

**“EFIMAS”**

**Managing fisheries in a virtual environment in order to provide more reliable scientific advice to stakeholders**

*European fisheries are under pressure at the moment. Not only are many commercially important fish stocks declining, so are the number of fishing boats and people employed within the fishing industry. At the same time, the management and regulation of the fisheries becomes more complicated every year. Stakeholder confidence in existing assessment and management models has been shaken, since these models currently only consider the effects of fishing on single fish stocks and the ecosystem, and do not take into account the social and economic impacts of fisheries management decisions as well as mixed fisheries and long term management strategy evaluation.*



To facilitate the development of better fisheries management regimes, a European research project, **EFIMAS**, was launched to develop and integrate a set of new tools into a robust framework within which to **simulate and evaluate the biological, social and economical consequences of a range of fishery management options and objectives within different management regimes.**

The project involves cooperation between 30 research institutions from all over Europe covering the disciplines of fisheries biology, economy and sociology, and is coordinated by the Technical University of Denmark, National Institute for Aquatic Resources.

One of the major challenges is to ensure that the best possible knowledge is synthesised and made available to decision-makers. To this extent, some of the project participants have reviewed the state-of-the-art knowledge base for fisheries systems and consequently published this in a book, **“The Knowledge Base for Fisheries Management”**, which is available from Elsevier. Such information provides the background to draw conclusions of what is needed to improve fisheries management.

The tools that are being developed take account of the dynamics in the fisheries systems (including fleet and mixed fisheries interactions and fisheries behaviour) as well as effects of using e.g. alternative stock and fishery assessment models, economic based fishery models, and also considers uncertainties in the dynamics and in the data collection, assessment, modelling, advisory and management processes.

The framework and simulation models are tested in selected case studies covering different types of EU fisheries in different areas: North Sea mixed roundfish and flatfish fisheries, North East Atlantic mixed Nephrops and mixed Northern hake fisheries, Mediterranean Swordfish and mixed hake fisheries, and Baltic Sea Salmon and cod fisheries.

An overview of the simulation module of EFIMAS is given in the conceptual box flow diagrams on the back. The input data to module are generated by a descriptive model (operating model), which is assumed to represent the “true/real” system. The input data are then processed by a traditional or an alternative fish stock or fisheries assessment model (knowledge production model), which is used



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**Project acronym:**

EFIMAS

**Full title of Project:**

Operational evaluation tools for fisheries management options

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**Web-site:**

[www.efimas.org](http://www.efimas.org)

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to generate management advice. By simulating the effect that the resulting management actions would have on the “true/real” system it is possible to generate a range of performance measures, covering the resource as well as the fishery (such as minimum mesh size, minimum landing size, closed areas, closed seasons and effort regulations). These performance measures will then enable the comparison of a range of management options under alternative management systems and objectives. In the same way that a pilot might fly in a simulator before flying for real, the simulation tool evaluates the robustness of alternative management strategies and options to give more holistic management advice before implementation.

The evaluation framework established through EFIMAS and its sister projects is an open source simulation tools and is made available from [www.efimas.org](http://www.efimas.org) and <http://flr-project.org/>. The evaluation framework has been used in ICES ([www.ices.dk](http://www.ices.dk)) stock assessment and mixed fisheries working groups, in EU STECF (<http://europa.eu/scadplus/leg/en/cha/c11127.htm>) working groups and EU RACs (Regional Advisory Councils), NAFO ([www.nafo.int](http://www.nafo.int)) and IWC ([www.iwcoffice.org](http://www.iwcoffice.org)), and presented through a long row of scientific papers, conferences, courses and workshops. By incorporating a wider range of variables and their uncertainty to illuminate the decision process and allowing for stakeholder feedback in the evaluation process, fisheries management will be made more accessible to all kinds of stakeholders.

