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CONTRIBUTIONS OF THE MAREFRAME PROJECT TO ECOSYSTEM-BASED FISHERIES MANAGEMENT SOLUTIONS FOR EUROPEAN FISH STOCKS

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Abstract. The importance of an ecosystem-based approach to fisheries management (EAFM) has been highlighted by the Directorate General MARE, the Food and Agriculture Organisation of the United Nations (FAO), the International Council for the Exploration of the Sea (ICES), the International Water Center (IWC) and the North Atlantic Marine Mammal Commission (NAMMCO), among others. FAO has recently provided guidelines on EAFM, and stakeholders show increased interest in sustainable management, most obviously through the requests for certification of sustainable fishing. These requests arise due to pressure from consumers, advocacy groups, general societal awareness of limited resources and environmental concerns. It will develop assessment methods and a decision-support framework (DSF) for management of marine resources and thereby enhance the capacity to provide integrated assessment, advice and decision support for an EAFM. Enabling comparisons between relevant 'what-if' scenarios and their likely consequences, the DSF will support the implementation of the new common fisheries policy (CFP) and the marine strategy framework directive (MSFD). Learning from the experience of previous and on-going research, MareFrame integrates stakeholders at its core using a co-creation approach that combines analytical and participatory processes to provide knowledge that can be applied to policy-making, improving management plans and implementation of an EAFM. MareFrame liaises with other national and international research projects and focused on the management of marine living resources in Europe in a changing environment, taking a holistic view incorporating socio-economic and legislative issues.

Keywords: ecosystem-based approach to fisheries management, ecosystem models, assessment methods, innovative visualisation tools, conservation of biodiversity.

AIMS AND BACKGROUND

In recent years, a significant change in the EU Common Fisheries Policy (CFP) emerged, considering the ecosystem-based approach as cornerstone of fisheries management, which should find a solution to the issue of sustainable fisheries. This viewpoint resulted in the creation and implementation of several European policies (Environment, Maritime, Common Fisheries, etc.) and materialised in the implementation of several European Directives (Habitats Directive, Water

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Framework Directive and the most recent Marine Strategy Framework Directive). Any analysis of resources must take place within the broader system that includes fisheries[1]. In this respect, most aquatic environments demonstrate a lack of management, which is reflected in particular by the increasing degradation, habitat loss, lack of coherence in policy management, poorly oriented research, poor or nonexistent long-term control, lack of strategy conflict management users, etc. The circumstances, conditions and dynamics of the ecosystems have a clear impact on fisheries and fish stock dynamics[2–4]. It is therefore important to have a thorough understanding of mechanisms controlling life history traits and plasticity within species, since time scale adaptations have broad reaching implications[4–6].

In this context, the aim of the MareFrame Project is to develop new assessment methods and a DSF for the management of marine resources. The project partner small and medium enterprises (SMEs), together with research institutions and stakeholders will develop and demonstrate the use of innovative monitoring systems and decision support tools for fisheries advice through training actions, role-play and workshops. Indicators of GES will be developed along with models for ecosystem-based management. These models will then be evaluated taking multispecies approaches into account in accordance with FAO guidelines to the ecosystem-based approach to fisheries.

MareFrame liaises with other national and international projects (e.g. on-going FP7 research activities such as: ECOKNOWS, MYFISH, BENTHIS, PERSEUS and CoCoNET projects). Learning from the experience in previous research, MareFrame integrates stakeholders at its core using a co-creation approach. Co-creation combines analytical and participatory processes to provide knowledge that can be usefully applied to policy-making and management. It provides an arena to optimise stakeholders knowledge and capabilities, allowing for a collective improvement in the knowledge on the paths for implementing the EAF, elaborating and refining ideas on the basis of the results generated in the project.

The project seeks to significantly increase the use of EAFM when providing advice relating to European fish stocks. The overall objective of MareFrame is to remove the barriers preventing more widespread use of EAFM through development of new tools and technologies, development and extension of ecosystem models and assessment methods, and development of a DSF that can highlight alternatives and consequences; all in close collaboration with the stakeholders in the co-creation processes (Fig. 1).

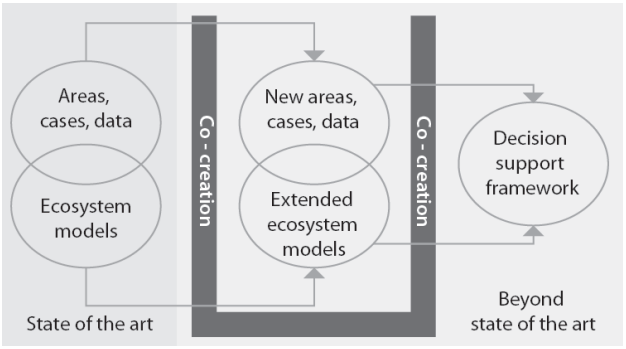

Fig. 1. MareFrame promotes the co-creation approach and collaboration between scientists and stakeholders

The MareFrame Project is organised in 9 work packages. Through a logical sequence of steps, the WPs are structured to contribute to the implementation of an EAFM decision support framework based on increased stakeholder involvement. Throughout the project, the close cooperation between stakeholders and scientists in the co-creation activities, dissemination and training actions are all designed to contribute to the implementation of an EAFM. The MareFrame consortium includes 28 participants from 14 countries: they have been active both in fisheries research, modelling and its management in close cooperation with the industry and are experienced both in coordinating and participating in FP6 and FP7 projects. For a detailed description of the consortium members, please access the MareFrame website (www.mareframe-fp7.org/Partners)[7].

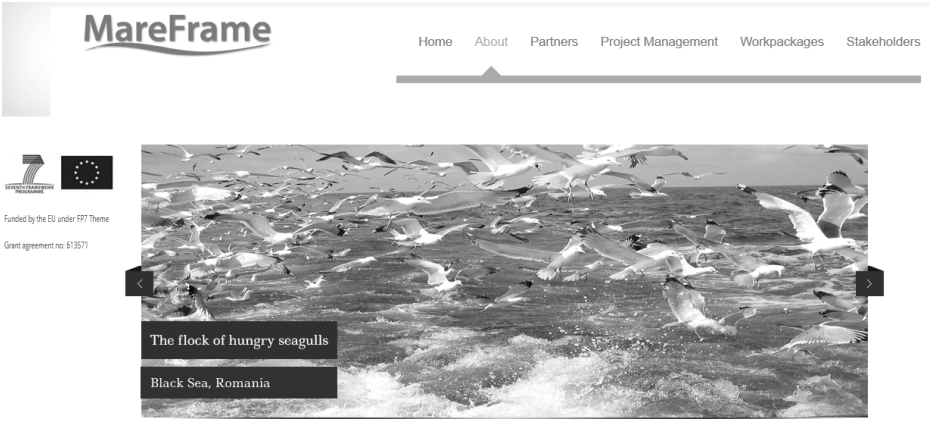

Fig. 2. MareFrame website (www.mareframe-fp7.org)

RESULTS AND DISCUSSION

The MareFrame project addresses the following objectives:

1. *New Tools and Technologies* will be used for developing new knowledge on population distribution, spatial patterns of spawning components, stock structure and definition, habitat preferences, species interactions (including food-web and predator-preys interactions), migration patterns, and biological parameters. One of the main objectives is to make the best use of new tools and technologies such as genetics, microchemistry, and isotope analysis to develop new knowledge on population distribution, spatial patterns of spawning components, stocks structure and definition, habitat preferences, species interactions (including food-web and predator-preys interactions), migration patterns, and some biological parameters such as growth and fecundity, for species targeted in fisheries carried out in the EU waters as well as for other species caught incidentally or are affected by fisheries because of related impacts on their habitats or food sources[8] .

2. *Multispecies Assessment Methods include fitting models to multiple datasets.* Two main ecosystem models (the statistical multispecies toolbox GADGET and Ecopath with Ecosim – EwE) will be fitted to 7 Case Study datasets representing 6 regional seas (Baltic Sea, North Sea, Northern Waters, Western Waters, Mediterranean Sea and Black Sea).

Model results will be compared by area and both models and ecosystem indicators will be evaluated using the Atlantis-based simulated ecosystem. This includes the consideration of biodiversity, food-web structures and habitat impacts including indicators of these. A new range of approaches supporting the development of new assessment tools, including ecosystems models such as size-based models and indicators of ecosystem function (e.g. size-based metrics, stable isotopes, etc.), among other options, should be considered and developed. Evaluations of the outcomes of the project will not be just in the traditional fishery science form of quantitative evaluation of precision of population estimates, but will be evaluations of how useful the various models and for management, and how they increase the capacity to deliver an EAFM in Europe.

3. Another important objective is to develop an innovative *Decision Support Framework,* which serves to provide an evidence basis for policy-makers about the trade-off between various management options on a multispecies basis. The project intends to utilise the assessment methods developed under the second objective as a basis to develop interactive and integrated tools for decision support and include a series of case studies of possible approaches, involving iterative management plan development with stakeholder involvement and considering the socioeconomic effects. Modelling development and management aspects should be based on close cooperation with the fishing industry in order to integrate fishers knowledge.

4. *Training Actions and Cooperation of Stakeholders* are planned between scientists and stakeholders including fishing sector, international scientific organisations providing scientific advice on fisheries management and competent authori-

ties for decision-making. The participation of relevant partners from Australia, Canada and New Zealand will add to the scientific and/or technological excellence of the project and ensure effective uptake of ongoing international efforts for the implementation of the EAFM.

CONCLUSIONS

The challenge of implementing the Ecosystem-based Approach to Fisheries Management requires the development and best use of innovative scientific methods, new tools and technologies, as well as new statistical, modelling tools and assessment methods that go beyond the single-species approaches which used to be, to a large extent, the main sources of scientific advice. It also requires the adaptation of current management objectives and practices. In this context, the MareFrame Project provides new knowledge, methods, models and tools to support the integration of an ecosystem-based approach in fisheries advice and the decision-making for ecosystem-based fisheries and environmental management.

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