Framework VI Meeting (31.1.03)

Joint meeting – BIOFAQs, MERAMED, MEDVEG and others (MARAQUA, OAERRE)

Overview of Projects:

1. Biofaqs – Importance of inclusion of Mitigation/ Regulation of impact in FVI. Importance of bioaccumulation – particularly in polyculture – health issues of cultured organisms (bivalves and macroalgae). Bioremediation – potential use of macro-organisms to accumulate metals and sea lice chemicals.
2. Meramed – Applied, transfer of expertise from Northern latitudes to the Mediterranean. Impact assessments, monitoring, regulations – apply to Med. Assess impacts on environment in eastern Med, interaction between cage production and seabed and interaction between aquaculture and wild fish production in close proximity to fish farm. Development model for above. Propose guidelines for monitoring and regulation in Med. Testing and modifying regulations etc. from Norway/ UK. Procedures used in Norway (EIA), could be used in Med. More work on indicator species, reclassification of sediment qualities (reduction of tidal influence), fish populations – waste fish feed – not influence organic enrichment by fish feed under the farm as taken up by wild fish. Structures attracting wild fish. Different species found under structures not used for fish farming - planktivores. Fish cages – increased abundance of predatory fish. Indications that grey mullet/ sardines may also feed on fish faeces – proportions between feed and faeces unknown. Tiered approach will be suggested for monitoring – dependent on what required by government/ fish farmer. Still need to define characteristics of disturbed, undisturbed etc. site. Dissemination activities – Co-ordination will be very important.
3. Aqcess – Larger spatial scales – impact of aquaculture. Does aquaculture effect labour market in region, structure and impacts on assests influenced by development of aquaculture. Investigation between fisheries and aquaculture – using historical data (how introduction, control impact studies (near and far field), effects on biodiversity and tourist industry. Significant increase in wild fish populations in Mediterranean after the introduction of aquaculture to the region. Hypothesis – surplus of nutrients introduced to nutrient depleted environment leading to increase in fish biomass – pronounced in oligotrophic environments. No significant increase in more hypertrophic environments. No ecosystem modelling. Shift in trophic levels. Conclusion – Aquaculture beneficial to fisheries in certain ecosystems.
4. Medveg – Fate of nutrients released from aquaculture production in Med. Concentrating on sea grasses and assoc. fauna. Slow growing Posidonia – studying whether shift to faster growing species or macroalgae. Med. – Posidonia able to grow to depths of upto 30 m and prefer oligotrophic regions. Community approach (meadow structure, seagrass density, biomass, epiphyte abundance, macroalgae biomass (light reduction to seagrass), herbivory grazers (sea urchins – increasing grazing pressure in affected areas). Physiological

approach – energy balance/ nutrient content of increased organic material – is having an effect on seagrass – reduced biomass. Production of monitoring tools. Identification of indicator species, use of biomarkers in seagrass and biochemical concentrations (e.g. sulphide conc. in sediments) for degraded environments. Production of user-friendly model! Invasion of *Calerpa taxifolia* – implication for use of sea grasses in regions.

5. Oaerre – Oceanographic Applications to Eutrophication in Regions of Restricted Exchange. Nutrient enrichment of lagoons and sea lochs etc. www.oaerre.napier.ac.uk Physical, biogeochemical and biological processes and their interactions, involved in eutrophication in RREs. RREs accumulate water and nutrients to a greater extent that other regions e.g. estuaries. 6 study sites – Norway to Med. Kongsfjorden – small nutrient input. Other extreme – Ria Formosa (Med.) – shallow lagoon, sheltered by sandbar, restricted exchange – region of mariculture, commercial shellfisheries and tourism. Comparison between sites – key features, location etc., tides, current regime, nutrient loading. Eutrophication (defined in UWWTD, 1991). Development of models – influence of eutrophication on growth of harmful vs benign phytoplankton (v. difficult at present - future goal). Potential to predict using existing model, whether RRE will become eutrophic. Key features – water exchange (exchange rate + regulating processed), ratio between chlorophyll and nutrients (+ processes involved in regulating this ratio). Model – not able to predict consequences of high chlorophyll levels (i.e. in toxic species, predominantly diatoms/ flagellates, *Pseudonitzia*? etc.). Development now of 3-D model to include species/ groups. Use of Sea Tramp (able to autonomously measure range of physical and biochemical parameters through a range of depths at set times). Use of satellite imagery – indication of optical conditions that encourage microalgal growth. Issue of grazing – loss term included in model, but typically a default value, lack of studies, but loss based mainly on protozoan grazing. To apply model to new regions - Flushing rates, optical depth (secchi disk), daylight/ light intensity. But for certain environments/ regions must take account of water mass adjacent to RRE and the exchange of water between the two regions.
6. MARAQUA – Monitoring and regulating of marine aquaculture (1999-2000). Review of current aquaculture practices throughout Europe, effluent quality control/ monitoring strategies. Analysis of methods/ practices which minimise impacts. www.biol.napier.ac.uk/maraqua 5 main topics –genetics, use of prediction models, use of chemicals, environment monitoring, economics. Sustainable management – assess 'best' methods of assessing the sustainability of aquaculture. Environmental quality – conservation of marine communities (biodiversity), safeguarding resources (health aspect). Assessment of wider impact of aquaculture activities.

Contamination – Use of chemicals in other countries (sea bream/ bass), medicines, net anti-fouling chemicals.
Biodiversity/ sustainable management/ management strategies
EU Water Framework Directive – implementation by EU countries? Important in next 2 years as directive becomes transposed by each country into their own law. How will this

influence current aquaculture practices? Pressure by directive to introduce 'Polluter Pays' – related to possible effluent charges?

Development of general purpose model, that will predict environmental impact (such as eutrophication or algae overgrowth of corals etc.) in areas of RRE (oligo- and hypertrophic) and then go on to include factors that would mitigate this impact (nutrient extracting processes – bivalves, macroalgae)

Hypothesis – Low conversion ratios in Med. – more immediate release of high concentrations of nutrients compared to salmon culture where higher conversion ratio – attractant for wild fish populations.

Dissemination of Information – Co-ordination between projects.

1. Scientific findings – peer reviewed journals & attendance of all EU project members at EAS Meeting – Barcelona, Nov. 2004
2. Presentation of findings at conference/ specific session
3. Public seminar - Training – web based course/ workshop (Require additional funding from EU) – Invite farmers, regulators, surveyors. Presentations for training course – dissemination for scientific and technical findings. Meeting to be held – October 2003. Concentrate of environmental monitoring methodology, but can be expanded. Use as basis for web based training course. Launch of course June 2004 or wait until EAS, Nov 04.

Project meetings:
Meramed – Oban (April/ May 03)/ Amsterdam (Sept 03)
Medveg – Alicante (Sept 03)
Biofaqs – Piran (9-12 Oct 03)
Oaerre – Tromso (May 03)

Funding Mechanisms – Framewk VI

Integrated Projects – Call for production of European C & N budget, human and natural induced…. I. Assessment of EU C balance II. Marine C sources and sinks (Paul Tett).

Network of Excellence

SAMS – National funding would be available for future funding in aquaculture impacts.
IMBC – Poor national funding in past. Possibility of large monitoring programme – uncertain.
Slovenia – Biogeochemical aspects (small amount of funding)
Israel – No internal funding
Aquaplan – Proposal has been submitted to Research Council (not too hopeful) – copper and antifouling agents and effect on the environment.
Spain – National research on 'natural resources' – are possibilities, but no specific programme for aquaculture.

Denmark – No national funding, but other sources available.

Co-ordination Action (CA) – Predominantly management rather than science. Organisation of conferences/ meeting. Research dissemination. No staff costs. Potential to draw together Frwk V projects.

STREP – Specific Targeted Research Projects

Work Programme 8 – Indicative task 10. Area 1.21 Key area: Developing ecosystem based approach to aquaculture sector.

TOOLS AND INDICATORS – Key words

- Identify key features that ensure 'healthy' ecosystem and features that can degrade or improve ecosystem.
- Protect and management of ecosystem in sustainable fashion (rather than conservation that concentrates on just a few species).
- Use of ecosystem models (large scale approach). Challenge to produce models that are representative of the 'real' world. Aim – prognostic/ practical tool. Reliability of tools.
- Sustainable aquaculture production
- Establishing ecosystem approach to management - make use of environmental/ water quality objectives (North Sea conference 2002).
- Carrying capacity – provision of criteria.
- Impact management – Inputs easily quantified (point source) in regions of little activity (difficult in Gulf of Aqaba). Space management. Closed areas – ICZM.
- Application of expertise gained from aquaculture studies to broader themes (including sewage, agricultural runoff, industry). Aquaculture – increase 4% annually in Europe.
- Integrated production – Regions of dense shellfish farms, problems with lack of food resource.
- Comparison of N budgets/ carrying capacity (used as the 'tool') between hypertrophic and oligotrophic water masses. Access to sites with v. different assimilative capacity.
- **Indicator** (Public indicators) – Posidonia (Med), corals/ water clarity (Eilat), toxic algae/ wild fisheries (Salmonid decline)/ shellfish quality? (Scotland), wild fisheries (Norway), toxic phytoplankton/ mucilage (organic matter produced by bacteria and phytoplankton) (Piran). Control sites – Ria's – where HABs occur naturally. Posidonia (Spain). Algal mats in shallow systems (Algarve). Need to assess changes in the 'health' of the indicator species related to the aquaculture activity in region. Almost all the indicators – chlorophyll related.
- Indicator = EQV -----EQS
- System – Input of pollutant …..EQS
- Input = Aquaculture
- Assimilative capacity…..determines the EQS

- **Thresholds of concern** (EIA). Response – limited by the ease of achievement. Problem with response curve of indicator species to organic input and differences between farm management practices.
- What happens to ecosystems that suddenly receive high input of organic material over short period of time? Does the ecosystem adapt to the increased loading – how, increase population, genetic changes. Are organisms more sensitive in oligotrophic systems?
- Indicators – public can be included in management. Assisting in making the measurements. Have to find link from indicators to measurable environmental impacts. Use of historical data/ remote sensing – problem with remote sensing – low resolution at land/ sea interface.
- Food Safety – use of incorporation of chemicals/ metals in certain key indicator species.
- Biodiversity

Note: h_wp_200201_en.doc (CORDIS website)

Specific Support Objective (Framewk VI) – Should try to submit a proposal for funding to support partner attendance at EAS meeting (2004). ACTION: Need to ask scientific officers if group can submit – resubmit JESMI.

Next EU call:
Work Programme 8/ Task 7: Environment and husbandry effects on environment and fish health. Part of Project orientated research.