

Theme Session H

The future of sustainable harvesting strategies

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Sustainability has become a watchword in the recent development of fisheries management. It is an integral part of maximum sustainable yield (MSY), the chosen reference level for European fisheries management under the Common Fisheries Policy (CFP), and has also been proposed in other jurisdictions. An increasing number of fish stocks within ICES are now managed according to agreed management plans and harvest control rules (HCR), most of which have been evaluated by ICES to be in accordance with the precautionary approach and in conformity with long-term sustainable exploitation and the ICES MSY framework. In turn, it has been recognized that HCRs and sustainability must be extended beyond single or multiple fish stocks, to encompass environmental, social, and economic sustainability. HCRs and sustainability objectives should go hand in hand under an Ecosystem Approach to Fisheries Management (EAFM), but in many cases sustainability objectives have been defined only in general terms, particularly for the social and economic domains, but also, arguably, in some ecosystem contexts (e.g. biodiversity and foodwebs). Evaluation procedures for HCRs, modelling and estimation methodologies, definition of biological references, as well as definition of acceptable risk relative to these reference points and sustainability objectives, is currently addressed in a range of ICES expert groups and EU Framework Projects (e.g. MYFISH and SOCIOEC). The session was coordinated with SOCIOEC and MYFISH and called for topics related to lessons learnt from the methodologies currently applied in relation to MSY strategies. The papers presented in this session covered a wide spectrum of topics, including data limited stocks approaches, single and multispecies analytical models, analysis related to studying fisheries, and studies focused on an integrated EAFM approach, including socio-economic studies.

Contributions examined:

- Sustainability and HCRs in a single species context;
- Purpose and usage of reference points;
- Sustainability and HCRs in the context of multispecies and multicontextual objectives;
- Analytical approaches to management strategy evaluation under potentially conflicting ecological, economic and social objectives.

Sustainability and HCRs in a single species context:

In the single species cohort models, accounting for autocorrelation in both biological processes and assessment errors had an impact on the estimation of F_{msy} (H:24). New approaches to single-stock models were presented for Icelandic cod (drawing from growth rates of farmed cod, H:25) and golden redfish (HCR with improving selectivity, H:29). Studies where broader metrics were included, such as profit and variable fuel prices (H:02), showed that an integration of biological and economic modules in a model can predict fleet behavior and assess the possible effects of different HCRs on the fleet. The applied model ('Fishrent') will also be used for further analysis of

the effects of the introduction of transferable fishing rights in the flatfish fishery of the North Sea (H:21). For the Tasmanian rock lobster fishery, the introduction of ITQs and exit and entry in the fishery as a result of changes in stock abundance were analysed (H:35). There is no clear link between large and small quota holders regarding the buying or selling of quota. Economic analysis (H:06) showed that changing fishing patterns (selection-at-age) has significant impact on net profit. Using multispecies biological models (H:20) revealed that there are trade-offs among species with respect to yield.

Purpose and usage of reference points:

Simulation analysis (H:16, H:30) revealed that F/F_{msy} of data limited stocks is more accurately estimated than F itself. Knowledge of natural mortality improves the estimation more than any other life history parameter. Various studies (H:13) revealed the diversity of single species indicators that may be of use in guiding management measures. The work on improving the robustness to uncertainties by implementing simpler management measures (H:14) also falls in this category.

Sustainability and HCRs in the context of multispecies and multicontextual objectives:

Including discards, seafloor impact and fuel consumption as criteria when evaluating management measures affects the outcome (H:01) and raises the question of by whom or how should criteria be selected and used when analysing the broader aspects of sustainability in fisheries management. An analysis of the management system in Iceland (H:09) showed how discard issues may be mitigated by allowing some flexibility in transfer of quota among species, albeit at the cost of overfishing some of the less productive stocks. This analysis could be very relevant now in the context of Article 15 (obligation to land all catches) of the new basic regulation of the CFP. An evaluation of the HCR in the Icelandic cod fishery integrating minke whales as top predators, showed that a change in the distribution of top predators may have significant implications for fisheries management (H:28).

Ecosystem size-spectra analysis (H:10) showed that unselective balanced fishing, where individuals are exploited in proportion to their productivity, produces the largest total system yield and lowest impact on trophic structure. However, there is a conflict between maximizing protein extraction and maximizing profit, and/or taking conservation into account (H:17). There is an ongoing debate on whether an influence of fishing on the genetic structure of fish populations is already occurring. In today's fisheries the large individuals are often the focus of fishing, and this may lead to changes in stock structure, as early spawners and fast growers in the population may more easily adapt to this situation (H:19).

Several papers discussed how the scope in the debate of sustainability objectives could be broadened. At the moment, often relatively precise biological/ecological objectives are accompanied by very unspecific social and economic objectives (like 'viable fishing sector'). In papers H:15 and H:22 an approach to locally adjusted objectives for management was described and an approach for ecosystem based management objectives developed (H:17). The work on finding ecosystem indicators for 'pelagic ecosystems' (H:11), where broader management objectives were discussed, also falls in this group of papers.

The management instruments in the CFP shall improve fisheries management and, at the same time, help achieve the objectives of environmental legislation, such as the Marine Strategy Framework Directive, Natura 2000 network, etc. Several presentations related to the integration of environmental indicators and fisheries management approaches. For the Eastern Baltic Cod fishery, ideas for an approach to finding thresholds for environmental indicators were described (H:27), whereas signal detection theory methods were put forward for the selection of indicators by their reliability in HCRs (H:08). In the US, NOAA assesses the influence of fishing and other environmental pressures on ecosystem indicators (H:26). It is generally difficult to find thresholds to be able to give advice concerning when a certain activity must be reduced.

Approaches to management strategy evaluation under potentially conflicting ecological, economic and social objectives:

The European Commission has the obligation to conduct impact assessments for all new regulations, a task which is severely complicated by the often limited amount of data available. JRC is developing a new method which shall allow fast management strategy evaluation for fish stocks with data from official or other sources (such log-books; H:18). Work is also being conducted to assess the impacts of certain management measures for the Eastern Channel flatfish fishery (H:12), which is a very complex fishery from a biological/ecological and economic point of view.

An approach to explain why ministers in the Council enforce inefficiently high TACs was presented (H:04), concluding that more sustainable fishery management requires binding long-term commitments instead of annual votes. Moving to a different part of the world and another social situation, including fishers in the management of small-scale fisheries in Brazil was highlighted as a main element in order to achieve conservation and fishing sustainability (H:34).

During the session a list of more general topics came up in both presentations and discussions. Firstly, results depend on the model used, and it is likely that using more than one model will be required in management strategy evaluations. Secondly, trade-offs arise in many cases, but it was unclear who will make the necessary decisions. Finally, in explaining and communicating the trade-offs, there is often a need to make complex information understandable and to include stakeholders in the process.