SOCRATES THEMATIC NETWORK
AQUACULTURE, FISHERIES AND AQUATIC RESOURCE MANAGEMENT
2008-11

LIFELONG LEARNING PROGRAMME
ERASMUS
Academic Network

Report on the **Possibilities for Integration of Research Results**

Project Acronym:	Aqua-tnet
Project title:	Aquaculture, Fisheries & Aquatic Resource Management TN
Contract number:	2008 – 3209 / 001 – 001
Project number:	142245 – LLP -1 – 2008 – 1- BE – ERASMUS - ENW

Possibilities for Integration of Research Results

. Description

In aquaculture and aquatic research, there are two main types of institutes which harbour and nurture major expertise in research, namely universities and research institutes. Apart from the expertise, they often have an impressive infrastructure. Sometimes, the research performed has different end goals. The task has identified the degree to which collaboration has been organised between these types of institute in different countries and how this kind of collaboration can be further stimulated to the benefit of both parties involved with regard to doctoral researchers.

. Research Institutes

The focus of Aqua-tnet 2 is on the mobility of doctoral researchers within the aquaculture and coastal sciences domains. It is important in considering mobility for early stage researchers, that the broader needs of academia, business and society are given careful consideration. It is at the interfaces between these broad stakeholder groups where interaction between institutions of learning and research become critical vectors of skills development, knowledge exchange and professional mobility. It has been recognised just how important these interactions are, since studies have shown that over 50% of doctorate holders move into careers outside the academic sector (Reference: Collaborative Doctoral Education: University-Industry Partnerships for Enhancing Knowledge-Exchange; EUA Publications, 2009).

Work package 2.11 felt compelled to adopt an encompassing definition of what a 'research institute' might actually be. The following categories were identified:

1. Entities within universities whose sole, or major, purpose is the undertaking of research (rather than teaching). These organisations typically conduct 'pure' and applied research, where the main drivers are the interests of lead academics (*e.g.* IMARES, Wageningen, The Netherlands).
2. Laboratories funded indirectly by the state, through government agencies. Such organisations are charged with delivering 'strategic' science as directed through 'stakeholder boards', which include senior bureaucrats, institute Directors, leading university academics, and – more frequently – industry representatives (*e.g.* CNR, Italy; CSIC, Spain; HCMR, Greece; IFREMER, France; NERC, UK).
3. Laboratories funded directly by Government ministries, who are charged with delivering science required for the definition of policy, and in order to meet regulatory responsibilities.

These are direct through appropriate government department (*e.g.* the Marine Institute, Ireland).

4. Commercial research and development (R&D) centres, which are either businesses in their own right, or are components of larger corporate entities (*e.g.* Viking Fish, Ardtoe, UK; NOFIMA, Tromsø, Norway).
5. Major non-profit organisations may also have, or are sole funders of, research institutes. These may be sub-divided into (1) independent and (2) focused (*e.g.* SINTEF, Trondheim, Norway).

. Mechanisms of Collaboration

With such a diversity of typologies it became clear that there would likely be a wide range of mechanisms through which universities collaborate. As a next step, therefore, our purpose was to consider these within the European context and categorise into the key approaches taken.

Individual Projects

One of the most common types of interaction occurs at the level of the individual project; where a PhD candidate will receive either joint supervision, from an external collaborator; or may spend a proportion of their programme of research based outside their university department: either within a university research institute, or an external agency. The purpose of such interactions may typically be to provide access to specialist facilities or expertise; both from the student and organisational perspectives.

Whilst many of these interactions will be organised on an informal basis, there are examples of a more formalised approach. For example, the Danish had an 'Industrial Research Programme' in the 1970's, and the French created a programme (*Convention Industrielle de formation par la Recherche*) in the early 1980's. Over several decades in the UK, Research Councils have encouraged the CASE (Cooperative Awards in Science and Engineering) scheme, providing enhanced support to individual students whose projects are supported formally by commercial collaborators.

Programme Level

More recently, there has been a growing trend to create 'structured' PhD programmes, where doctoral candidates are expected to spend a significant proportion of their time 'working' at an organisation outside the university. Such doctoral training centres are designed to provide candidates with experience of potential employers; development of wider skills sets; wider networks of contacts; and exposure to varied research cultures. The collaborating partners also gain, through

developing relationships with potential employees; accessing high-level expertise through university networks; and being able to influence the direction of R&D in their own sectors.

National Networks

It is not a new idea for countries to take a nation-wide perspective on research infrastructure; at least in the public sector (*e.g.* universities and government-funded institutes). Over recent years, however, there has been increasing enthusiasm for combining resources and opening access; particularly to large and expensive infrastructure. In the marine sciences, research vessels are the most apparent, but there are many other 'national facilities', such as aquaria, specialised laboratories and culture collections.

What might be changing in some countries is the scale of intra-national collaboration and access. In Scotland, UK, four of the Aqua-tnet partners (three represented on Work Package 2) are members of the Marine Alliance for Science and Technology for Scotland. MASTS is a €100 million per year collaboration which brings together universities, and other marine research organisations across Scotland (including university research institutes, the main Government marine laboratory and a research institute charity), with the Scottish Funding Council. This provides a 'research pool' aimed at: (1) competing at the highest academic level with the best in the world; and (2) meeting Scotland's needs of a knowledge-based marine sector, which boosts competitiveness and drives economic growth. At the heart of MASTS is the Graduate School, whose focus is to promote mobility of candidates across institutions; facilitate shared access to specialised research facilities; and to organise bespoke training for doctoral candidates. The MASTS Graduate School approach recognises PhD candidates as the 'future influencers' in government and industry, and nurtures their talent in that context.

Since the 1990's, marine research and doctoral training organisations in Brittany have joined together in a 'Blue Network' with 20 members. This *Europôle Mer* **network has played a key role within the region to secure shared infrastructure (e.g. a coastal research vessel and specialist library).** Links with industry are strong: particularly in the *Pôle Mer Bretagn*e, a regional economic competitiveness cluster which gained recognition by the French Government in 2005. The main institutions comprising *Europôle Mer* include universities, engineering schools, research institutes and museums. The consortium is also a member of MENTOR (**Marine European Network for Training of Researchers), which aims to provide** high-quality initial research training capacity in marine sciences through 'a central hub of the premier laboratories / institutes / universities in the field of marine sciences'; and also t**he European PhD Program of Integrated Marine Biology, which aims t**o provide early stage researchers with an advanced

integrated training program, provided by a consortium of European universities, and the **European Molecular Biology Laboratory (EMBL).**

As a third example, in the past the Dutch research institutes covering agriculture, fisheries and other life sciences were organised separately under the ministry. Around 10 years ago these institutes, together with the Agricultural University fused into Wageningen University and Research Centre (WUR). The university (Wageningen University) and the research institutions are still operating independently, but they are also joined within WUR. The Aquaculture and Fisheries group of Wageningen University and Wageningen IMARES (Institute for Marine Resources & Ecosystem Studies), the former Institute for Fisheries Research, are also joined within WUR which has resulted in new opportunities for co-operation and the integration of a number of IMARES staff within the Aquaculture and Fisheries group as special professors, enabling them to directly supervise PhD students.

In Norway, SINTEF (The Foundation for Scientific and Industrial Research) operates in partnership with the Norwegian University of Science and Technology (NTNU) in Trondheim, and collaborates extensively with the University of Oslo. SINTEF is the largest independent non-profit research organisation in Scandinavia. Every year, the Foundation supports research and development with around 2,000 Norwegian and overseas companies via its R&D portfolio. This collaboration provides wide-scale access to laboratories and other infrastructure: more than 500 people are employed jointly by NTNU and SINTEF. Consequently, many SINTEF staff contribute to teaching at NTNU, and NTNU staff reciprocate, through contributions to SINTEF research projects.

Access to European Infrastructure

For many years now, the European Commission has promoted mobility of researchers through various Framework Programme Actions opening up research infrastructure to visiting academics, doctoral candidates and larger research teams. Most recently, initiatives such as ASSEMBLE (Association of European Marine Biological Laboratories), AQUAEXCEL (Aquaculture Infrastructures for Excellence in European Fish Research) and EMBRC (European Marine Biological Research Centre) have been active in promoting access to infrastructure and collaboration across areas of science directly relevant to the Aqua-tnet domain.

ASSEMBLE provides access to a comprehensive set of coastal marine ecosystems, and to specialist facilities such as experimental laboratories, technological platforms and research vessels. Through its nine partner organisations, the Association offers access to a wide range of European marine environments, as well as at the Red Sea and the Chilean margin of the Pacific Ocean. Dedicated technical support and academic staff provide specific training to external researchers using the

infrastructure. AQUAEXCEL is a collaboration of 17 participating organisations, from 10 nation-participants in the Aqua-TNet programme. Importantly, the orientation of the partner organisations includes a number of university departments and specialist institutes; government laboratories; and commercial research organisations. The collective infrastructure network provides researchers from across Europe with a platform and tools to address some of the more complex challenges of the aquaculture industry: production systems, varying aquatic environments and fish species. EMBRC has been approved by the European Strategic Forum for Research Infrastructures as a hub for all major European marine stations, to provide access to model organisms and their ecosystems. The Centre will offer scientists from universities and research institutes access to international expertise and cutting-edge techniques to analyse the composition, function and diversity of marine organisms, adding value to research in life, environmental and biomedical sciences. The EMBRC consortium federates 15 scientific partners, from seven of the Aqua-tnet partner nations.

. Recommendations for the Doctoral Researcher Experience

It is becoming widely accepted across Europe that the PhD should be considered as a 'training process' which should equip doctoral candidates with a range of knowledge and experience beyond academia. None more so than in the field of aquaculture, universities are developing their duty to prepare doctoral graduates who possess experience and skills which equip them for (1) working as academics across the boundary with industry; or (2) as employees of industry, working in an applied R&D environment.

In developing our doctoral candidates, it is clear from the narrative above, that there are a variety of mechanisms through which universities are able to cooperate with the various categories of research institutes and with industry specifically. In considering the opportunities available, Aqua-tnet Work Package 2 proposes the following mechanisms as a focus for stimulating collaboration which will be of direct benefit to doctoral researchers, universities and collaborating organisations:

Individual Projects

Although there is some variety in the PhD 'training' programme across Europe, the most typical model is around the direct relationship between a doctoral candidate and a lead PhD supervisor [Reference: Aqua-tnet 1 Final Report, WP2, 2009]. Importantly, in some countries, there is a supervisory team. This provides an easily-adopted model to include academics, applied researchers and/or commercial advisors. Aqua-tnet participants should be encouraged to systematically include an additional supervisor or advisor on supervisory teams, thus promoting greater knowledge-exchange to the benefit of student, collaborator(s) and the university.

Programme Level

When Aqua-tnet participants decide to lead, or are invited to participate in, proposals for 'Doctoral Training Programmes', they should be mindful of the added benefits of including non-university partners. Attempts should be made to include 'compulsory' periods working outside of the university department: spending time in a research institute

National / International Networks

It is accepted that the creation of national-scale disciplinary networks will be a matter of policy at a level beyond the university: typically this is driven through government agencies. However, where realistic opportunities do exist - such as the 'Research Pooling' programme, in Scotland; and the Erasmus-Mundus European PhD Programme, across Europe - Aqua-tnet participants are encouraged to (i) become actively involved; and (ii) to lobby for non-university partners to be formally bound into the structures. [The same approach is supported in relation to Marie Curie Networks for Early Stage Research Training Fellowships.]

European Infrastructure

(i) The Aqua-tnet PhD portal should include a specific area which promotes all active European Infrastructure Programmes with direct relevance to the Aqua-tnet domain. [At any one time these are likely to be few, so will not require major investment of webmaster time; and may simply involve a link to the outcomes of the FP7 MERIL project 's updated database of 'European Research Infrastructures'.]

(ii) When Aqua-tnet participants decide to lead, or are invited to participate in, proposals for new Research Infrastructure Programmes, they should be mindful of the added benefits of including non-university partners.