AQUA-TNET3

Promoting innovation and a European dimension through Lifelong learning in the field of Aquaculture, Fisheries and Aquatic Resource Management – Thematic Network

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RE Restricted to other programme participants (including the Commission Services)	
CO Confidential, only for members of the consortium (including the Commission Services)	

Indicate any document related to this deliverable (report, website, ppt etc and give file name)* WP_5.B.1.2 EU Charter on LLL briefing for AquaTNet

** Please attach deliverable documents and any additional material if needed.*

SUMMARY

Objectives:
WP 5 sub-group B updating information on the EUA Charter of lifelong Learning to AQUATNET members

Rationale:
Searching Internet for up-tto-date info on progress concerning the EUA Charter of lifelong Learning, contacting Coordinator of ALLUME project (Luc Francois, vice-rector, Gent university), summarising findings for group

Results:
Briefing Document which has been circulated internally, and communicated to whole network in Annual Event 2. Will be uploaded to website

Teams involved:
Stirling University
AMC Ltd

Geographical areas covered:
N/A

AquaTNet 3: Work-package 5: Sub-group B: Deliverable 2.1

Briefing report: The EUA Charter for lifelong learning

1. Introduction

European Universities Charter for Lifelong Learning (LLL)

The EUA *Trends 2010* report (http://www.eua.be/eua-work-and-policy-area/building-the-european-higher-education-area/trends-in-european-higher-education/trends-vi.aspx) highlights the lack of progress in developing LLL strategies between 2003 and 2009 while advances were taking place in relation to other higher education objectives and reforms, a situation shared by many of the AQUATNET universities.

However, on October 24, 2008, The European Universities Association (EUA) launched its Charter for Lifelong Learning, in response to a request from (then) French Prime Minister François Fillon to prepare a Charter on this key topic for Europe's universities and for society in the future.

What follows is a highly abbreviated version of the Charter (complete version downloadable from here: http://www.eua.be/eua-work-and-policy-area/eua-policy-position-and-declarations.aspx under the 2008 heading).

European Universities commit to:

1. Embedding concepts of widening access & LLL in their strategies
2. Providing education to a diversified student population
3. Adapting study programmes to enhance widening participation
4. Providing appropriate guidance & counselling service
5. Recognising prior learning
6. Embracing LLL in quality culture
7. Strengthening the research/teaching links in LLL perspective
8. Consolidating Bologna reforms designed to promote flexible learning environments
9. Developing partnerships at all levels to provide relevant programmes
10. Acting as role models of LLL institutions

Universities call on governments to commit to:

1. Recognising the university contribution to LLL as a major benefit to individuals & society
2. Promoting social equity & an inclusive learning society
3. Including LLL objectives in their national QA systems
4. Supporting the development of appropriate guidance/counselling
5. Recognising prior learning
6. Removing legal obstacles that prevent potential learners from responding to LLL opportunities
7. Ensuring the necessary autonomy & incentives
8. Encouraging partnerships, especially at regional level
9. Informing and encouraging citizens to take advantage of LLL opportunities offered by universities
10. Similarly acting as role models in relation to their own employees.

It is obvious that signing up to the Charter would have serious implications for universities, and that accurate information concerning any developments and/or progress is needed by AQUATNET university partners. The AQUATNET Thematic Network dissemination outlets and events are well suited for this, and this is the purpose of the present report.

There does not seem to have been very much progress since 2008, which could certainly be a consequence of the severe financial climate throughout Europe, in which European universities have had to make many severe cutbacks. It is not surprising therefore that universities are reluctant to commit to those actions of the Charter such as "*adapting study programmes to enhance widening participation*", catering for "*a diversified student population*" and "*providing appropriate guidance & counselling service*". Especially when governments do not appear eager to engage in their commitments, such as "*recognising the university contribution to LLL as a major benefit to individuals and society*" and "*promoting social equity & an inclusive learning society*".

Nevertheless some progress has been made, which has been duly reported in two valuable EUA projects (**SIRUS** http://www.eua.be/eua-work-and-policy-area/building-the-european-higher-education-area/projects/shaping-inclusive-and-responsive-university-strate.aspx and **ALLUME** http://allume.eucen.eu/) whose results are paraphrased below for the benefit of AQUATNET members. It should be noted that 29 universities participated in **SIRUS** and 10 in **ALLUME** with 6 additional 'testing' partners. AQUATNET's role is to further progress the outputs from these projects by circulating and articulating their findings.

2. The SIRUS project

In 2009, the EUA, in a consortium with the European Association of Distance Teaching Universities (EADTU), the European Access Network (EAN), and the European University Continuing Education Network (EUCEN) launched project SIRUS to support European universities in implementing the Lifelong Learning Charter. Engaging in Lifelong Learning: Shaping Inclusive and Responsive University Strategies (**SIRUS**) was a two-year EC-supported project involving 29 universities from 18 different European countries, led by the European University Association (EUA).

Based on existing research, the underlying assumption in **SIRUS** was that many universities already contribute substantially to lifelong learning (LLL), but that these approaches are

a) often not guided by institutional strategies

and

b) are constrained by national legal frameworks and financial provisions.

The aim of **SIRUS** was to look at the positioning of LLL in different types of higher education institutions in Europe and to demonstrate different ways of incorporating LLL activities into institutional portfolios, through the further development of institutional strategies for lifelong learning. Thus **SIRUS** offered an opportunity for a diverse group of universities to develop and enhance their strategic LLL approaches through interactive discussions with colleagues from across Europe

Specifically, the goals of **SIRUS** were:

- to support universities in developing, embedding and enhancing lifelong learning strategies

- to test the implementation of the ten commitments adopted in the European Universities' Charter on Lifelong Learning
- to ensure wide dissemination of existing best practices in the field to universities, governments and stakeholders
- to contribute to the further development of policy recommendations.

Over the last decade, lifelong learning (LLL) has become increasingly important for universities, in particular as a result of the economic downturn and demographic changes which have increased pressure on them to develop coherent strategies to widen access and participation in higher education. Over the course of the **SIRUS** project, participating universities shared their experiences, with the aim of documenting and inspiring other universities to address these challenges. The project results indicate that, while national legal and financial frameworks play an important role for universities, the single most important push factor for developing successful LLL, has been the active engagement of university leadership in creating inclusive and responsive university strategies.

The report proposes that most universities go through a three-step sequence in developing an institutional LLL strategy involving: an adaptation stage; an organisation stage (where strategies are put in place); and finally a cultural stage (where universities adopt a new way of thinking, a LLL culture and a shared vision across the institution). It also assesses the framework conditions that are crucial for supporting the successful development of lifelong learning. According to the participating universities, the two most important conditions were funding and legislation.

Only 12 of the 18 countries represented by universities in the project believed such 'supporting legislation' was in place. Furthermore, only four countries outlined that specific funding for the development of lifelong learning activities was available. Many of the universities also pointed out that their respective governments had been slow to respond to the commitments in the EUA Lifelong Learning Charter. Regardless of the framework conditions in place, the report argues that there are four common elements when universities develop and implement strategies, which involve diversifying student populations; and diversifying services to learners, educational provision and external partnerships.

Universities agreed that for successful implementation, both support from the university leadership and the proactive engagement of staff was crucial. Partnerships and cooperation with other universities and also with non-university partners, including the private sector, were identified as another strategic priority for the success of LLL.A project implemented by:

The report also looks to address the different challenges and obstacles which arise when universities seek to create this engagement both within their own institution and externally.

SIRUS ended August 2011 and the final project report is available here: http://www.eua.be/pubs/Engaging_in_Lifelong_Learning.pdf

The **SIRUS** website is here: http://www.eua.be/eua-work-and-policy-area/building-the-european-higher-education-area/projects/shaping-inclusive-and-responsive-university-strate.aspx

3. The EU project ALLUME

Another important project, **ALLUME**, aimed to combine research and assessment activities in the context of organisational development, with awareness-raising initiatives at different policy levels. This approach enabled **ALLUME** to propose pathways, make policy recommendations and design tools, all of which were presented to decision-makers, deciders and LLL-practitioners in universities and promoted through key European networks in Higher Education.

3.1 Allume main objective

ALLUME's main objective was to explore ways of increasing university participation in lifelong learning and to produce "A Lifelong Learning University Model for Europe". This model was intended to assist universities by providing guidelines based on the European Universities' Charter on Lifelong Learning (2008). However, during the project's lifespan it became clear that the idea of a unique model or a one-size-fits-all approach was not only out-dated but seriously inadequate given the diversity of universities, environments and the heterogeneity of LLL strategies and processes. This is an important conclusion, with implications which the AQUATNET members need to consider.

ALLUME still faced the challenge of making the Charter and of making Lifelong Learning Universities (LLLUs) a reality, but because of the above finding, ALLUME adapted its aims somewhat, and instead tried to find ways for universities to develop flexible "Pathways for Lifelong Learning Universities" as one method of tackling the diversity in LLL strategies. ALLUME's objective then was to provide decision-makers, such as rectors, vice-rectors and senior managers involved in LLL, and to LLL-practitioners a set of reflexive and inspiring tools and recommendations that could help their teams to define and implement concrete actions to make the ten commitments of the Charter a reality. ALLUME then contributed to the implementation process by describing best practices in effect in universities which had already built and integrated successful LLL strategies.

3.2 The ALLUME methodology

The project's methodology can be divided into the following areas:

1. Production of consortium case studies followed a three-step methodology:

    Step 1: Institutional analysis of University Lifelong Learning (ULLL) strategies in the 10 partner universities and first case study report

    Step 2: Visits to the case study institutions and visit reports

Step 3: The final case study reports on the basis of the visitors' recommendations

2. Analysis of the case study results and design of draft supporting tools
3. Testing visits in the form of on-site visits in six universities in European member states not yet considering LLL as a priority.

3.3 PROBLEMS encountered

While working on the case studies and carrying out the testing visits, it became clear that there was considerable diversity in the strategies being used in the attempts to create or implement a LLL University. This led to a questioning of the usability of the concept of a single set of guidelines, which would not be adequate for today's diversity and flexibility of processes. Thus, it was concluded that an LLLU strategy process had to take into account and respect a wide range of identified strategic frameworks.

These are the findings of the **ALLUME** project which are relevant to the AQUATNET members. In order to implement the EUA Charter of Lifelong Learning, there has to be:

- Constant interaction with LLL stakeholders and decision-makers at European level (consultation seminars and a testing process carried out by face-to-face visits)
- This can lead to a high impact on the partner institutions who guided and hosted the visits as independent experts
- Mutual exchange of different LLL approaches and concepts which can lead to highly valued benefits for both hosts and visitors
- Adaption of the final tools to end-users' needs
- Analysis of identified needs

  Because of the supportive character of the developed tools, LLL was included as one of the fundamental principles of action in the draft of the West University of Timisoara's Charter. University Lifelong Learning (ULLL) was embedded in the Zentrum für Lehre und Weiterbildung (ZWL) in the University of Stuttgart and concrete ULLL strategies were designed in the University of Stuttgart.

4. Conclusions

ALLUME produced the following extremely useful methodology (in addition to two publications):

- 10 case studies presenting progress in 10 European universities in the implementation of LLL strategies in line with the 10 commitments of the Charter
- The 10 case studies presented in an analytical grid
- A highly effective proven methodology including structured peer visits
- Tools and Results (on-line) including the three flexible tools for self-analysis and benchmarking, the two transversal analyses in full length and background papers addressed to LLL-practitioners

The outputs of the ALLUME project can be found here:
http://allume.eucen.eu/documents
The 'tools and results, report is particularly useful in terms of the templates provided that allow institutions to reflect on their progress towards LLL goals in a structured format and with visual representations of current status in the form of spider diagrams for which an Excel tool is also provided.

4. Final comments, conclusions and recommendations

Information regarding European policies and programmes concerning Lifelong Learning must be proactively and widely disseminated. This will allow all stakeholders to adapt the many models of good practice to their own context. The **ALLUME** and **SIRIUS** projects, and their use of the EUA Charter for Lifelong Learning as a model framework of reference, point the way forward.

The ideas, ideals and aspirations embodied in the EUA Charter for Lifelong Learning must be further explained in a better way to all players involved and AquaTNET provides a relevant target group for this.

Tuning
Educational Structures
in Europe

Draft summary of Tuning subject area findings

[AQUACULTURE]

Introduction to the subject area

A general description of the subject area and its key characteristics: is it understood in the same way in all European countries or are there relevant differences; are there any other particular aspects that should be mentioned in an overview.

For centuries, Europe's citizens have benefited from the abundance of the oceans, with fish and shellfish an integral component of European fare, with different culinary traditions forming an important part of regional and national heritage. For centuries, carps, then trout, were reared in ponds, using primitive feeds. However, in the 1970s salmon farms appeared in Northern Europe, followed by seabass and seabream farms in the Mediterranean. Key to these initiatives was the understanding of the life-cycle and mastering the rearing of young livestock in specialized hatcheries. The sector gained access to new technologies in the form of new equipment, novel tank and cage designs, high performance feeds, creating a need for a range of innovative services (veterinary, pharmaceutical, management software). Since 1966 (total European seafood production was 378000 tons) the European aquaculture industry has experienced phenomenal growth and now provides a valid and sustainable alternative to declining capture fisheries (more than 2 million tones of seafood in 2004, with 1 in every 3 fish processed coming from aquaculture). This surge has been achieved through European technological advances, made by high-performance institutional, academic and industrial research efforts. Production of new species, utilization of new nutritional regimes, advanced hatchery techniques, require a highly skilled workforce able to work in innovative farming facilities. In the 1990s, environmental issues became an integral part of aquaculture operations, following the raft of European, national and regional legislation concerning aquaculture, and adding another element to the already rich multi-disciplinary aquaculture curriculum.

Nevertheless, although the EU "Blue Book"(COM(2007)575 Final) on a future Maritime Policy for Europe highlights aquaculture as one of the sectors with the most growth potential for the maritime regions of Europe, the aquaculture sector remains a patchwork, characterized by the production of different species, different production zones and culture techniques. It is this very diversity, in marine or freshwater aquaculture, that imposes a need for an adaptable response at all levels of education and training. An additional factor impacting on course design and provision, is that sectoral knowledge and technology have developed rapidly over the last 30 years, changing what was a small-scale skilled family

activity to that of a technically-qualified profession. The result is a radical change in European aquaculture, in its current structure of multinational, SME and family operations. This change has been reflected in education and training provision. Though highly skilled in many respects, the European aquaculture sector needs continuing support in education and training at all levels, to maintain its globally important position that could not have been achieved without effective R & D from research institutes, university departments and industrial research facilities, which has been used in the education and training curriculum to further support the growth and development of the sector.

Degree profile(s)

A wide range of practice is currently seen in aquaculture/marine science programmes with regard to the BOLOGNA model of three cycles. While some countries adopted a three cycle system model some years ago, e.g., Ireland, UK, Spain, Norway, others are at different stages of development, though candidate countries and new EU countries have been quick to adopt the reforms.

As diversity is a characteristic of education and training in aquaculture, for the reasons set out below, it is important that aquaculture programmes continue to reflect their biogeographic and scientific needs. Each European country cultivates a certain species-mix, utilising a variety of farming methodologies and practices which take into account available natural resources and local topography. Each country also has differing educational systems, though most have either implemented, or are in the process of implementing, the Bologna three cycle system. The interaction between industry requirements and educational systems has led to a diversity of third level courses being provided across Europe and, as might be expected, new courses have emerged in response to specific national requirements within existing frameworks.

Marine/fishery science courses did not exist as a formal part of tertiary education until relatively recently, except in countries with well-developed fishing industries and even there, were offered at the post-graduate level only. However, the reduction in wild fisheries resources together with the rapid development of the European aquaculture industry (almost all member states now have aquaculture industries and have had to develop new courses, departments and facilities to meet their needs) has focused attention on the provision of marine science courses, especially in the area that may be termed intensive fishery management, i.e., aquaculture'. One result is that a well-constructed fishery science syllabus covering a broad scientific base is seen as a necessary foundation for the more detailed studies necessary for the relevant specializations. This syllabus may cover a wide range, including biology, bio-chemistry, chemistry, mathematics, ecology, economics and statistics, fisheries biology, fishery environmental studies, as well as aquaculture studies. Some courses also include bioengineering, biotechnology, HACCP, food quality, business management and marketing.

This type of course is provided only in the tertiary sector, at both college and university level, and leads to recognised diploma or first degree awards. The specialisations come as part of M.Sc. and Ph.D degrees.

1st cycle course title Length of course 3 years	Modules	Credits
Environmental & Aquatic Technology 3 years	Year 1 Physics; Statistics; General Chemistry; Applied Mathematics I and II; Data Processing; Biology Part I (Ecology, Evolution and Environmental Technology); Introduction to Business Economics	60
	Year 2 Biology Part II (Cell Biology, Microbiology and Fish Quality); Introduction to Aquaculture; Fish Biology; Thermodynamics;Discrete Mathematics and Linear Algebra; Leadership, Marketing and Organisation.	60
	Year 3 Quality Control; Introduction to Cage Engineering; Water Quality and Aquaculture Technology; Water Supply and Sanitary Engineering; Thesis	60
2nd Cycle course Title: Culture of Marine Organisms Length of course 1 year	1st semester: fish nutrition, endocrinology, genetics and bio-technology, pathology, interaction of aquaculture and the environment, and production of marine invertebrates. 2nd semester includes seminars, training, educational visits to fish farms, and a thesis.	60
2nd Cycle course Title: M.Sc in aquaculture Length of course 2 years	Year 1: General Aspects of Aquaculture, Biology of Aquatic Organisms, Aquatic Ecology, Algae Culture, Larviculture and Larval Food Production, Fish Culture Techniques, Mollusc and Crustacean Culture, Aquaculture and the Environment, Microbial Ecology and Environmental Sanitation, Technology of Fishery Products, Farm Management Training	60
	Year 2 Diseases in Aquaculture, Aquaculture Genetics, Management in the Aquaculture Industry, Elective courses	60
3rd Cycle course Title: Ph.D, aquaculture specialisation Length 3 years	Original research in specialised topic presented as doctoral thesis. Typical subjects: *Artemia* diversity in Central and East Asia: Optimisation of Mud crab for larviculture in Vietnam See www.aquatnet.com Ph.D portal for further details.	

Typical occupations of the graduates in the subject area (map of professions)

The multi-disciplinary studies encompassed in typical aquaculture courses enables students to develop a wide range of knowledge, skills and competences which can be used in many different occupations. Scientific and research skills include: acquisition of scientific methodology, formulation/testing of hypotheses, designing research protocols, collecting/analysing data in different fields (research skills).

Technical and aquaculture knowledge and competences include characterizing, analyzing, evaluating different forms and systems of animal production, assessing strategic and operational issues in the field of aquaculture sciences, knowledge of biology of farmed animals, recirculation technology, increased mechanization of aquaculture operations.
Management skills include management of aquaculture operations including aquatic production environment and all animal health matters.

Business skills covered in aquaculture courses include presentation skills, communication skills, planning and management skills, developing marketing strategy, provision of goods and services to customers, financial management.

Environmental aspects covered, such as ecology, CZM studies, environmental management, waste management can also lead to environment-based occupations.

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- **1st cycle**

Occupational roles/functions identified after completion of the first cycle include laboratory workers, technicians, assistants, section/team managers

- **2nd cycle**

Production supervisor, researchers, senior analysts, fish farm managers, decision-makers, business managers, environmental and fish health officials, PR and spokespersons, quality control inspectors

- **3rd cycle**

Senior scientists, technical project leaders, veterinarians, fish diseases experts

Role of subject area in other degree programmes

A well-constructed aquaculture science syllabus covering a broad scientific base is seen as a necessary foundation; therefore biology, bio-chemistry, chemistry, physics, mathematics, genetics, ecology, economics and statistics, are core subject areas, though they often form part of other degree programmes.

There are also elective courses in molecular biology, zootechnology, fisheries biology, fishery environmental studies, bio-engineering and biotechnology, food technology, pathology, larviculture, aquariology of ornamental fish, hydrodynamics, quality management, which may be found in other degree programmes.

Which programmes

Typical degree in Animal Science: 5-year course described as first cycle degree, the two final years with specialised aquaculture courses and 4-month thesis recognized as M.Sc. Common course requirements: Physics, Chemistry, Biology, Mathematics and Statistics, Botany); Animal Science specialisations-Physiology, Anatomy, Genetics and Breeding, Nutrition, Pathology.The aquaculture component comes in the 7th semester, entitled Applied Hydrology, with modules Applied Hydrobiology, Limnology, Oceanography, Principles of Aquaculture, Production Systems, Engineering Principles, Cage selection and operation, Farm management (plant: phytoplankton to seaweeds; and animal: zooplankton to farmed fish, shellfish and crustacean species) and Fish Diseases.

Learning outcomes & competences - level cycle descriptors

Which are the main learning outcomes expressed in the relevant subject specific and generic competences (from the Tuning list of generic competences) for the different cycles, taking into account the level of the competence (what the graduate knows and is able to do) that has to be achieved.

A Master List of the competences used in primary production in aquaculture has been compiled over a five-year period, based on existing national curricula with detailed industry input. This list of competences is being translated into the learning outcomes appropriate to the different level descriptors. The Master List recognises variations in work practices and variations according to species, types of farms and farming methods across Europe.

Examples are shown in the subject-specific and generic competences Level descriptors below.

1st Cycle learning outcomes and competences – Level descriptors

Subject specific Competences	**Generic competences**
To have a broad knowledge base(biology, chemistry, physics)	Ability to develop a systematic understanding of knowledge
To have knowledge of the biology of some farmed animals: finfish(salmon, trout, cod, halibut, eels, turbot, seabass, seabream), shellfish (mussels, oysters, scallops), crustaceans (shrimps, prawns, lobsters)	Ability to develop basic research skills and to collect and select, analyse and critically judge information/data
To know how to apply this knowledge in some areas of production (hatchery operations, husbandry, harvesting) i.e., shellfish (spat collection, monitoring of larvae status)	Ability to develop knowledge and understanding of theories, concepts and methods pertaining to a specific relevant field of study

To be capable of -characterising -analysing -evaluating different forms and systems of animal production(spat collection, shellfish spawning, plankton production, fish spawning, hatchery operations, husbandry, harvesting,	Ability to act under supervision and to act effectively under guidance, with peers and qualified professionals
To acquire a scientific attitude, oriented towards: -formulation of hypotheses -testing of hypotheses -collection of data -analysis of data in different fields	Ability to work with and make a positive contribution in an inter-disciplinary team
Good laboratory practices, i.e., microscopy, water monitoring, basic microbiology	Ability to work autonomously, to manage workloads, to meet deadlines
Knowledge and use of statistics, use of appropriate software	Ability to adapt to new situations, and solve problems
Ability to work autonomously to carry out literature searches	Oral and written communication, appropriate computer and software knowledge and skills for 1st cycle needs
To indicate and prevent side effects of animal production on man & environment (maintenance of fish health, environmental issues), i.e., measurement of water parameters-temperature, salinity, pH, measurement of water quality, -ammonia, nitrite, CO2	Develop awareness of ethical, health and safety practices
To search for solutions through a multi-disciplinary approach	Presentation skills

2nd Cycle learning outcomes and competences – Level descriptors

Subject specific Competences	**Generic competences**
To have knowledge of the biology/life requirements of some farmed animals: finfish(salmon, trout, cod, halibut, eels, turbot, seabass, seabream), shellfish (mussels, oysters, scallops),	Ability to develop a systematic understanding of knowledge
To know how to apply this knowledge in some areas of animal production (hatchery operations, husbandry, harvesting) i.e., shellfish spawning, broodstock management, environmental control of spawning	Ability to develop advanced research skills and to collect and select, analyse, synthesize, summarize and critically judge information/data
To be capable of -characterising -analysing -evaluating different forms and systems of animal production(spat collection, shellfish spawning, plankton production, fish spawning, hatchery operations, husbandry, harvesting,	Ability to develop knowledge and understanding of theories, concepts and methods pertaining to a specific relevant field of study
To search for solutions through a multi-disciplinary approach	Ability to work with and make a positive contribution in an inter-disciplinary team. Negotiation skills.
To acquire a scientific attitude, oriented towards: -formulation of hypotheses -testing of hypotheses -collection of data	Ability to work autonomously, to manage workloads, to meet deadlines, to take responsibility

-analysis of data in different fields	
To indicate and prevent side effects of animal production on man & environment (surveillance routines, identification of common diseases, asses trophic resources of natural site, manage and maintain aquatic environment)	Ability to adapt to new situations, foresee, predict and solve problems in unfamiliar situations
Knowledge and use of statistics, use of complex software	Effective oral and written communication, appropriate computer and software knowledge and skills for 2nd cycle needs
Ability to work autonomously to complete research thesis/dissertation	Advanced presentation skills
Specialisations from: • Tech & engineering of Culture Systems • Health and Welfare • Production and Environment • Nutrition • Genetics • Reproductive Physiology • Business Management	Develop awareness of ethical, health and safety practices and to develop good and successful working practices
Optional courses from: • Economics • Informatics • Zootechnology • Water quality • Food Technology • Pathology • Larviculture • Aquariology of ornamental fish • Restocking • Broodstock Mgt. • Polyculture • Molecular Biology • Hydrodynamics Quality Management	Ability to make valid self-assessment of progress, take responsibility for continuing academic development

3rd Cycle learning outcomes and competences – Level descriptors

Subject specific Competences	**Generic competences**
Ability to summarise the existing literature on a specific topic relevant to the research field/domain	Ability to develop a systematic understanding of substantial body of knowledge at the forefront of specialist area
Ability to write a project proposal on a topic relevant to the research topic/field/domain	Have insight into the development of working processes (if appropriate) and critical analysis during the research process
Ability to design experiments capable of producing results that are considered as novel/innovative in the research topic/field/domain	Demonstrate a significant range of the principal skills, techniques, tools of practices associated with the field of learning
Ability to process results statistically, using appropriate and advanced software	Develop new skills, techniques, practices suitable for new area of research
Ability to write papers for high-level academic journals (relevant to the research topic/field/domain)	Creation and interpretation of new knowledge, either through original research, or advanced scholarship, of a quality to satisfy review by peers
Ability to write and present papers at high-level conferences (relevant to the research topic/field/domain)	Effective oral and written communication skills for 3rd cycle needs, i.e., documentation, reporting, reflection on research findings, ability

	to write up thesis
	Advanced presentation skills
	Develop awareness of ethical, health and safety practices
	Ability to make valid self-assessment of progress, take personal responsibility for continuing academic development
	Negotiation skills, ability to interact with other members of group

Consultation process with stakeholders

The AQUATNET Thematic network has worked since 1998 on the aquaculture curriculum throughout Europe, having produced the "White Paper on Education and Training in the new Millennium'(2001) which foresaw many of the reforms subsequently introduced as part of the Bologna Process. AQUATT, network coordinator, produced a Master List of Competencies in aquaculture (LDV WAVE project). To ensure that the Master List is appropriate and easily understood by workers at all levels in the industry, 151 individuals working on aquaculture farms (from small, medium and large enterprises) were interviewed in 10 European countries. The Master List was then adjusted in the light of this detailed feedback. Consultation with stakeholders was long, detailed, and involved both academia and industry.

Since then, the Master List has been presented and approved at important Producer Association meetings throughout Europe by the Federation of European Aquaculture Producers (FEAP) which represents 28 countries. The AQUATNET Thematic Network has also considered the Master List, both as a network of 109 institutions/universities/stakeholders, and at its core group meetings in Barcelona(March 2007), Crete (2007). The present draft was approved by the network at its Annual Event meeting in Krakow (September 2008).

Workload and ECTS
Workload of the typical degree programmes expressed in ECTS-credits:
Trends and differences within the European higher education area in this subject area.

Very few countries (Norway, Greece, Belgium) offer a first degree in aquaculture. In many countries, there are no first degrees in the marine sciences, and specialised aquaculture components are offered only after the first degree. However, there may be more than one type of M.Sc. on offer, with an equivalent disparity in the length and the content of each course - though the final degree award is the same. In other countries there are specialised aquaculture degrees lasting five or more years, with the final award being equivalent to a Master's degree. Thus even the duration of the M.Sc. course varies from a standard 12-month course, to a variable 18 to 24-month course, to a standard 24-month course, and also includes an 18-24 month topping up of a first degree. This remains the situation, in spite of the Bologna reforms. The structure and the organisation of the courses also differ considerably. Some are totally prescribed, with lectures, tutorials, practicals, field work and work experience, with little variation, flexibility and modularisation, whereas others have a core of compulsory modules with a kaleidoscope of options or electives. There are still differences between the 'professional' Master (60-120 ECTS) and the academic Master degree (270-300 ECTS) with an obligatory thesis or dissertation.

- First cycle (180-240)
- Second cycle (60-90-120)
- Third cycle (120-180-240)

Learning, teaching & assessment

Examples of best practice in learning, teaching and assessment to achieve the relevant competences.

Learning
In response to the Bologna agenda and the aim to establish a European Higher Education Area, many European courses in aquaculture have developed an organisational and curricular structure enabling them to keep pace with the nature and the rate of change. Student-centred learning, autonomous learning, collaborative learning, active learning, are well-tried methodologies particularly appropriate to its

multi-disciplinary field. The AQUATNET partnership makes use of pedagogical and didactical approaches offered through new technologies (especially relating to distance, blended and lifelong learning models) and has developed virtual learning environments and e-learning courses, which are particularly suitable for joint degrees and life-long learning (University of Stirling).
Some short courses place emphasis on role of simulation (problem-based learning) and the generic and specific tools to support it, as it is seen as a key technique for responding to industry needs and the Tuning initiative to develop needed competences and means for their assessment.
Reliance on external experts to cover specific aspects, Wageningen University, Gent University.This enables aquaculture courses to offer high quality education on a wide spectrum of aspects but at the same time remain flexible and up-to-date by inviting the right expert as knowledge evolves.
Practical exercises are particularly important in aquaculture, where failure to spot specific symptoms can result in severe financial loss (Agricultural University of Athens). Case studies on mollusc culture, Business accounts, and Fish Culture are part of the Gent University structure).

Teaching
University of Stirling with its courses: B.Sc. aquaculture, B.Sc. Freshwater Science, B.Sc. Marine Biology, M.Sc. Sustainable Development, M.Sc. in Aquaculture, M.Sc. Aquatic Veterinary Studies/Aquatic Pathology, and many short courses to meet specific demands from the industry.

Assessment
In aquaculture, there is a genuine need to balance theoretical knowledge with the acquisitions of knowledge, skills and competencies and this need is by and large reflected in the way each individual undergraduate course is assessed.
It is clear from surveys carried out across the sector that many types of assessment instruments are used in the grading of aquaculture courses across Europe. In no department is the formal written examination the sole criterion of performance. There is nearly always some continuous assessment, whether of laboratory work, research experiments, report/essay writing, which is a significant part of the assessment methods and is usually built into the weighting or final scaling procedures. In addition, there is also the writing up of projects, case studies, lab reports, literature reviews, etc. There are many examples European-wide of this eclectic approach to assessment and the awarding of credits.

Quality enhancement
Subject area related observations on the use of Tuning tools in programme design, delivery, monitoring and improvement.

One major benefit of the competency approach advocated in the TUNING initiative is its transparency; the creation of a competency list, based on industrial knowhow as well as academic syllabi, enables the whole range of competencies, applicable to job roles or occupations to be covered, and defines them in statements of knowledge and skills required to confirm competence. The TUNING approach, developed by AQUATT in the LEONARDO WAVE project, has been disseminated to the entire AQUATNET network (109 organisations), and the WAVE Master List of Competencies has been accepted as a feasible entry point to the task of describing aquaculture academic curricula in terms of Learning Outcomes. In addition, the coordinator, University of Gent, has been involved in the recommended internal and external evaluation procedures for its courses in marine science and aquaculture, and has carried out all the administrative procedures which are an integral part of the process. It is thus able to assume an advisory and monitoring role which can only result in the improvement of European courses in aquaculture.