Ecosystem Approach for Sustainable Aquaculture

ECASA Newsletter

ECASA.org

Issue 1 **Summer 2005**

ECASA- An Ecosystem Approach for Sustainable Aquaculture – is an EU funded Framework 6 RTD project, with 16 research partners from 13 member states. It is the successor to several 4th and 5th Framework Programme projects which have helped to push forward our understanding of the effects of aquaculture on the environment especially in the Mediterranean.

Marine aquaculture is expanding rapidly within Europe, bringing societal benefits to coastal communities. Marine ecosystem changes can arise as a result of aquaculture activities; nutrient, organic and chemical waste discharges may affect important habitats such as seagrass meadows, genetic interactions with wild populations, concentration of pathogens and parasites, and interactions with marine birds and mammals. Most negative effects can be minimised by optimal site selection and by matching the scale of aquaculture to the assimilative capacity of the ecosystem.

Across Europe, regulators and industry are aiming towards sustainable development; creating wealth while protecting the environment by efficient use of resources and energy. Farmers and government require tested tools and methods for assessing assimilative capacity and for predicting effects in an environment forced by economic and climatic variability.

Salmon farm, Scotland.

Proposed sites

ECASA is planning a fieldwork programme with sites ranging from the Atlantic waters of Norway and Scotland, the Baltic and the warmer climes of the Mediterranean. ECASA will include both fin and shell fish marine aquaculture and will actively seek stakeholder participation from the outset.

ECASA objectives are to:

- Identify and assess quantitative and qualitative indicators of the effects of aquaculture on the environment and vice-versa
- Assess and develop operational tools, (models) to establish and describe the relationship between environmental conditions and aquaculture activities over a range of ecosystem conditions and aquaculture production systems
- Develop effective environmental impact assessment and site selection methods for coastal area management

The indicators of the main drivers of ecosystem change will be identified and assessed using existing datasets considering each in the context of appropriate site selection criteria. A suite of tools will then be developed that encapsulate best understanding of marine processes on a range of scales. The end result will be the final "toolpack" of models and indicators for assessment of aquaculture-environment interactions.

The Ecosystem Approach

The concept of the ecosystem has been around since 1935, but its incorporation into environmental management systems is a relatively new approach. The Convention on Biological Diversity in 2000 recommended 12 principles on which the practical application of the Ecosystem Approach is based. (See ECASA website/Overview page for link). These were subsequently endorsed by the World Summit on Sustainable Development in 2002. Highly compatible with the European Water Framework Directive, the Ecosystem Approach has also been recommended in the implementation of the Ramsar Convention and is also an integral part of the development of the European Marine Strategy, a framework for Member States to follow to achieve the sustainable use of marine resources.

Ecosystem Approach: The comprehensive integrated management of human activities, based on best available knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.

EU Marine Strategy Stakeholder Workshop Denmark, 4-6 December, 2002.

Sustainable Development

Sustainable Development: Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.

The Brundtland Report. World Commission of Environment and Development.1987

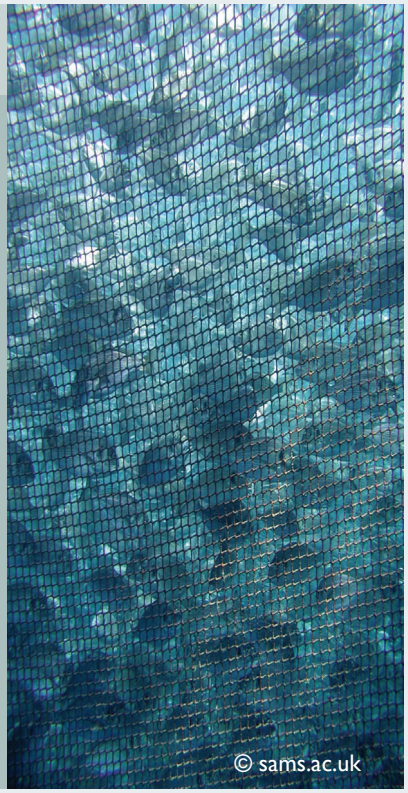
In the modern Industrial Age three forcing factors tend to increase environmental impacts; pressure for resource-intensive goods to get cheaper, population growth, and economic growth. The resultant increase in the exploitation of resources has led to the formulation of ever stronger environmental laws that attempt to limit environmental damage and prevent the unsustainable use of these resources.

For any development to be sustainable it must maintain quality of life, ensure continuing access to natural resources and avoid irreversible environmental damage. In short, it must survive on the Earths' income rather than its capital.

Sustainable Aquaculture

The global expansion of aquaculture has occurred in parallel with the global decrease of commercial fisheries. The depletion of wild fish stocks has led to the application of quotas and other restrictions to try and protect the oceans' living resources. The production of farmed fin- and shell-fish has filled the shortfall in the fishery marketplace and provided much needed employment in rural communities. Several of the detrimental environmental impacts of aquaculture are relatively well understood, but little has been done to help the aquaculture industry to match developments with available ecosystem services.

The application of an ecosystem approach to present and future aquaculture activities is a fundamental step towards effective environmental management and sustainable resource use. The ECASA project aims to support the aquaculture industry in minimising environmental impacts whilst maximising sustainable productivity by producing guidance incorporated in a 'Tool-Box' containing methods for effective site selection and a coherent and fair approach to Environmental Impact Assessment.



The ECASA Tool-Box

The ECASA 'Tool-Box' will contain a suite of indicators and predictive environmental models whose focus will be to aid the assessment of appropriate sites for aquaculture activities and then subsequently provide a consistent framework for the application of Environmental Impact Assessments, resulting in coherent and relevant Environmental Statements.

Environmental Indicators

Indicators summarise complex and often disparate sets of data and thereby simplify information. They should be based on comparable scientific observations or statistical measures. They should provide a clear message that can be communicated to, and used by, decision makers and the general public.

UNEP (2003) Monitoring and Indicators: designing national level monitoring programmes and indicators. Convention on Biological Diversity. UNEP/CBD/SBSSTA/9/10

Environmental indicators are measures of the state of and pressures on the environment. They reflect biological, chemical or physical attributes of ecological conditions. The primary uses of indicators are to characterise the current status and track or predict significant change of the environment and consequently identify major ecosystem stress. Essentially environmental indicators have four basic functions; simplification, quantification, standardisation and communication and ideally they meet the following criteria:

- scientifically sound
- easily understood
- show trends over time
- sensitive to the change that they are intended to measure
- measurable and capable of being updated regularly
- the data and information are readily available.
- cost effective

Within the ECASA 'Tool-Pack' users will be able to select from a suite of indicators whichever best matches their culture species/type and environment. The 'Tool-Pack' will also contain a manual which will assist in the selection of indicators for different purposes and promote consistency of use.

An environmental indicator is defined here as a measure of environmental properties that singly or in combination provide scientifically and managerially useful information about status and trends in environmental quality. True environmental indicators are composed of chemical, physical and biological measures and are further stratified according to stressor, exposure and response roles.

Environmental Models

Models are powerful tools in understanding ecosystem behaviour and have proved to be important in good environmental management.

Jorgensen, S *et al*. 2000 Handbook of Environmental and Ecological Modelling.

An environmental model represents the characteristics of a system or process through a series of linked mathematical equations which can be simple to mathematically complex. Information gathered is fed into the model and the results then used to predict the real-world response to change.

A model requires input data to describe the system and its components, and model parameters to define the relationships. Through these relationships, different scenarios can be investigated.

Model testing (validation) compares predictions with observations and helps identify components sensitive to change. As well as defining the uses and benefits of a model, limitations must also be clearly defined for the model users and stakeholders.

Within ECASA models are developed and tested to examine the relationships between the environment and aquaculture activities. These models will help inform regulatory decisions on aquaculture, establish appropriate monitoring programmes and improve husbandry practices to optimise productivity in a sustainable way. From a research viewpoint models will help in developing better understanding of marine systems and aquaculture.

Project Dissemination

To facilitate the implementation of the Ecosystem Approach stakeholders such as regulators, ecosystem managers, developers and operators and other users of the marine resource will be involved from the outset to ensure the best obtainable deliverables. Regular stakeholder meetings will be organised at local, regional and national level. Further details about the ECASA project will be available from the website www.ecasa.org and the ECASA newsletter will be published regularly with up to date information on how the project is progressing.

This interaction with industry and regulators will ensure the practical relevance of the work and that the user community achieves ownership of the project's outputs. The final "toolpack" of indicators and models for effective environmental impact assessment and site selection will be demonstrated at an international conference and workshop in Spring 2007. This will for the first time bring together regulators and industry from across Europe to consider the best methods for ensuring the sustainable development of marine aquaculture.

SCOTTISH ASSOCIATION *for* MARINE SCIENCE

The Coordination Team are based at the Scottish Association for Marine Science (SAMS) one of the oldest marine research institutions in the world and a centre of excellence for the study, education and promotion of marine science.

Partners at the ECASA 'Kick-Off' meeting at SAMS, Oban in December 2004.

Sixth Framework Programme

The EU's Research Framework Programme 6 contributes to the creation of a true "European Research Area" (ERA), which is a vision for the future of research in Europe, an internal market for science and technology. Fostering scientific excellence, competitiveness and innovation through the promotion of better co-operation and coordination between all levels. Economic growth increasingly depends on research, and the FP is the financial instrument that will help make the European Research Area a reality.

ECASA Partner Contact Details

Partner	Contact	
Scottish Association for Marine Science, SAMS, UK	Kenneth D Black	Kenny.Black@sams.ac.uk
Centre for the Economics and Management of Aquatic Resources, UOP, UK.	David Whitmarsh	david.whitmarsh@port.ac.uk
Napier University, NUE, UK.	Paul Tett	p.tett@napier.ac.uk
National Institute of Biology, NIB, Slovenia.	Alenka Malej	malej@mbss.org
Leibniz Institute of Marine Science, Kiel University, IFM-GEOMAR	Helmut Thetmeyer	hthetmeyer@ifm-geomar.de
Akvapaln Niva, Norway	Reinhold Fieler	rf@akvaplan.niva.no
University of Haifa, Israel	Dror Angel	dror@mit.edu
University of Crete, UOC, Greece	Ioannis (Yannis) Karakassis	karakassis@biology.uoc.gr
Plymouth Marine Laboratory, PML, UK	Tony Hawkins	ajsh@pml.ac.uk
Institute of Marine Research, IMAR, Portugal	Jaoa Ferreira	joao@hoomi.com
Central Institute for Marine Research, ICRAM, Italy	Salvatore Porello	s.porello@icram.org
Institut Francais de Recherche pour l'Explotation de la Mer, France	Alain Bodoy	Alain.Bodoy@ifremer.fr
Instituto Tecnologico Pesquero y Alimentario, AZTI, Spain	Ángel Borja	aborja@pas.azti.es
University of Venice, Italy	Roberto Pastres	pastres@unive.it
Rudjer Boskovic Institute, RBI, Croatia	Tarzan Legovic	legovic@irb.hr
University of Goteborg, Sweden	Anders Stigebrandt	anst@oce.qu.se

www.ecasa.org

Contact details

Coordination Team

Kenny.Black@sams.ac.uk

Averil.Wilson@sams.ac.uk

ecasa@sams.ac.uk