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The added value of participatory modelling in fisheries management – what has been learnt?

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ABSTRACT

How can uncertain fisheries science be linked with good governance processes, thereby increasing fisheries management legitimacy and effectiveness? Reducing the uncertainties around scientific models has long been perceived as the cure of the fisheries management problem. There is however increasing recognition that uncertainty in the numbers will remain. A lack of transparency with respect to these uncertainties can damage the credibility of science. The EU Commission's proposal for a reformed Common Fisheries Policy calls for more self-management for the fishing industry by increasing fishers' involvement in the planning and execution of policies and boosting the role of fishers' organisations. One way of higher transparency and improved participation is to include stakeholders in the modelling process itself. The JAKFISH project (Judgment And Knowledge in Fisheries Involving StakeHolders) invited fisheries stakeholders to participate in the process of framing the management problem, and to give input and evaluate the scientific models that are used to provide fisheries management advice. JAKFISH investigated various tools to assess and communicate uncertainty around fish stock assessments and fisheries management. Here, a synthesis is presented of the participatory work carried out in four European fishery case studies (Western Baltic herring, North Sea Nephrops, Central Baltic Herring and Mediterranean swordfish), focussing on the uncertainty tools used, the stakeholders' responses to these, and the lessons learnt. It is concluded that participatory modelling has the potential to facilitate and structure discussions between scientists and stakeholders about uncertainties and the quality of the knowledge base. It can also contribute to collective learning, increase legitimacy, and advance scientific understanding. However, when approaching real-life situations, modelling should not be seen as the priority objective. Rather, the crucial step in a science–stakeholder collaboration is the joint problem framing in an open, transparent way.

1. Introduction

How to link fisheries science with competent and fair governance processes? In EU fisheries management, mathematical and statistical modelling has long been the central analytical method used for producing scientific advice informing the European decision makers. Strong tensions have grown in some fisheries between scientists and industry, in particular around questions of credibility and legitimacy of scientific advice based on the use of such models [1,2]. This credibility crisis has been identified as an

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important issue hampering the Common Fisheries Policy (CFP) to provide biological and economic sustainability (e.g., [3–11].

Uncertainties challenge the 'good' governance in fisheries. Adequate handling and communication of uncertainty in fisheries science is still poorly addressed. Specific approaches or tools dealing with this are emerging, but are still insufficiently formalised, and underperformance in this field contributes to impairing scientific credibility [2,3,5–7,12]. Fisheries science and fisheries management are associated with various forms of uncertainty, which require approaches that go beyond the traditional quantification of uncertain parameters. For example, specific management measures may fail to fit the policy questions [13]. Questions to reflect on include: *Does the scientific method fit the policy problem?* (For example whether a single stock TAC approach is appropriate for a mixed fishery); *Does the choice of assumptions or scientific method potentially favour certain values at stake?* (For example, choosing the assumption of whether a unit of fish comprises one or two stocks may affect the fish and a fisherman in various ways); *What are the sources of uncertainty, and to what extent do they matter?* (A particular uncertainty may be substantial in itself, but may not affect the effectiveness of a particular management measure); *Can the uncertainty be reduced?* (Through data collection, other model approaches or other management approaches); *Do scientists communicate uncertainties in an understandable way?*

Scientists and practitioners in natural resource governance have highlighted the value of and the demand for integrating science and public participation [14, p. 148]. The European Commission (EC) has taken steps in this direction by actively promoting increased stakeholder involvement in fisheries management, for example through the Regional Advisory Councils (RACs). The RACs represent a forum within the CFP, where representatives of the fisheries sector and other interest groups affected by the CFP can be consulted [15]. However, their involvement is indeed mostly restricted to consultation, i.e., providing views on pre-defined management proposals, where scientific advice has already been incorporated [16]. The EC has also supported a number of collaborative research projects (e.g., JAKFISH,[1] EFIMAS,[2] MEFEPO,[3] PRONE,[4] GAP and GAP2[5]), and science–stakeholder partnerships that have investigated ways to effectively and legitimately combine scientific modelling with participatory processes in fisheries governance (Review in [17]) [18,19]. One flexible and innovative concept for combining modelling with stakeholder involvement is participatory modelling [20–22]. It can solicit input from a wide diversity of stakeholders, facilitate creating a shared vision of complex problems among scientific experts, policy-makers and stakeholders, and help to maintain substantial, structured dialogue between these groups [20,23,24], for an overview see [25].

The European FP7 research project JAKFISH (Judgement and Knowledge in Fisheries Involving Stakeholders) has explored tools to address quantitative and qualitative uncertainties in the models used for fisheries management and policy advice within a participatory modelling process with fisheries stakeholders. Participatory modelling is expected to enhance a common and advanced understanding of the current biological, fishery, socio-economic and management issues and their potential risks for stocks and fisheries. The JAKFISH approach to participatory modelling was mainly inspired by the concept of *post-normal science* [26,27]. A policy situation can be considered post-normal when stakes are high and scientific knowledge is uncertain (Fig. 1) [26,28], which often is the case for fisheries. In such situations, one cannot rely on textbook knowledge, and trust that scientists alone will be able to give the answers – because there is not one single answer due to the uncertainties and decision stakes involved. The different types of uncertainties have traditionally been dealt with insufficiently by the science, and some scientists have advocated to bring them to the centre of the policy debate [3,5,7]. A central element of post-normal science is *extended peer review*, where the scientific "peer review community" is extended to include stakeholders [27]. An extended peer review process extends beyond simply ensuring the scientific credibility of results to ensuring the relevance of the results for the policy process. Crucial for an extended peer review is that non-experts understand the implied uncertainties in scientific knowledge so that management actions can take them into account.

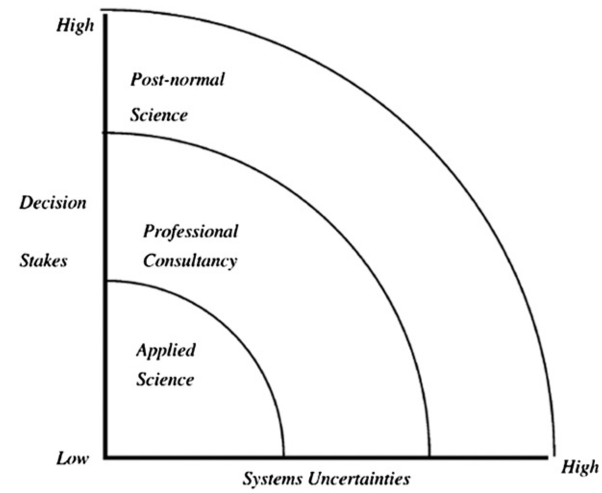

Fig. 1. Problem-solving strategies and the concept of post-normal science (from [27] p. 745).

Practical experience with participatory modelling for natural resource management and marine governance is still limited. JAKFISH explored the potential of participatory modelling in four case studies and in varied and flexible ways. Context and issues differed in each case study, thus representing different situations that can arise within the CFP. This diversity in case studies enabled us to learn about possible options and basic procedural and structural requirements of participatory processes that involve stakeholders in model-related activities.

This paper reviews the participatory processes carried out in the four JAKFISH case studies and synthesizes the achievements, failures and successes. In Section 2, an overview is given of forms of participatory modelling and ways of handling uncertainty. Detailed characteristics of the four JAKFISH case studies and their individual participatory modelling approaches are presented in Section 3. Section 4 reflects upon the lessons learned. The paper concludes with suggestions for the further integration of participatory approaches into fisheries management.

2. The toolbox of participatory modelling and uncertainty handling

The following paragraphs sketch possible forms of participatory modelling and uncertainty handling with relevance for the JAKFISH case studies.

[1] Judgement and Knowledge in Fisheries involving Stakeholders (JAKFISH); EU FP7 project: www.jakfish.eu

[2] Operational Evaluation Tools for Fisheries Management Options (EFIMAS); EU FP6 project (project no.: SSP8-CT-2003-502516): www.efimas.org

[3] Making the European Fisheries Ecosystem Plan Operational (MEFEPO); EU FP7 project: http://www.liv.ac.uk/mefepo/

[4] Precautionary risk methodology in fisheries (PRONE); EU FP7 project: http://ec.europa.eu/research/fp6/ssp/prone_en.htm

[5] Bridging the gap between science, stakeholders and policy (GAP); EU FP7 project: http://www.gap2.eu/