ECASA – Ecosystem Approach for Sustainable Aquaculture

Partners

Ecosystem Approach

Objectives

Workpackages

Contact details

ECASA – Ecosystem Approach for Sustainable Aquaculture

Project Co-ordinator-SAMS

	Partner		Country
1	Scottish Association for Marine Science	SAMS	UK
2	Centre for the Economics and Management of Aquatic Resources	UOP	UK
3	Napier University	NNUE	UK
4	National Institute of Biology	NIB	Slovenia
5	Leibniz-Institute of Marine Science	IFM-GEOMAR	Germany
6	Akvaplan Niva	Akvaplan	Norway
7	University of Haifa	HAIFA	Israel
8	University of Crete	UOC	Greece
9	Plymouth Marine Laboratory	PML	UK
10	Institute of Marine Research	IMAR	Portugal
11	Central Institute for Marine Research	ICRAM	Italy
12	Institut Français de Recherche pour l'Exploitation de la Mer	IFREMER	France
13	Instituto Tecnológico Pesquero y Alimentario	AZTI	Spain
14	University of Venice	DCF_UNIVE	Italy
15	Rudjer Boskovic Institute	RBI	Croatia
16	University of Göteborg	UGOT	Sweden

ECASA – Ecosystem Approach for Sustainable Aquaculture

Principles of the ecosystem approach

Convention on Biological Diversity (UNEP/CBD/COP/5/23 Decision V/6, 103-106)

Principle 1: The objectives of management of land, water and living resources are a matter of societal choice.

Principle 2: Management should be decentralized to the lowest appropriate level.

Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.

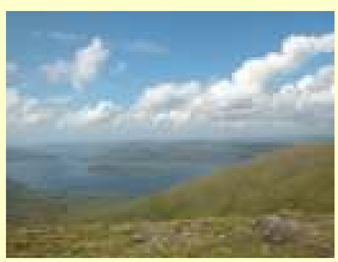
Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:

(a) Reduce those market distortions that adversely affect biological diversity;

(b) Align incentives to promote biodiversity conservation and sustainable use;

(c) Internalize costs and benefits in the given ecosystem to the extent feasible.

Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.



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Principle 6: Ecosystems must be managed within the limits of their functioning.

Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.

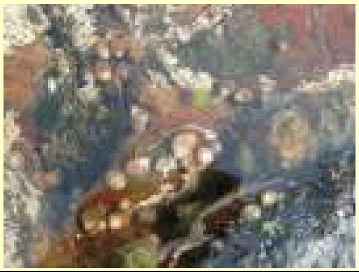
Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.

Principle 9: Management must recognize that change is inevitable.

Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.

Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.

Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.



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Objectives

To identify quantitative and qualitative indicators of the effects of aquaculture on the environment and vice-versa, and to assess their applicability

To develop operational tools, including models, to establish and describe the relationship between environmental conditions and aquaculture activities over a range of ecosystems and aquaculture production systems.

To develop effective environmental impact assessment and site selection methods for coastal area management.

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WORKPACKAGES

Workpackage 1. Co-ordination

Workpackage 2. Identifying and quantifying the most relevant indicators of the interactions of aquaculture on ecosystems

Workpackage 3. Identifying and quantifying the main driving forces of ecosystem changes influencing the aquaculture sector and developing the appropriate environmental indicators

Workpackage 4. Assessing the applicability (efficiency, cost effectiveness, robustness, practicality, feasibility, accuracy, precision, etc) of selected indicators and developing operational tools, e.g. models, establishing the functional relationship between environment and aquaculture activities.

Workpackage 5. Testing and validating these tools in order to include them in a methodology for Environment Impact Assessment (EIA) and effective site selection.

Workpackage 6. Dissemination

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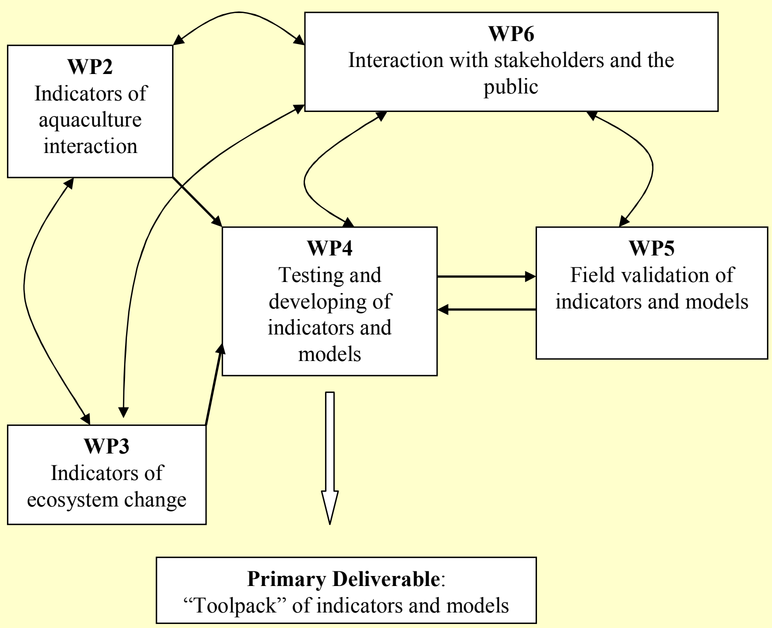

Graphical presentation of the components showing their interdependencies (straight lines) and information flow (additional curved lines)

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WP2

Objectives

To establish a workable definition of indicators

To identify the most relevant indicators of the impacts of aquaculture on ecosystems, including on other activities (e.g. fisheries grounds, sea-ranching) and interactions relating to issues of relevance to the Birds and Habitat Directives

To identify indicators of socio-economics impact of aquaculture on coastal areas (David Whitmarsh, Univ. of Portsmouth)

To classify the different indicators of positive or negative impact of aquaculture on ecosystems, with regards to the different types of aquaculture, their location and their environment

To assess the interactions between aquaculture and other major uses of the coastal zone (fisheries, tourism & recreation, shipping etc)

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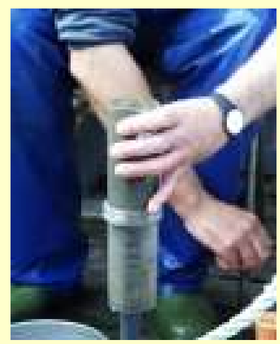
Indicators of ecosystem change

53 indicators proposed, which were grouped into categories

- -benthic fauna (indices AMBI, ITI…)
- -sediment (sulphide, redox…)
- -water quality (Chl a, nutrients…)
- -Coastal Zone management
- -Escapes



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Socio-economic indicators

Objective	**Indicator**
Supply availability	Total output of aquaculture products by country or region Consumption of aquaculture products per capita Consumption of aquaculture products as a % of total fish consumption Consumer prices for aquaculture products
Livelihood security	Total employment in aquaculture by country or region Regional dependency ratios Income per capita in aquaculture Multiplier indicators of dependency
Economic efficiency	Productivity ratios Profit per unit Environmental damage costs per unit Environmental protection costs per unit Producer prices for aquaculture products
Social acceptability	Public attitudes towards aquaculture development Qualitative indicators of user conflict

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WP3

Objectives

To identify and quantitatively assess the role and the relative importance of the different forcing factors: (aquaculture, fisheries, pollution, eutrophication, habitat destruction etc.) and environmental variations affecting the water quality in aquaculture zones and the major ecosystem services provided

To suggest the best methods for obtaining reference levels and associated indicators useful to monitor the impact of anthropogenic factors on aquaculture

To assess indicators of the interactions between aquaculture and other major uses of the coastal zone (fisheries, tourism & recreation, shipping etc)

To identify potential ways for measuring the additional cost caused by external environmental change

To identify indicators of incompatibilities between uses and/or minimal distances required to avoid conflicts over environmental issues

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Consequences of environmental issues
- can they be used as indicators?
e.g. insurance claims

GREECE	2001	2002	2003	2004	2005	Total	%
Disease	51	71	62	48	2	234	56
Storms	19	14	14	15	14	76	18
Predator Attack	9	11	13	6	0	39	9
Hatchery mortality	11	14	8	7	1	41	10
Transportation	6	5	4	1	1	17	4
Thermal inversion			3			3	1
Illegal actions	1			1		2	0
Equipment	2			1	1	4	1
Total	**99**	**115**	**104**	**79**	**19**	**416**	**100**

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Consequences of environmental issues
- can they be used as indicators?
e.g. insurance claims

SPAIN	2001	2002	2003	2004	Total	%
Storms	3	5	7	7	22	76
Disease			3		3	10
Predator Attack		1	1		2	7
Collision				1	1	3
Oil Spill		1			1	3
Total	**3**	**7**	**11**	**8**	**29**	**100**

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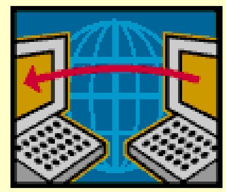
WP4

Objectives

To assess the efficiency, cost effectiveness, robustness, reliability, practicality, feasibility, accuracy, and precision of aquaculture-environment interaction indicators identified in WP2 and WP3.

To develop operational tools, especially models, which capture the functional relationship between environment and aquacultural activities, and which embody the chosen indicators.



Definitions

model: algebraic expression of hypotheses allowing refutable numerical predictions; a model is both a scientific and an engineering tool

procedure: a set of rules allowing a human judgment about quality which is not refutable by scientific method

scales: spatio-temporal basis of model parameterization; some models are explicitly or implicitly scale-less (=universal)

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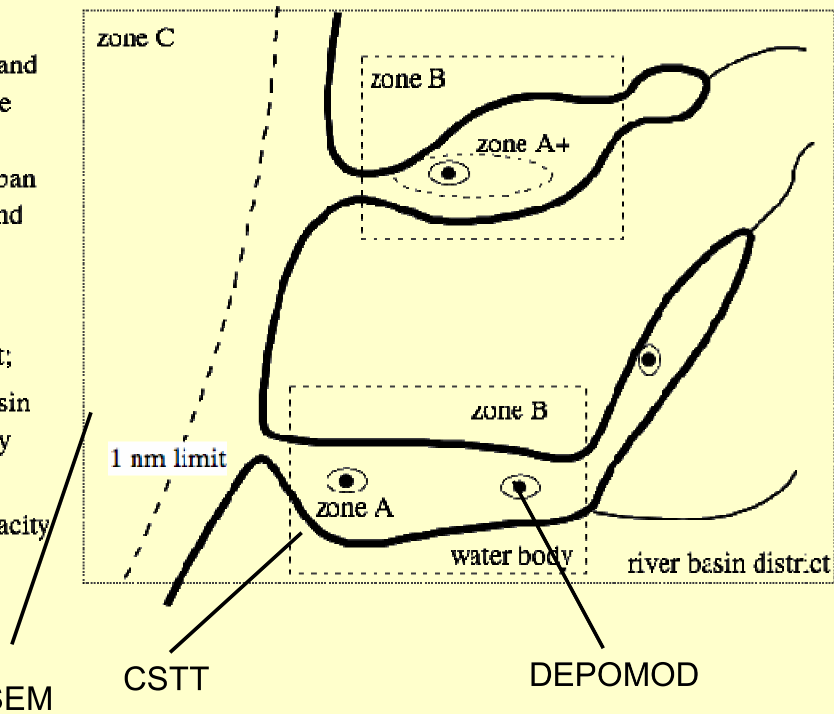
Scales

Environmental impact occurs, and assimilative and carrying capacities can be estimated, on 3 scales (defined by CSTT for urban waste water discharge, and shown here in relation to WFD):

A: local – benthic impact;

B: water body scale – basin assimilative capacity

C: regional scale – e.g. Minch carrying capacity for aquaculture



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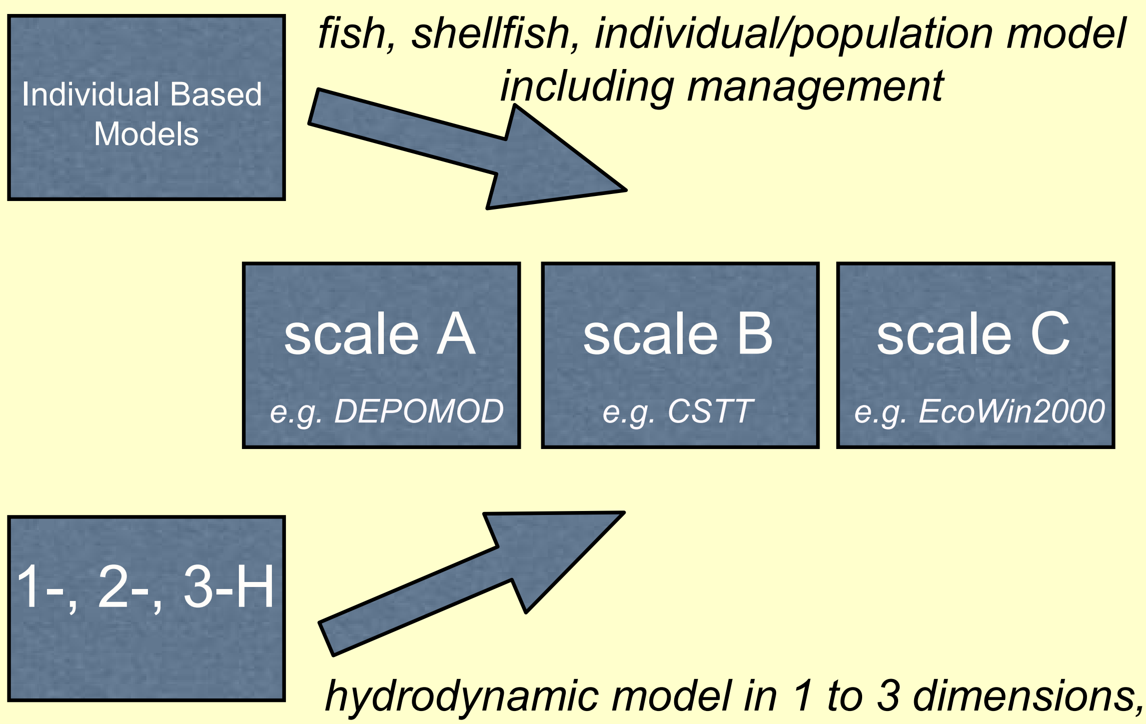
Model (system) components



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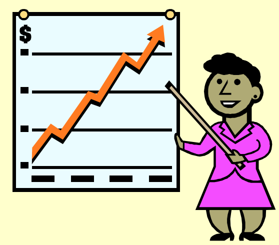
Issues for ECASA to address



relevance of models (e.g. DEPOMOD does not apply/should not be applied to stony seabeds)

scientific **accuracy** of models - tests leading to rejection - studies leading to estimates of **precision** of prediction

system/procedure **appraisal**

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20 Models in WP4	reporter	owner/status
BRNS Early diagenesis model	Brigolin/ Pastres	Uni Venice
TRIMODENA-HYDRO	Julien Mader	AZTI (& LIM-Barcelona)
Hydrodynamic model (IFREMER-Hydro)	C. Bacher	IFREMER
FISH, FARM and SETTLE	Silvert	Canada
SETTLE 2	Silvert	Canada
RECOVERY	Silvert	Canada
DEPOMOD	Chris Cromey	SAMS/SEPA
TRIMODENA-LPT	Luis Ferrer	AZTI
CSTT eutrophication screening model	Paul Tett	CSTT/NUE/public domain
dCSTT+ and ESV models	Laurent, Tett	NUE and NUE/SAMS/FRS/SARF in development
FjordEnv	Anders Stigebrandt	UGOT
Effect of mussel longlines	C. Bacher	IFREMER
EcoWin 2000	Sequeria/ Ferreira	IMAR, widely used, freely available for research
ASSETS	Sequeria/ Ferreira	IMAR widely used; freely available
Shellfish 2005	Hawkins	in wide use by Hawkins
***Sparus aurata* individual-based model**	Brigolin/ Pastres	DCF-Unive
***Tapes philippinarum* individual-based model.**	Brigolin/ Pastres	DCF-Unive
Ecophysiological model based on DEB theory	Aline Gangnery	IFREMER
Shellfish production model	Aline Gangnery	IFREMER
Mass Balance Predictions of Finfish Waste	Strain, IOS, Sidney BC	open source; in use in Canada

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WP5 Testing and validating these tools in order to include them in a methodology for Environment Impact Assessment (EIA) and effective site selection.

Objectives

To establish robust site selection criteria to maximise the utility of the work package.

To select suitable study sites for testing of the tools and indicators that are chosen in WP4

To carry out a series of field sampling campaigns that will generate a database of information that will enable evaluation of the tools and indicators by means of appropriate predictive models.

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Salmon

Cod

Mussels

Oysters

Sea Bass

Sea bream

Tuna

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Country	**Italy**	**UK**	**UK**	**Spain**	**Portugal**	**Portugal**	**Italy**	**Italy**	**Italy**	**Slovenia**
Site	Chioggia Venice	Loch Creran Scotland	Vidlin Voe, Shetland	San Pedro del Pinatar	Ria Formosa	Sagres	Bisceglie	Porto Ercole	Alghore	Portoroz,
environment	offshore	coastal	coastal	offshore	coastal	offshore	offshore	offshore	offshore	coastal
WFD ecoregion, type	Med., coastal	N Atlantic, coastal	N Atlantic, coastal	Med., offshore	N Atlantic, coastal	N Atlantic, coastal (exposed)	Med., CW – M3	Med., CW – M3	Med., CW – M3	Med., CW
water temps	6-25	5-15	7 - 12	14-28	7-31	13-24	12-26	12-26	12-26	6.5-27.8
salinity (psu)	35-37.5	28-32.5	35	37-38	34.6-36.6	35-37	37-38	36-38	35-38	31-38.7
ave depth (m)	25 m	20-30 m	15-35	30-50 m	2 m	25 - 35	18-25 m	30-32 m	30-34 m	13 m
cult. spp	mussels	salmon	Atlantic Cod (Gadhus morhua)	seabass, seabream, red tuna	manila clam	Eur flat oyster, Pacific oyster	sea bass, seabream, pandora	sea bass, seabream, Shi drum	sea bass, seabream	mussels
annual production (t)	600	2,000	100-500	2,000, 800 Tuna	8,000	500	700	180	200	135
gear used	long line	cages	cages	cages	intertidal culture; bottom& trestles	long lines	cages	cages	cages	long line

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Country	Slovenia	France	Croatia	Germany	Greece	Greece	Greece	Greece	Norway
Site	Portoroz,	Marennes Pertuis	Krka estuary	Sylt Island	Souda, Crete	Rhodos East coast	Siteia	Sounio	Tromsø
environment	coastal	coastal	estuarine	coastal	coastal	coastal	coastal	coastal	coastal
WFD ecoregion, type	Med., CW	N Atlantic, coastal protected	Med., CW	Wadden Sea, coastal	Med.	Med.	Med.	Med.	N Atlantic
water temps	6.5-27.8	8-20	12-20	0 - 21	12-26	12-26	12-26	12-26	4-16
salinity (psu)	31-38.7	26.7-34.4	??	26-31	38.5	38.5	38.5	38.5	35
ave depth (m)	14 m	variable!	20-40 m	2.5-10	40-110 (70)	40	13-20	11-25	70
cult. spp	sea bass, seabream	oysters, mussels	sea bass, seabream, oysters, mussels	blue mussel	seabass, seabream	seabass, seabream	seabass, seabream	seabass, seabream	salmon
annual production (t)	71	O 45,000 M 10,000	fish 20 M 400 O 10,000	8,000- 25,000	10	500	1000	400	3600
gear used	pens	variable!		bottom culture	cages	cages	cages	cages	cages

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WP6 Dissemination

Objectives

To ensure effective dissemination of the project through producing effective public and private web-interfaces.

To ensure co-ordination of national meetings between stakeholders and participants and the 2 way flow of information.

To organise a **final international meeting of the project** between participants and stakeholders including organisations from outside the partner's countries and appropriate international bodies. (Probably Norway 2007)

To co-ordinate the production of effective dissemination materials including newsletters

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The ECASA 'Tool-pack'

The data produced during ECASA will test and select the final 'tool-pack' of models and indicators, including decision support tools to guide users to effective implementation

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