS AND LIMITS FOR LONG TERM FISHERIES MANAGEMENT

Session 4

Achieving Mixed-fisheries and multispecies MSY in the North Sea demersal fisheriesto sustainability: European examples

Clara Ulrich, Paul Dolder, Ernesto Jardim, Steven Holmes, Alexander Kempf, Lars Olof Mortensen, Jan-Jaap Poos, Anna Rindorf, Youen Vermard

There are concerns about attaining the desired objectives stated in the Common Fishery Policy (CFP) and Marine Strategy Framework Directive (MSFD) in complex and dynamic fisheries targeting multiple species, and in particular about the applicability of Maximum Sustainable Yield (MSY) in mixed fisheries. These concerns apply to a large extent to the North Sea, where the diversity of species and fisheries induce numerous biological and technical interactions. In contrast to many other systems, the North Sea is data rich and well-studied. Interactions are routinely monitored and quantified, allowing for new approaches to emerge. The dynamic nature of the biological system can be addressed through defining MSY as a desirable area of "Pretty Good Yield" rather than a single species point estimate for each stock. Using the FCube fleet-based mixed-fisheries model we demonstrate how the North Sea demersal fisheries system can reach this multidimensional 'space of opportunity' within a short time period, through the use of flexible TAC management that can minimise mixed-fisheries conflicts and improve regional governance, while maintaining viable economic outcomes. We also emphasise the positive changes which have already been attained along this path in recent years.

How metier and vessel size class may influence accident and fatality rates at sea

Simon Northridge

Although it is widely recognised that the fishing industry has one of the highest accident and fatality rates of any occupation, accident rates are rarely if ever considered when making fishery management decisions. Accident rates are not even considered in European fisheries management policy. Fishing vessels accidents are reported in detail by most EU member states and many of these are available online. In this study the available records have been synthesised and accident rates compared between fishing methods and length classes. In order to standardise these rates, the number of days at sea by fishing gear type and by vessel length class have been used to highlight fishing methods and vessel length classes that appear to be most dangerous. Results suggest that (for the UK at least) static net and potting vessels, and vessels of less than 12m in length have a lower accident rate (number of vessel accidents and number if human fatalities) per day at sea than certain other gear and length classes. Specifically, the most accident prone sectors are the over 20m vessel length class and vessels using Nephrops trawls and dredges. The reasons for these differences are speculated upon, though further research into the causes may help elucidate why some sectors are more accident prone than others. These results provide another possible consideration when allocating effort among vessel sectors.