



LIFELONG LEARNING PROGRAMME
European Qualifications Framework (EQF) Projects
Transversal Programme

Key Activity 1: Policy cooperation and Innovation

Deliverable 4A
20 case studies with completed templates

Project Acronym: VALLA
Project title: Validation of All Lifelong Learning in Aquaculture
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1. INTRODUCTION

Aims

The aim of VALLA Work Package 4 – From competences to Learning Outcomes - was to test the efficiency of the VALLA online tool, which has been developed as a method of helping users/trainers to present courses/units in a format suitable for submission to an awarding body. This was to be done by choosing exemplars from a range of courses representative of different types of courses which at present lack formal validation/accreditation in both VET and HE education. Such courses/training experiences are often formative educational experiences which are rightly regarded as valuable, from several points of view. These exemplars/case studies are at the heart of the VALLA project and we see their influence as guidelines for the sector as constituting its most important justification.

The case studies were to be based on two important areas:

- i) *unaccredited sectoral skill acquisition courses* (professional short training courses, mobility exchanges, 2-day workshops for industry, candidates undergoing on-the-job-training).
- ii) *non-standard aspects of higher education courses* (course work units, field trips, mobility exchanges).

Background

Course selection procedure

Completion of the case studies task was entirely dependent on following a lock-step procedure that was procedurally complex as well as functionally difficult. Potential courses and candidates from all of the above listed types of courses were indeed identified quite early on in the life of the project. All courses and many work placement candidates follow a set timetable according to the institution and country concerned; once the fixed dates of the various timetables have been missed, another year must pass before an attempt can be made to run the course or programme. In a two-year project, that can pose severe logistical problems which are quite frankly insurmountable. In addition, in the present financial climate, many courses have been subject to a degree of volatility (often called *flexibility*) inherent in vocational, academic, formal and informal learning programmes: in other words, in response to fluctuations in demand, types of courses on offer will also vary from one year to the next.

Design requirements of the VALLA online generic tool

The lock-step procedure of the case study deliverable was also influenced by the rate of progress in designing and delivering the VALLA generic tool. The design requirements of the tool were seriously wide-ranging. Its front-end interface had to be as simple and



user-friendly as possible, in order not to deter users, as can often happen with project-built software. Its purpose is to enable users to produce their own customised courses in terms of Learning Outcomes in a format suitable for submission to an awarding body that could then decide whether the course in question could be validated and accredited. This in turn means that the courses must be compliant with national qualifications standards and levels, as well as being compatible with EQF levels and descriptors.

Potential users have to be made familiar with all of these new concepts and structures, and that too has been done within the design framework of the VALLA online tool. Training users who are beginners is a complex and difficult task, because of all the parameters that have just been described. It needs trainers who have considerable personal skills in imparting the range of new knowledge and skills required (some old adages indicate the level of difficulty in such tasks - *'You can't teach an old dog new tricks'* or *'You can lead a horse to the water but you can't make it drink'*). However, for users who have already struggled, perhaps unsuccessfully, to fulfil these new requirements, and who therefore already have some knowledge of the concepts and terminology involved, the task is made much simpler with the use of the tool, as has been shown in the official training workshop and several unofficial workshops which have been held to instruct potential users.

Completion of case studies

A dedicated workshop held in Crete in September 2009 succeeded in finalising the occupational and the functional map for aquaculture. The agreed competencies were then transformed, after long face-to-face and electronic discussions, into a series of agreed learning outcomes. This agreement was a necessary part of the design process. A preliminary version of the tool was produced in September 2009 which was tested at a second dedicated workshop held in Dublin in November 2009. Although this alpha version of the tool still had some bugs, it was demonstrated to participants who were invited to make use of it to create their own customised courses. From these tests, the tool was further refined and simplified, with the emphasis on retaining its unique usability and capacity to provide the right kind of information at the most appropriate point.

From the discussions and work arising from these workshops, the VALLA partners selected an optimal range of courses from the unaccredited sector as well as from non-standard aspects of higher education courses, bearing in mind the constraints described above. A particularly successful part of WP4 can be seen in the functionality of the VALLA tool, which has enabled both partners and individual participants in the training workshops to complete their own courses and thus provide genuine working case studies. At this juncture, we have not edited the resulting case studies; the whole point of the exercise is to see whether the tool can be used to present an individual course in a



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format that facilitates an informed and useful dialogue with a national or international awarding body. Interestingly, all participants in the training workshops wished to use AquaTT, not only as a training body which had developed a useful piece of software, but also as a sounding board, as a substitute for a dialogue with an awarding body.

Final note

We have also included online courses as a substitute for mobility exchanges which have proved impossible to obtain. Since mobility within the existing timescale seems to be the problem, the substitution of virtual mobility courses is perhaps acceptable in the circumstances. Additional suggestion MR: Online courses had not been suggested at proposal stage, but during the course of the project it was felt that this type of course is very suitable to include regarding the nature of this project.

The course templates are as follows:

Unaccredited sectoral skill acquisition

On-the-job-training

- i. On-the-job training in a marine fish breeders unit in Greece (general)
- ii. On-the-job training in a marine fish breeders unit in Greece (phytoplankton)
- iii. On-the-job training in a marine fish breeders unit in Greece (rotifers)
- iv. On the job training in fry production sequence in a commercial marine fish hatchery in Greece
- v. On-the-job training on an eel farm using recycling technology in Greece

2-day workshops for industry

- vi. FineFish/PEPITe Training workshop: How to use the Finefish webportal to
- vii. import monitoring data and how to use datamining tools
- viii. Introducing Successful Novel candidate marine fish species for aquaculture

Professional short training courses

- ix. Fish Welfare Training
- x. Introduction to marine biodiversity
- xi. Introduction to Salmon Production
- xii. Basic principles of aquaculture production
- xiii. Introduction to aquaculture productions

Mobility exchanges

- xiv. BIODAQUA

Non-standard aspects of higher education courses

Course work units

- i. Water transport and water treatment in aquaculture
- ii. Water treatment as a tool for improvement in traditional carp farming

Field trips

- iii. Aquatic Farm Management Training
- iv. Aquaculture work placement

Virtual Mobility courses (substitution for actual mobility exchanges)

- v. Tropical Ecology
- vi. Age determination of marine fish
- vii. Larviculture for marine cultured species
- viii. Introduction to the marine environment

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April 2010

Unaccredited sectoral skill acquisition

On-the-job-training

i. On-the-job training in a marine fish breeders unit in Greece (general)



Course Specification

Course title: On-the-job training in a marine fish breeders unit in Greece

Candidate attends an one month on-the-job training in a commercial marine fish breeders unit in Greece, a Mediterranean country with an important production of sea bass and sea bream. By this training candidate has the opportunity to acquire skills and competencies concerning the organisation and the function of this unit by applying biological knowledge in an adequate technological context. This training can be part of a MSc in Aquaculture program (as one unit).

Course Type:

Work Placement

Entry Level:

Participants require a BSc in a relevant field (ex. marine biology).

Recommended prior knowledge of “Maintain the aquatic production environment” and basic biological knowledge of “Reproductive Physiology of Fish”.

Credit Points:

N/A

Credit Points, Level and Framework:

Desired EQF Level 4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	80%	None%	None%	None%	None%	None%

Unit title: New Unit

Purpose: N/A

Entry Level: N/A

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: Understanding the structure of the unit

Knowledge and Skills:



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Breeders productivity per species, sex ratio and sizes of broodfish.

Breeders' stocks size according to the production requirements.

Stocking densities and rearing volumes.

Departments' main features, general description (quarantine, broodstock natural and photoperiod sifted spawning, incubation unit).

Departments' dimensioning according to the production requirements

Outcome: Evaluate the production equipment for breeders and eggs

Knowledge and Skills:

Operation and function of the breeders' tank.

Operation and function of the quarantine unit.

Operation and function of the natural spawning eggs' collectors.

Operation and function of the incubation unit.

Routine maintenance and servicing of special equipment for breeder unit.

Routine maintenance and servicing of special equipment for incubation unit.

Routine maintenance and servicing of miscellaneous equipment for breeder unit.

Routine maintenance and servicing of miscellaneous equipment for incubation unit.

Outcome: Manage food and feeding of the breeders

Knowledge and Skills:

Quality and quantity of broodstock feed for an efficient production of good quality eggs per species and gonad maturation phase

Enrichment of food per species and gonad maturation phases.

Frequency of feeding per species and gonad maturation phase

Type of fresh food per species

Maintenance and use of fresh food.

Outcome: Apply preventive treatments to the breeders and eggs

Knowledge and Skills:

Broodfish reception

Prophylactic treatments

Routine therapeutic treatments

Outcome: Manipulate the fish

Knowledge and Skills:

Prepare fish for anaesthesia.

Induce anaesthesia with the most commonly used anaesthetics products.

Evaluate fish behaviour and control of the environmental parameters during anaesthesia progress.

Organize and accomplish breeders weighting and sexing

Determine sexual maturity of fish broodstock

Know how to correctly use hormonal regulation to induce fish reproduction

Outcome: Collect eggs and operate incubation unit

Knowledge and Skills:



Eggs' collection and cleaning
Eggs' quantity estimation
Eggs' quality estimation
Eggs' disinfection
Eggs' incubation
Newly hatched larvae quality estimation
Eggs' transportation

Outcome: Plan production cycles

Knowledge and Skills:

Gonadal maturation and natural reproductive period
Spawning shift conditions for out of season spawning



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Unaccredited sectoral skill acquisition

On-the-job-training

ii. On-the-job training in a marine fish breeders unit in Greece (phytoplankton)



Course Specification

Course title: On-the-job training in a phytoplankton unit of a commercial marine fish hatchery.

Candidate to undertake an on-the-job training in a phytoplankton production unit of a commercial marine fish hatchery. Planktonic unicellular algae are used in the large-scale production of rotifers, first fish larvae prey. Furthermore, they are used in larval culture of marine fish (“green water” technique) to regulate water quality, as well as enrichment product for the zooplankton prey fed to the fish larvae. This training gives the candidate the opportunity to acquire skills and competencies concerning the organisation and the function of a microalgae production unit by applying biological knowledge in the appropriate technological context.

Course Type:

Work Placement

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology). Recommended prior knowledge of how to maintain the aquatic production environment.

Credit Points:

N/A

Credit Points, Level and Framework:

Desired EQF Level 4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	80%	None%	None%	None%	None%	None%

Unit title: Microalgae production unit of a commercial marine fish hatchery

Purpose:

This unit is designed to enable candidates to gain knowledge and understanding of microalgae production scheduling and the technology used. On completion of the Unit the candidate should be able to:

1. Understand the structure of the unit
2. Evaluate the production equipment for algae production

3. Prepare culture enrichment medium
4. Manage scale-up of algal cultures
5. Manage mass algal production
6. Plan microalgae production

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology). Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment:

It is recommended that candidates carry out one case study and the relevant associated reports developed from this training.

Optional Supplementary Information:

N/A

Outcome: 1. Understand the structure of the unit

Knowledge and Skills:

- Departments' main features general description (strains and algal cultures' scaling up of unit, large-scale culture volumes, photobioreactors, lighting, networks, filters, etc.)
- Cite specific production model
- Departments' dimensioning according to the production requirements

Evidence:

Candidates will produce written evidence of understanding showing that they can:

- explain the general arrangement and the dimensioning of the production departments
- explain departments' main features

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: 2. Evaluate the production equipment for microalgal production

Knowledge and Skills:

- Know about facilities for strains' maintenance.
- Know about the operation and function of low-volume flasks for culture scale-up.
- Know about the operation and function of an algae culture-bag.
- Know about the operation and function of the pumps for fertilization or transfer (e.g. peristaltic pumps, piston pumps).
- Know procedures for routine maintenance and servicing of special equipment
- Know procedures for routine maintenance and servicing of miscellaneous equipment.

Evidence: Candidates will produce written evidence showing that they can:

- Explain the function of low-volume equipment for strains and initial cultures
- Explain the function of a culture bag

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 3. Prepare culture enrichment medium

Knowledge and Skills:

Prepare suitable culture media for different algal species by using inorganic nutrients and vitamins.

Evidence:

Candidates will produce written evidence showing that they can:

- Propose suitable culture media for efficient mass production of algae, depending on method and/or species used

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: 4. Manage Scale-up of algal cultures

Knowledge and Skills:

- Prepare water enrichment media to support an algal culture. Operate scale-up of an algal culture
- Carry out algae sampling and monitoring
- Estimate the quality parameters of a culture
- Detect parasites in a culture.

Evidence:

Candidates will produce written evidence showing that they can:

- Evaluate the population characteristics and detect parasites in an algal culture
- Control the water quality and adjust the culture media by proper use of CO₂.
- Prepare a bag with its special equipments to inoculate it and start a new algal culture.

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: 5. Manage large-scale algal production

Knowledge and Skills:

- Prepare water enrichment media to support an algal culture.
- Control and adjust water quality of the culture medium.
- Estimate algal density and assess quality parameters of a culture
- Operate algal volume transfer using pumps

Evidence:

- Candidates will produce written evidence showing that they can:
- Evaluate the population characteristics and detect parasites in an algal culture
- Control the water quality and adjust the culture media by proper use of CO₂.
- Prepare a bag with its special equipments to inoculate it and start a new algal culture

Assessment:

The outcome could be assessed by an associated report developed from this training

Outcome: 6. Plan microalgae production

Knowledge and Skills:

- Organise maintenance of Algal strains.
- Organise scale-up of algal production.
- Manage algae production modes (continuous, batch, high density cultures with photobioreactors)
- Plan daily inoculation and transfer schedules according to production needs
- Plan yearly algal production schedule of a hatchery according to rotifer and larval rearing plan.
- Plan an annual disinfection programme for the unit. Plan an annual maintenance and budget programme for equipments and consumables for the unit

Evidence:

Candidates will produce written evidence showing that they can:

- Apply a protocol for Algal strains maintenance.
- Apply scale-up protocols for algae mass production. Understand and plan different algal production models (continuous cultures, batch cultures, high density cultures with photobioreactors).

Plan an appropriate disinfection programme for the unit

Assessment:

The outcomes could be assessed by a case study of alternatives scenarios of productivity of the given unit by applying different methods of large-scale phytoplankton production and the associated report developed from this training

Unaccredited sectoral skill acquisition

On-the-job-training

iii. On-the-job training in a marine fish breeders unit in Greece (rotifers)



Course Specification

Course title: On-the-job training in a zooplankton production unit of a commercial marine fish hatchery

Candidate to undertake an on-the-job training in a zooplankton production unit of a commercial marine fish hatchery. Since the use of live preys (rotifers and Artemia) is an essential phase of marine fish larval rearing, adequate production programmes have to be carried out in order to cover trophic needs both quantitatively and qualitatively, according to the stages of the rearing larval populations and the respective rearing volumes. This training gives candidates the opportunity to acquire skills and competencies concerning the organisation and function of rotifer and Artemia production units by applying biological knowledge in the correct technological context.

Course Type:

Work Placement

Entry Level:

Candidates should have a BSc in a relevant field (e.g., marine biology). Recommended prior knowledge of how to maintain the aquatic production environment.

Credit Points:

N/A

Credit Points, Level and Framework:

Desired Level EQF4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	80%	None%	None%	None%	None%	None%

Unit title: Rotifer production unit of a commercial marine fish hatchery.

Purpose: This unit is designed to enable candidates to gain knowledge and understanding of rotifer production scheduling and the technology used. On completion of the Unit the candidate should be able to:

1. Understand the structure of the unit
2. Evaluate the production equipment for rotifer production

3. Manage food and feeding of the rotifers
4. Manage scaling up of rotifers' cultures
5. Manage large-scale rotifer production
6. Plan rotifer production

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology). Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment:

It is recommended that candidates produce one associated report developed from this training.

Optional Supplementary Information:

N/A

Outcome: Understand the Structure of the Unit

Knowledge and Skills:

- Departments' main features general description (strains and rotifers' scaling up of unit, cultures' tanks, networks and filters, etc.)
- Cite specific production model
- Departments' dimensioning according to the production requirements

Evidence: Candidates will produce written evidence of understanding showing that they can:

- explain the general arrangement and the dimensioning of the production departments
- explain departments' main features

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: Evaluate Production Equipment for Rotifer Production

Knowledge and Skills:

- Operation and function of low volume flasks and bags for the initial cultures.
- Operation and function of a rotifer culture tank.
- Operation and function of harvesting baskets or/and selective automatic devices (e.g., Wheel filter).
- Operation and function of the pumps for feeding or transfer (e.g., peristaltic pumps, piston pumps).
- Routine maintenance and servicing of special equipment.
- Routine maintenance and servicing of miscellaneous equipment.

Evidence:

Candidates will produce written evidence of understanding showing that they can:

- Explain the function of low volume equipment for initial cultures
- Explain the function of a culture tank
- Explain the function of the rotifer's harvesting devices

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: Manage Food and Feeding of Rotifers

Knowledge and Skills:

- Feeding schedule for the rotifer cultures or enrichment,.
- Maintenance and use of rotifers' food.

Evidence:

Candidates will produce written evidence showing that they can propose appropriate feeding regimes for efficient massive production or enrichment of rotifers, depending on method and/or food used

Assessment:

The outcome could be assessed by one associated report developed from this training

Outcome: Operate Scaling-Up of Rotifer Cultures

Knowledge and Skills:

- Strain maintenance
- Scaling-up of a rotifer culture
- Rotifer sampling and counting
- Estimation of the quality parameters of a culture
- Detection of parasites and cleaning of a culture.

Evidence:

Candidates will produce written evidence showing that they can:

- Propose a Scaling-up of a rotifer culture protocol.
- Estimate density and population characteristics of the rotifers in a culture.

Assessment:

The outcome could be assessed by the associated report developed from this training and demonstration of rotifers sampling and counting.

Outcome: Manage Large-Scale Rotifer Production

Knowledge and Skills:

- Estimate rotifer density and assess quality parameters of a culture
- Prepare tank to receive a new rotifer culture.
- Control and adjustment of water quality of the media.
- Operate rotifer harvesting, cleaning and transfer
- Carry out rotifer enrichment programme

Evidence:

Candidates will produce written evidence showing that they can:

- Evaluate the population characteristics and the condition of a rotifer culture and potentially propose appropriate actions to face problems.
- Control water quality and adjustment of the media by correct use of pure oxygen and

hydrochloric acid (when applying a high density rotifer production method)

- Prepare a tank with its special equipment to start a new culture and operate transfer of rotifers to inoculate it, or for enrichment purposes.

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: Plan Rotifer Production

Knowledge and Skills:

- Rotifer production models (continuous cultures, batch cultures, high density cultures)
- Daily planning of feeding and transfers according to the production requirements
- Yearly rotifer production schedule of the hatchery according to larval rearing planning

Evidence:

Candidates will produce written evidence showing that they can:

- Plan the daily feeding of the rotifer cultures according to their characteristics (stocking densities, ages of the production cycles)
- Plan the daily rotifer populations transfers according to the production requirements
- Plan the yearly rotifer production schedule of the hatchery according to larval rearing planning
- Propose alternative models for large-scale rotifer production vis-a-vis applied technique, initial stocking densities and food regime.

Assessment:

The outcome could be assessed by a case study in alternatives scenarios of productivity of the given unit by applying different methods of large-scale rotifer production and the associated report developed from this training.

Unit title: Artemia production unit of a commercial marine fish hatchery

Purpose:

This unit is designed to enable candidates to gain knowledge and understanding of Artemia production scheduling and the technology used. On completion of the Unit the candidate should be able to:

1. Understand the structure of the unit
2. Evaluate the production equipment for Artemia production
3. Operate Artemia cysts treatments and decapsulation procedures
4. Operate Artemia cysts incubation and nauplii harvesting
5. Manage cultures and enrichment of the Artemia metanauplii
6. Organize Artemia production

Entry Level:

Candidates should have a BSc in a relevant field (e.g., marine biology). Recommended prior knowledge of how to maintain the aquatic production environment

Assessment:



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It is recommended that candidates carry out case studies in one associated report developed from this training.

Optional Supplementary Information:

N/A

Outcome: Understand the Structure of the Unit

Knowledge and Skills:

- Departments' main features general description (tanks, networks, filters etc.)
- Departments' dimensioning according to production requirements

Evidence:

Candidates will produce written evidence showing that they can:

- Explain the general arrangement and the dimensioning of the production departments
- Explain departments' main features

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: Evaluate Production Equipment for Artemia Production

Knowledge and Skills:

- Operation and function of special devices and equipment for decapsulation and/or disinfection of Artemia cysts
- Operation and function of an Artemia incubation tank.
- Operation and function of an Artemia culture tank.
- Operation and function of harvesting devices.
- Operation and function of the pumps for transfer.
- Routine maintenance and servicing of special equipment.
- Routine maintenance and servicing of miscellaneous equipment.

Evidence:

Candidates will produce written evidence showing that they can:

- Explain the function of the special devices and equipment for decapsulation and disinfection of Artemia cysts
- Explain the function of an incubation tank
- Explain the function of a culture tank
- Explain the function of the rotifer's harvesting devices

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: Operate Artemia Cyst Treatments and Decapsulation Procedures

Knowledge and Skills:

- Cyst supply and storing.
- Cyst and water media disinfection before incubation.

- Decapsulation of Artemia eggs.
- Dehydration and storage of decapsulated eggs

Evidence:

Candidates will produce written evidence showing that they can:

- apply disinfection procedures on Artemia's cysts.
- apply decapsulation procedures on Artemia's cysts

Assessment:

The outcome could be assessed by one associated report developed from this training.

Outcome: Operate Artemia Cysts Incubation and Nauplii Harvesting

Knowledge and Skills:

- Incubation conditions of Artemia cysts
- Incubation conditions of decapsulated eggs
- Sampling and counting of the nauplii
- Yield and cleaning of the nauplii

Evidence:

Candidates will produce written evidence of:skills showing that they can:

- Operate incubation of Artemia cysts or decapsulated eggs.
- Estimate nauplii production of the tank (and nauplii yield per gram of used dry cysts).

Assessment:

The outcome could be assessed by one associated report developed from this training.

Outcome: Manage Cultures and Enrichment of Artemia Metanauplii

Knowledge and Skills:

- Feeding schedule for Artemia enrichment,.
- Yield and filtration of Artemia A1 metanauplii
- Artemia cold stocking
- Maintenance and use of Artemia food supply.

Evidence:

Candidates will produce written evidence showing that they can propose appropriate enrichment for Artemia rotifers, depending on food used

Assessment:

The outcome could be assessed by one associated report developed from this training

Outcome: Organize Artemia Production

Knowledge and Skills:

- Daily planning of tank preparation to receive new cultures to the production requirements
- Daily planning of enrichment and transfers according to the production requirements
- Yearly Artemia production schedule of the hatchery according to larval rearing planning



Evidence:

- Plan the daily enrichment of Artemia metanauplii rotifer cultures according to their characteristics (stocking densities).
- Plan the daily cyst quantities for disinfection and/or incubation according to the production requirements
- Plan the yearly Artemia production schedule of the hatchery according to larval rearing planning

Assessment:

The outcome could be assessed by a case study in alternatives scenarios of yearly needs on Artemia cysts (different fish species composition of the hatchery production) and the associated report developed from this training.



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Unaccredited sectoral skill acquisition

On-the-job-training

- iv. **On-the-job training in fry production sequence in a commercial marine fish hatchery in Greece**



Course Specification

Course title: On-the-job training in fry production sequence in a commercial marine fish hatchery

Candidate to undertake an on-the-job training in fry production sequence of a commercial marine fish hatchery. Fish larvae cultures have a special place in rearing cycle of seawater species. Their main characteristic is the necessity of feeding the larvae with live planktonic preys, such as rotifers and Artemia. The success of larval cultures depends on the quality of the used eggs, the quality control of the water medium, the choice of a good rearing protocol including the use of properly enriched live preys and weaning with high quality appropriated feeds and the effective control of swim bladder formation of the fish. "Pregrowing" is the second rearing phase of fry production from an average initial weight of 0.3-0.5g, to the commercial size, usually up to 1.5g or more. In these stages the main characteristics of the fish are the high metabolic needs therefore large quantities of sea water and oxygen must be provided, the type of feeding management, depending on fish density in the tank and not on tank volume, unlike what happens during larval rearing and weaning. Feeding management of a fish population presumes additional husbandry cares, such as grading, which also serve the fry's sale planning. This his training gives the candidate the opportunity to acquire skills and competencies concerning the organisation and the function of a juvenile production unit by applying biological knowledge in the appropriate technological context.

Course Type:

Work Placement

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology).

Recommended prior knowledge of how to maintain the aquatic production environment.

Credit Points:



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N/A

Credit Points, Level and Framework:

Desired EQF Level 4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	80%	None%	None%	None%	None%	None%

Unit title: Larval Rearing and Nursery

Purpose:

This unit is designed to enable candidates to gain knowledge and understanding of the technology used of marine fish larval rearing. On completion of the Unit the candidate should be able to:

- Understand the structure of the unit
- Evaluate the production equipment for larval rearing
- Control water quality and environmental parameters
- Manage food and feeding of larvae
- Control larvae quality and detect possible problems
- Manage larval population transfer
- Plan larval production schedule

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology).

Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment: It is recommended that candidates carry out one case study and relevant associated reports developed from this training.

Optional Supplementary Information:

N/A

Outcome: 1: Understand the structure of the unit

Knowledge and Skills:

- Know departments' main features/ general description (rearing volumes, networks, filters, etc.)
- Know and understand the main production model
- Know the departments' dimensioning according to the production requirements

Evidence: Candidates will produce written evidence showing that they can:

- Explain the general arrangement and the dimensioning of the production departments according to rearing needs (water filtration level, UV treatment, biological filters, air network, fresh, salt, hot, cold waters networks, lighting of the room etc.)

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: 2: Evaluate Production Equipment for Larval Rearing

Knowledge and Skills:

- Operation and function of the rearing tanks
- Operation and function of the tanks.
- Routine maintenance and servicing of special equipment.
- Routine maintenance and servicing of miscellaneous equipment.

Evidence: Candidates will produce written evidence showing that they can:

- Explain the function of the rearing tanks
- Explain the function of tank equipment and related devices for larval rearing and weaning purposes (use of overflow security strainers, oil separators, Artemia distributors, weaning feeders, etc.).
- Be able to use physicochemical parameters measurement apparatus
- Be able to maintain physicochemical parameters measurement apparatus

Assessment: The outcome could be assessed by the associated report developed from this training.

Outcome: 3: Control water quality and environmental parameters

Knowledge and Skills:

- Manage water flow and temperature.
- Apply lighting regimes.
- Monitor environmental parameters in tanks.
- Monitor environmental parameters in closed systems..

Evidence: Candidates will produce written evidence showing that they can:

- Adjust tank's water renewal and water temperature of the tank.
- Operate water treatment equipment (filters, recirculation filters, UV radiation).
- Apply lighting regimes according to the used technology requirements.
- Measure and monitor physico-chemical data to assess water quality (Temperature, Oxygen, Salinity, pH, NH₄, NO₂, NO₃).
- Interpret physico-chemical data to assess water quality (Temperature, Oxygen,

Salinity, pH, NH₄, NO₂, NO₃)

Candidates will demonstrate that they can:

- Remove culture waste
- Record mortalities after removal by siphoning the tank bottom.

Assessment:

The outcome could be assessed by the associated report developed from this training

Outcome: 4: Manage food and feeding of larvae

Knowledge and Skills:

- Be able to handle the use of live prey

Operate weaning procedures.

- Monitor food consumption.

Evidence: Candidates will produce written evidence showing that they can:

- Propose appropriate feeding regimes for larval rearing, (types and quality of live prey or inert foods, conditions of shifting from a type to the following one, prey replacement procedures, doses of food, weaning procedures).
- Evaluate prey densities in a tank,
- Adjust quantity of prey
- Record procedures and quantities accurately in tank record card

Assessment:

The outcome could be assessed by the associated report developed from this training

Outcome: 5: Control larvae quality and detect problems

Knowledge and Skills:

- Evaluate larvae quality and welfare.

Detect larvae parasites

- Know how to apply adequate treatments.

Monitor swim bladder inflation stage of larvae.

Monitor larval growth.

- Record mortality events (deaths).

Evidence: Candidates will produce written evidence showing that they can:

Estimate quality of newly hatched larvae

- Estimate trophic condition of the larvae
- Understand their relative behaviour.
- Examine swim bladder inflation of the larvae
- Apply adequate techniques to promote swimbladder inflation.
- Record major mortality events (deaths).
- Measure larval length in order to estimate growth and decide food type replacements.

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 6: Manage larval population transfer

Knowledge and Skills:

- Prepare larvae population for transfer

Prepare tank to receive larvae population.

Harvest and transfer larvae.

Evidence: Candidates will produce written evidence showing that they can:

Organize fish population transfer (fasting of the animals, siphoning their tank's bottom etc)

- Manage fish population transfer (fasting of the animals, siphoning their tank's bottom etc)

- Prepare tanks to receive larvae population (adjustment of the water flow and temperature etc)

Carry out harvesting and transfer of the larvae using appropriate equipment.

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 7: Plan larval production schedule

Knowledge and Skills:

- Carry out yearly planning of stocking and transfers
- Operate yearly disinfection of the unit.

Evidence: • Candidates will produce written evidence showing that they can:

Plan the yearly larval rearing schedule per species according to the production requirements.

- Organise disinfection of the unit (networks and tanks) using chemicals, and a drying-out period.

Assessment:

The outcome could be assessed by a case study in alternatives scenarios of stocking of different species per period.

Unit title: Pregrowing

Purpose:

This unit is designed to enable candidates to gain knowledge and understanding of the technology used in marine fish juvenile production. On completion of the Unit the candidate should be able to:

- Understand the structure of the unit

- Evaluate the production equipment for juvenile rearing
- Control water quality and environmental parameters
- Manage food and feeding of juveniles
- Manage fish biomasses
- Control juveniles' quality
- Treat juveniles
- Transport juveniles to the ongrowing units
- Plan juveniles' production schedule.

Entry Level:

Candidates should have a BSc in a relevant field (e.g. marine biology).

Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment:

It is recommended that candidates carry out one case study and relevant associated reports developed from this training.

Optional Supplementary Information:

N/A

Outcome: 1: Understand the structure of the unit

Knowledge and Skills:

- Departments' main features general description (rearing volumes, networks, filters, etc.)
- Main production model
- Departments' dimensioning according to the production requirements

Evidence: Candidates will produce written evidence showing that they can:

- explain the general arrangement and the dimensioning of the production departments according to rearing needs (water filtration level, UV treatment, biological filters, air network, fresh, salt, hot, cold waters networks, lighting of the room etc.)

Assessment:

The outcome could be assessed by an associated report developed from this training.

Outcome: 2: Evaluate production equipment for juvenile rearing

Knowledge and Skills:

- Operation and function of the rearing tanks.

- * Operation and function of the special equipment of the tank.
- * Routine maintenance and servicing of special equipment.
- * Routine maintenance and servicing of miscellaneous equipment

Evidence: Candidates will produce written evidence showing that they can:

- * Explain the function of the rearing tanks.
- Explain the function of tank equipment.
- Explain the function of oxygen supply devices.
- Operate feeders.
- Operate fish graders.
- Use and maintain physicochemical parameters instruments.
- Explain the function of transportation tank and their equipment.

Assessment:

The outcome could be assessed by the associated report developed from this training

Outcome: 3: Control water quality and environmental parameters

Knowledge and Skills:

- Manage water flow.
- * Measure and monitor biological and physico-chemical data to assess water quality in tanks and closed systems
- Interpret biological and physico-chemical data to assess water quality in tanks and closed systems

Evidence: Candidates will demonstrate that they can:

- Adjust tank's water flow of the tank.
- Remove waste of the culture and record mortalities by siphoning the tank bottom. Operate water treatment equipment (filters, recirculation filters, UV radiation).
- Measure, and monitor physico-chemical data to assess water quality (Temperature, Oxygen, Salinity, pH, NH₄, NO₂, NO₃) in tanks and closed systems.

Candidates will produce written evidence showing that they can:

- Measure, and monitor physico-chemical data to assess water quality (Temperature, Oxygen, Salinity, pH, NH₄, NO₂, NO₃) in tanks and closed systems.
- Interpret physico-chemical data to assess water quality (Temperature, Oxygen, Salinity, pH, NH₄, NO₂, NO₃) in tanks and closed systems.

Assessment:

The outcome could be assessed by the associated report developed from this

training.

Outcome: 4: Manage food and feeding of juveniles

Knowledge and Skills:

- Apply juveniles' feeding protocol.
- * Operate and adjust feeders' function.
- Monitor food consumption.

Evidence: Candidates will produce written evidence showing that they can:

- Propose appropriate feeding regimes for juveniles (pellet's size, feeding frequency), Programme food requirements of the fish depending on species, sizes and water temperatures (daily food ratio).
- Operate automatic feeders.
- Use self feeders. Feed juveniles manually.
- Prepare food with additives (enrichments or treatments).
- Monitor food consumption by accurate completion of labour record cards.

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 5: Manage fish biomasses

Knowledge and Skills:

- Monitor growth.

Estimate fish biomass

- Estimate performance of a specific rearing phase.
- Grade fish
- Transfer fish

Evidence: Candidates will produce written evidence showing that they can:

- * Organize fish weighing,
- Carry out fish weighing
- Estimate fish average weight in order to estimate biomasses of a rearing phase (Food Conversion Rate)
- Estimate fish average weight in order to estimate growth of a rearing phase (Specific Growth Rate).
- Estimate fish average weight in order to estimate performance of a rearing phase (Daily Food Rate).
- Organise and apply size grading of the fish using graders
- Transfer fish to their new tanks.

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 6: Control quality of juveniles

Knowledge and Skills:

- Apply "floating test".
- Evaluate skeletal abnormalities in a fish population

Evidence: Candidates will produce written evidence showing that they can:

- Organise "floating test" to remove fish without swim bladder and/or short operculum
- Distinguish skeletal abnormalities
- Record relevant data.

Candidates will demonstrate that they can:

- Organise and operate "floating test" to remove fish without swim bladder and/or short operculum by preparing fish for anaesthesia,
- Operate "floating test" to remove fish without swim bladder and/or short operculum by inducing anaesthesia with the most commonly used anaesthetics products
- Operate "floating test" to remove fish without swim bladder and/or short operculum by evaluating fish behaviour
- Operate "floating test" to remove fish without swim bladder and/or short operculum by control of the environmental parameters during anaesthesia progress.
- Monitor skeletal abnormalities in the fish by sampling tank population
- Monitor skeletal abnormalities in the fish by preparing fish for mammography

Assessment:

The outcome could be assessed by the associated report developed from this training

Outcome: 7. Treat juveniles

Knowledge and Skills: • Apply preventive therapies under veterinary supervision.

- Vaccinate juveniles

Evidence: • Candidates will produce written evidence showing that they can:

- * Apply preventive therapies ("baths" or via feeding) under veterinary supervision.

Organise fish vaccination

- Carry out fish vaccination

Assessment: The outcome could be assessed by the associated report developed from this training.

Outcome: 8: Transport juveniles to the ongrowing units

Knowledge and Skills:

- Prepare juveniles to be transported.
- * Monitor water quality during transportation.
- * Adjust water quality

Evidence: Candidates will produce written evidence showing that they can:

- * Organize juveniles transport correctly by preparing fish (fasting according to size and water temperature), transport tanks and relative equipment (oxygenation) and respecting stocking densities.
- Control transportation by monitoring environmental parameters and adjusting water quality before delivering of the fish juveniles, or during transportation if necessary

Assessment:

The outcome could be assessed by the associated report developed from this training.

Outcome: 9: Plan juvenile production schedule

Knowledge and Skills:

- Yearly planning of the stocking schedule.
- Operate yearly disinfection of the unit.

Evidence: Candidates will produce written evidence showing that they can:

- * Plan the yearly stocking schedule of the pregrowing unit according to the production planning of the hatchery
- Organise disinfection of the unit (network and tanks) using chemicals

Assessment: The outcome could be assessed by the associated report developed from this training

Unaccredited sectoral skill acquisition

On-the-job-training

v. On-the-job training on an eel farm using recycling technology in Greece

Course Specification

Course title: On-the-job training in eel farm using recycling technology

Candidate to undertake an on-the-job training in an eel farm unit using recycling technology. Water recirculation represents several advantages for eel rearing, allowing the use of abundant water in optimal, stable temperature for faster growth of the eels in high densities and ensuring stable water quality. In modern closed systems for fish rearing continuous automatic control of water parameters and cost effective, continuous use of oxygen is possible ensuring best management of fish populations. On the other

hand, eel production worldwide is based on wild juveniles? supplies (glass eels) as artificial reproduction of eel still impossible. So, eel rearing includes reception and acclimatization procedures for glass-eels, weaning procedures, Feeding management of an eel population presumes additional husbandry cares, such as grading, which also serve the eels? sale planning. This training gives the candidate the opportunity to acquire skills and competencies concerning the organisation and the function of an eel production farm by applying biological knowledge in an appropriate technological context.

Course Type:
Work Placement

Entry Level: Candidates should have a BSc in a relevant field (e.g. Biology, Aquaculture).

Recommended prior knowledge of how maintain the aquatic production environment

Credit Points: N/A

Credit Points, Level and Framework: Desired EQF Level 4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	80%	None%	None%	None%	None%	None%

Unit title: Eel Rearing

Purpose: This unit is designed to enable candidates to gain knowledge and understanding of the technology used in eel production. On completion of the Unit the candidate should be able to:

1. Understand the structure of the unit
2. Evaluate the production equipment for eel rearing
3. Organize and operate glass eel stocking and acclimatization
4. Manage food and feeding
5. Manage biomasses
6. Control parasites and treatments
7. Transport live eels
8. Plan production schedules

Entry Level: Candidates should have a BSc in a relevant field (e.g. marine biology).

Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: 1. Understand the structure of the unit

Knowledge and Skills:

- * Departments' main features general description ((rearing volumes, quarantine, networks, harvesting tanks
- * Main production model
- * Departments' dimensioning according to the production requirements

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Explain the general arrangement and the dimensioning of the production departments according to production requirements
- * Explain department's main features according to rearing needs (water filtration level, UV treatment, biological filters, air, oxygen and water networks, etc.)

Assessment: The outcome could be assessed by an associated report developed from this training.

Outcome: 2. Evaluate production equipment for eel rearing

Knowledge and Skills: * Operation and function of the rearing tanks.

- * Operation and function of the special equipment of the tank.
- * Operation and function of the harvesting tank
- * Routine maintenance and servicing of special equipment.
- * Routine maintenance and servicing of miscellaneous equipment.

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Explain the function of the rearing tank in quarantine and in ongrowing unit.
- * Explain the function of tank equipment. (overflow security strainer, float level switch oxygen meter, etc)
- * Operate feeders.
- * Operate fish graders.
- * Explain the function of transportation tank and their equipment.

Assessment: The outcome could be assessed by an associated report developed from this training and an oral examination concerning demonstration of changing use of overflow security strainers of a tank with fish.

Outcome: 3. Organize and operate glass eel stocking and acclimatization

Knowledge and Skills:

- * Receive glass eel populations
- * Acclimatize glass eel populations
- * Operate weaning procedures.

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Prepare tanks' water to receive glass eel.
- * Acclimatize fish to enter in the rearing tank.
- * Propose and apply appropriate feeding protocol for glass-eels' acclimatization and



weaning (types of fresh or frozen food and shifting procedures to dry food, doses of food according to the protocol, feeding periods).

Assessment: The outcome could be assessed by an associated report developed from this training.

Outcome: 4. Manage food and feeding

Knowledge and Skills:

* Monitor food consumption.

Evidence: Candidates will produce written evidence of understanding showing that they can:

* Propose appropriate feeding regimes for eels (types of fresh or frozen food and shifting procedures to dry food, doses of food according to tanks' biomass, feeding periods).

* Write up tank's food record card.

* Schedule food supply for the next monthly period.

Assessment: The outcome could be assessed by an associated report developed from this training.

Outcome: 5. Manage biomasses

Knowledge and Skills:

* Monitor growth.

* Estimate eel biomass.

* Estimate performances of a rearing phase.

* Grade fish

* Transfer fish

Evidence: Candidates will produce written evidence of understanding showing that they can:

* Organize and accomplish eel weighting

* Estimate eel average weight in order to estimate biomasses, growth and performance of a rearing phase (Food Conversion Rate, Specific Growth Rate, and Daily Food Rate)

* Organise and apply size grading of the eels using graders

* Transfer fish to their new tanks.

Assessment: The outcome could be assessed by an associated report developed from this training.

Outcome: 6. Control quality of parasites and treatments

Knowledge and Skills:

* Detect parasites on the eel.

* Apply therapies under veterinary supervision

Evidence: Candidates will produce written evidence of understanding showing that they can:

* Detect presence of parasites on eels' gills, skin and swim bladder.

* Estimate abundance of parasites on eels' gills, skin and swim bladder.

* Control parasite populations by managing pH levels in the system.

- * Control parasite populations by managing nitrate levels in the system.
- * Use of parasiticides under veterinary supervision, for therapeutic or preventive purposes and
- * prepare the eels for it.
- * Use of salt for therapeutic or preventive purposes.
- * Record major mortalities events.

Assessment: The outcome could be assessed by an associated report developed from this training and a oral examination concerning demonstration of parasites' detection on an eel.

Outcome: 7. Transport live eels

Knowledge and Skills:

- * Prepare eels to be transported.
- * Monitor water quality during transportation.

Evidence: * Organize properly live eels? transport by preparing fish (fasting), relevant equipment (oxygenation) and respecting stocking densities.

- * Control transportation by monitoring environmental parameters.

Assessment: The outcome could be assessed by an associated report developed from this training.

Outcome: 8. Plan Production schedules

Knowledge and Skills:

- * Know how to carry out the yearly planning of the stocking and sales schedules.
- * Operate yearly disinfection of the unit.

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Plan the yearly glass eel stocking and sales schedule according to the production planning of the hatchery
- * Organise disinfection of the quarantine unit using chemicals.
- * Schedule next year's supplies of glass eel stocks
- * Schedule chemical supplies for the next yearly period.

Assessment: The outcome could be assessed by an associated report developed from this training.

Unit title: Water Treatment

Purpose: This unit is designed to enable candidates to gain knowledge and understanding of the technology used in water treatment for sustaining water quality in intensive eel farms. On completion of the Unit the candidate should be able to:

1. Operate biological treatment units ("biofilters")
2. Control and manipulate environmental parameters

Entry Level: Candidates should have a BSc in a relevant field (e.g. marine biology).

Recommended prior knowledge of how to maintain the aquatic production environment.

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: 1. Operate biological treatment units (biofilters)

Knowledge and Skills:

- * Schedule and apply biofilter's activation and operation.
- * Manipulate water flow on biological filter.
- * Operate and maintain solids removal device.
- * Operate and maintain denitrification filter

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Explain the function of the biological filtration unit and maintain the relative equipment (pumps, mechanical filter, ultra violet radiation device etc.).
- * Organise and apply activation of biological substrate of the filter in the beginning of the activity, or after a dry out period (e.g. in the quarantine unit), by monitoring Temperature, Oxygen, pH, NH₄, NO₂ and NO₃).
- * Maintain the physicochemical parameters' measures instruments.
- * Manage water flow on biological filter's departments by operating and combining pumps' functions in order to scavenge the biological substrate, ensuring the good function of the unit (e.g. operate backwash, draining, etc).
- * Explain the function of solid removal device (mechanical filter).
- * Explain the function of denitrification filter and scavenge the biological substrate, ensuring the good function of the unit (cleaning).
- * Write up tanks' record card

Assessment: The outcome could be assessed by an associated report developed from this training and an oral examination concerning demonstration of using and maintaining of scientific equipment for measuring parameters.

Outcome: 2. Control and manipulate environmental parameters

Knowledge and Skills:

- * Measure physico-chemical data in the biological and denitrification filters in order to edit properly or activate automatic devices for the regulation of the water quality.
- * Be aware of and follow oxygen concentration in the tanks
- * Know how to correctly control oxygen concentrations in the tanks
- * Know how to activate automatic devices for regulation

Evidence: Candidates will produce written evidence of understanding showing that they can:

- * Understand function and maintenance of oxygen and pH control panels.
- * Measure and monitor physico-chemical data to assess water quality in the biological filter (temperature, oxygen, pH, NH₄, NO₂ and NO₃).
- * Interpret physico-chemical data to assess water quality in the biological filter (temperature, oxygen, pH, NH₄, NO₂ and NO₃).
- * Monitor oxygen concentration in the denitrification filter.
- * Monitor oxygen concentration in tanks.
- * Define oxygen concentration routine levels for the rearing tanks, according to the eel's



stages and adjust oxygen flow in the incoming water.

- * Explain the function of oxygen supply devices.
 - * Define oxygen concentration thresholds for the rearing tanks in order to activate the automatic emergency oxygen flow and the alarm systems.
 - * Explain the function of base supply devices.
 - * Define pH routine levels in the recycled water, in order to regulate the automatic supply of base in the system.
 - * Define pH thresholds in the recycled water in order to activate the alarm system.
- Regulate pH of the water by using chemical agents (HCl, NaOH) in order to regulate water quality or for disinfection purposes.

Assessment: The outcome could be assessed by the associated report developed from this training.

Unaccredited sectoral skill acquisition

2-day workshops for industry

- vi. **FineFish/PEPITe Training workshop: How to use the Finefish webportal to import monitoring data**



Course title: FineFish/PEPITe Training workshop: How to use the Finefish webportal to import monitoring data and how to use datamining tools

This one and half day workshop will enable candidates to use the malformations/operational database developed in the FineFish projet (Find-IT) and to apply data mining tools (PEPITo software).

Course Type: Workshop

Entry Level: No specific prior learning required, but it may be beneficial if candidates are working in the RTD unit or in the Fish Hatchery or Fish Production Department

Credit Points: N/A

Credit Points, Level and Framework: desired EQF Level 7

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
35%	50%	None%	None%	None%	None%	15%

Unit title: Set up your farm in the FineFish database and import production data

Purpose: This unit is designed to enable the candidate - through the online database FindIT - to build up a farm profile and upload production data of a fish farm or laboratory results. On completion of this unit candidates should be able to:

- 1) set up a farm in the system
- 2) enter monitoring data of a production cycle
- 3) track batches
- 4) extract data from the system

Entry Level: No prior learning required, but it may be beneficial if candidates are working in the RTD unit or in the Fish Hatchery or Fish Production Department

Assessment: The candidate to demonstrate the use of the web based data collection system. He will build up a farm profile and upload production data

Optional Supplementary Information: The candidates must follow the 3 units.

Outcome: to set up a farm in the system

Knowledge and Skills: understand the process
know how to use the process

Outcome: to extract data from the system

Knowledge and Skills: understand the process
know how to use the process

Outcome: to enter monitoring data of a production cycle

Knowledge and Skills: understand the process
know how to use the process

Outcome: to track batches

Knowledge and Skills: understand the process
know how to use the process

Unit title: Data mining: key concepts and basic application of the PEPITo software

Purpose: This unit is designed enable the candidates to gain understanding and knowledge of the data mining process (more precisely for malformation incidence) and to download and use the PEPITo software which is used to analyse (uploaded) production data.

On completion of this unit candidates should be able to:

- 1) understand the definition and practical evaluation of a Key Performance Indicator (KPI)
- 2) install and set up the software PEPITo
- 3) load data in the data mining tool from the online database

4) select and filter data

Entry Level: No prior learning required, but it may be beneficial if candidates are working in the RTD unit or in the Fish Hatchery or Fish Production Department

Assessment: only after completion of unit 3

Optional Supplementary Information: The candidate must follow the 3 units

Outcome: to understand the definition and practical evaluation of a Key Performance Indicator

Knowledge and Skills: understand a KPI

know how to evaluate a KPI

Outcome: Install and set up the software PEPITo

Knowledge and Skills: understand the process

know how to install and set up the software

Outcome: load data in the data mining tool from the online database

Knowledge and Skills: understand the process

know how to load data from the online database

Outcome: select and filter data

Knowledge and Skills: understand the process

know how to use the process

Unit title: Data analysis and extraction from production and/or laboratory results

Purpose: This unit is designed to enable candidates to analyse the selected and filtered data and extract knowledge from production and/or laboratory results. On completion of this unit candidates should be able to:

- 1) present histograms, scatter plots... of determined data
- 2) identify trends and detect correlation between parameters
- 3) use root cause analysis

Entry Level: No prior learning required, but it may be beneficial if candidates are working in the RTD unit or in the Fish Hatchery or Fish Production Department

Assessment:

Assessment will be by candidates demonstrating the use of the PEPITo software by analysing data for requested parameters

Optional Supplementary Information: The candidates must follow the 3 units

Outcome: to present histograms, scatter plots... of determined data

Knowledge and Skills: understand the process



know how to use the process

Outcome: to identify trends and detect correlation between parameters

Knowledge and Skills: understand the process

know how to use the process

Outcome: to use root cause analysis

Knowledge and Skills: understand the process

know how to use the process

Unaccredited sectoral skill acquisition

2-day workshops for industry

vii. Introducing Successful Novel candidate marine fish species for aquaculture



Course title: Introducing Successful Novel candidate marine fish species for aquaculture.

A high-level 2-day workshop aiming to identify the main issues to be considered in order to assess successful candidate marine fish species for farming. Given the interest of the consumers for healthy and cheap proteins it is the fish farmers who need to respond by offering a variety of options. The cost benefit approach needs to match with the biological efficiency and the technical capacities of existing or new entrepreneurs. The presentation of actual success and failure stories and the case study approach are the adopted methodology of lectures and discussions allowing for a lively and high level exchange of ideas and scientifically valid information.

Course Type: Workshop

Entry Level: Participants are Managers, technical and scientific supervisors of aquaculture farms and owners and entrepreneurs with an interest in diversifying their production. Prior experience in the sector and advanced knowledge of farming technologies and requirements are requested.,

Credit Points: N/A

Credit Points, Level and Framework: Desired 3 ECTS/EQF Level 7



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Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
50%	None%	None%	20%	None%	30%	None%

Unit title: Novel candidate marine fish species for aquaculture.

Purpose: Purpose

The introduction of new fish species for farming will assist the diversification of offered products, thus increasing the market penetration and the profitability of farms. The successful candidate species need to be selected carefully, following a series of biological, technical and market acceptance criteria. This unit will offer the candidates the ability to realise the issue and learn to spot the most important species.

Entry Level: Participants are Managers, technical and scientific supervisors of aquaculture farms and owners and entrepreneurs with an interest in diversifying their production. Prior experience in the sector and advanced knowledge of farming technologies and requirements are requested.

Assessment: N/A

Optional Supplementary Information: The candidates will be working in well balanced groups where all involved scientific and business backgrounds will be blended.

Outcome: Assessing biological and ecological information of candidate fish species

Knowledge and Skills:

Broodstock requirements

Eggs survival and hatching requirements

Larval rearing and survival (nutrition, disease prevention, installations and water quality)

Fish On-growing requirements (nutrition, disease prevention, installations and water quality)

Bio-Economics of fish farming

Evidence:

Broodstock conditioning, sexual cycle control, feeding and handling

Fertilisation of fish eggs

Establishment and maintenance of eggs under hatchery conditions

Larval rearing requirements (live feed, production environment management, monitoring and prevention of diseases)

On-growing technical requirements (installations, equipment, specific requirements)

Growth rates and food efficiency assessment

Assessment:

A case study will be required to be prepared on a new fish species, intended for farming in an existing farm. The main point will be to replace present farmed species. A cost benefit analysis according to biological data will be requested,

Unaccredited sectoral skill acquisition

Professional short training courses

viii. Fish Welfare Training



Course title: Fish Welfare Training

The unit is designed for candidates to gain knowledge and understanding of fish welfare concepts, legislation, and disease management. On completion of this course, candidates will have developed the skills required to identify stress responses in fish and other welfare concerns, to measure and monitor to improve fish health and end product quality in a fish farm by following good husbandry practice.

Course Type: Training Course

Entry Level: Entry is at the discretion of the centre.

Credit Points: N/A

Credit Points, Level and Framework: 3 credit points at SCQF Level 4

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
None%	None%	None%	None%	None%	None%	None%

Unit title: Fish Welfare Training

Purpose: The unit is designed for candidates to gain knowledge and understanding of fish welfare concepts, legislation, and disease management. On completion of this course, candidates will have developed the skills required to identify stress responses in fish and other welfare concerns, to measure and monitor to improve fish health and end product quality in a fish farm by following good husbandry practice.

Entry Level: At the discretion of the centre



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Assessment: Don't know yet

Optional Supplementary Information: N/A

Outcome: 2. Describe and demonstrate water quality parameters and other which affects fish welfare.

Knowledge and Skills:

- Osmoregulation and its importance in fish welfare.
- The physical and chemical characteristics of water that can affect water quality (Dissolved oxygen, carbon dioxide, pH and ammonia)
- The importance of stocking density and other factors such as jelly fish, photoperiod which affect fish health.

Evidence:

Candidates will demonstrate that they can:

- (a) Outline the role of osmoregulation and its importance to fish welfare.
- (b) Investigate the physical and chemical characteristics of water that can affect water quality (Dissolved oxygen, carbon dioxide, pH and ammonia)
- (c) State the importance of stocking density and other factors such as jelly fish, photoperiod which affects fish health.

Assessment: Don't know yet

Outcome: 1. Define welfare concepts and codes of practice, factors responsible for causing stress and to manage disease in a fish farm.

Knowledge and Skills:

On completion of this unit, candidates should be able to:

1. Describe welfare concepts, codes of practice and legislation applied to fish farming in UK
2. Demonstrate knowledge on the terminology of stress, factors inducing stress and the stress response.
3. State the different control and preventive measures which can be applied for disease management.

Evidence: Candidates will produce written evidence that they can:

1. Describe welfare concepts, codes of practice and legislation applied to fish farming in UK
2. Demonstrate knowledge on the terminology of stress, factors inducing stress and the stress response.
3. State the different control and preventive measures which can be applied for disease management.

Assessment:

Outcome: 3. Describe husbandry practices with reference to harvesting and welfare end product quality, measuring and monitoring welfare

Knowledge and Skills:

- Husbandry and pre-harvest handling procedures in relation to fish welfare.
- Comparison and analysis of different harvest methods in relation to fish welfare
- Identification of welfare indicators,
- Ability to assess quality
- Ability to record observations.

Evidence: Candidates will demonstrate that they can:

- (a) Demonstrate knowledge on husbandry and pre-harvest handling procedures with reference to welfare considerations.
- (b) Interpret and evaluate different harvest methods in relation to how each method will affect the welfare and end product quality.
- (c) Evaluate different harvest methods in relation to how each method will affect the welfare and end product quality
- (d) Be able to identify welfare indicators
- (e) Be able to assess quality
- (f) Record observations.

Assessment: Don't know yet

Unit title: Treat health problems in fish

Purpose:

The unit is designed for candidate to gain knowledge and understanding of fish welfare concepts, legislation, and disease management. Candidates will develop the skills required to identify stress responses in fish and other welfare concerns, to measure and monitor to improve fish health and end product quality in a fish farm by following good husbandry practice.

Entry Level: At the discretion of the centre

Assessment: N/A

Optional Supplementary Information: N/A

Unaccredited sectoral skill acquisition

Professional short training courses

ix. Introduction to marine biodiversity



Course title: Introduction to marine biodiversity

The aim of the course is to introduce candidates to the complexities of marine diversity in terms of genetic diversity (the genetic variation that can occur within and between individuals of the same population or species); species diversity (how species diversity of a marine site is measured; how to use practical methods for measuring; how statistical packages are used to estimate trends; how to use statistical packages to interpret trends; how to use statistical packages to estimate and interpret unique features) and habitat diversity. Units 1 & 2 introduce several types of statistical packages, as well as introducing candidates to the practicalities of marine sampling techniques. In Unit 3, the aim is to give the student fuller awareness of the invaluable goods and services provided by the marine environment, by evaluating and quantifying aspects which are usually ignored or grossly under-valued. Unit 4 deals with threats to marine biodiversity most of which are caused by anthropogenic factors.

Course Type: Training Course

Entry Level: At discretion of presenting centre but some knowledge of statistical packages is desirable.

Credit Points: N/A

Credit Points, Level and Framework: Desired EQF level 6

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
50%	10%	None%	None%	40%	None%	None%

Unit title: Genetic biodiversity

Purpose: This unit deals with the genetic variation that can occur within and between individuals of the same population or species. On completion of this unit candidates should know the methods of analysis, how to measure genetic diversity, should know how to use the Simpson Diversity Index and how to interpret trends and unique features

Entry Level: Undergraduate EQF level ?

Assessment: Continuous assessment, followed by short written examination



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Optional Supplementary Information: N/A

Outcome: 1. Methods of analysis of marine biodiversity

Knowledge and Skills:

On completion of the unit, candidates should know how to choose the most appropriate for a specific purpose/site.

Evidence: Candidates will be required to:

Take part in informal discussions concerning the methodology of analysis as presented

Assessment: Informal oral questioning; written test of understanding of statistical analytic packages as presented.

Outcome: 2. Measurement of marine biodiversity

Knowledge and Skills:

On completion of the Unit, candidates should know how to use the most appropriate statistical package for a specific purpose/site.

Evidence: Candidates will demonstrate their ability to choose the most appropriate package and to use it.

Assessment: Completion of test use of statistical package without supervision.

Outcome: 3. Simpson Diversity Index

Knowledge and Skills:

On completion of the Unit, candidates should be able to handle the Simpson Diversity index in order to classify findings at a specific marine site.

Evidence: Candidates will be required to:

Carry out a test survey/analysis using the Simpson Diversity Package.

Assessment: Written test

Outcome: 4. Interpretation of trends in a specific site

Knowledge and Skills:

On completion of the Unit, candidates should be able to interpret findings as trends in terms that are understandable both to the man in the street and the scientist.

Evidence: Candidates will be required to:

Take part in informal discussions in preparation for oral presentation/role play

Assessment: Informal oral questioning, part of continuous assessment

Outcome: 5. Interpretation of unique features in a specific marine site

Knowledge and Skills: On completion of the Unit, candidates should be able to identify unique features of a marine site in terms that are understandable both to the man in the street and the scientist.

Evidence: Candidates will be required to:

Make a presentation which includes a case study

Assessment: Written case study; oral presentation

Unit title: Species Diversity

Purpose: On completion of this unit, the candidate will know how to measure species diversity of a marine site, will know how to use practical methods for measuring, will know how to use statistical packages to estimate and interpret trends as well as unique features.

Entry Level: At discretion of centre, but some knowledge of statistical packages is desirable.

Assessment: Informal oral questioning; role play concerning interpretation of unique feature of marine site

Optional Supplementary Information: The course is run on a demand basis, with candidates having a wide range of previous managerial experience but little knowledge of the importance of biodiversity in environmental management issues.

Outcome: 1. Measurement of species diversity of a marine site (theoretical)

Knowledge and Skills: Candidates will know the theoretical elements needed to measure species diversity of a marine site.

Evidence: At discretion of centre but some knowledge of statistical packages is desirable.

Assessment: Informal oral questioning as part of continuous assessment.

Outcome: 2. Practical methods

Knowledge and Skills: Candidates will know the practical elements needed to measure species diversity of a marine site (quadrat measurements, beach sampling, underwater sampling techniques using diver-held instruments, use of ROVs for visual sampling,

etc.). Field trip to demonstrate beach sampling techniques.

Evidence: Candidates will demonstrate ability to identify the practical elements needed to measure species diversity of a marine site (quadrat measurements, beach sampling, underwater sampling techniques using diver-held instruments, use of ROVs for visual sampling, etc.).

Assessment: Continuous assessment; written report on field trip.

Outcome: 3. Estimation of trends (statistical package)

Knowledge and Skills:

Candidates will use previously acquired knowledge of statistical package to measure species diversity of a marine site and determine existence of trends if possible.

Evidence: Candidates will use taught materials to measure diversity and estimate trends in a specific marine site.

Assessment: Written report containing trend estimation carried out by means of statistical package.

Outcome: 4. Interpretation of trends (statistical package)

Knowledge and Skills:

Candidates will use previously acquired knowledge of statistical package to determine existence of trends if possible and interpret what this means for a specific marine site.

Evidence: Candidates will use taught material to determine existence of trends if possible and interpret what this means for a specific marine site.

Assessment: Short written report giving interpretation of results.

Outcome: 5. Estimation and interpretation of unique features.

Knowledge and Skills: Candidates will know how to identify unique features (species diversity) of a marine site.

Evidence: Candidates will provide written evidence of ability to identify unique feature (species diversity) of a marine site.

Assessment: Informal oral questioning; role play concerning interpretation of unique feature of marine site.

Unit title: Marine Biodiversity - Goods and Services

Purpose:

The aim is to give student fuller awareness of the invaluable goods and services

provided by the marine environment, by evaluating and quantifying aspects which are usually ignored or grossly under-valued.

On completion of this unit, the candidate should know and be able to discuss meaningfully the goods and services provided by the marine environment in terms of:

-raw materials

-food

-employment

-sits role in controlling climate change.

Entry Level: At discretion of centre, but some knowledge of statistical packages is desirable.

Assessment: Literature survey with oral presentation. Optional PR presentation on marine goods and services.

Optional Supplementary Information: The course is run on a demand basis, with candidates having a wide range of previous managerial experience but little knowledge of the importance of biodiversity in environmental management issues.

Outcome: 1. Quantifying specific aspects of goods and services

Knowledge and Skills:

On completion of this unit, the candidate will know how to quantify undervalued aspects of marine goods and services such as raw materials, food, employment and the role of biodiversity in controlling climate change.

Evidence: On completion of this unit, the candidate will demonstrate written understanding of how to quantify undervalued aspects of marine goods and services such as raw materials, food, employment and the role of biodiversity in controlling climate change. This will be done by conducting a literature search.

Assessment: 1. Written literature survey 2. Oral presentation of results

Outcome: 2. Evaluating specific aspects of goods and services

Knowledge and Skills:

On completion of this unit, the candidate will know how to evaluate specific aspects of goods and services, such as

Raw materials

Food

Employment

Role of biodiversity in controlling climate change

Evidence: The candidate will demonstrate ability to evaluate specific aspects of goods



and services by means of a literature search and survey.

Assessment: Written evaluation and role play in decisionmaking.

Unit title: Threats to Marine Biodiversity

Purpose: Most but not all threats to marine biodiversity are caused by anthropogenic factors. On completion of this unit, the candidate should know about the role played by habitat fragmentation or loss, invasive species, pollution, over-fishing and global climate change.

Entry Level: At discretion of centre, but some knowledge of statistical packages is desirable.

Assessment: Written presentation of regional case study on habitat loss.
Oral presentation on invasive species based on relevant literature search.

Optional Supplementary Information: The course is run on a demand basis, with candidates having a wide range of previous managerial experience but little knowledge of the importance of biodiversity in environmental management issues.

Outcome: 1. Habitat loss or fragmentation

Knowledge and Skills: On completion of this unit, the candidate will have conducted a literature search in order to be able to complete the compulsory part of the unit, the regional case study on habitat loss.

Evidence: Candidate must demonstrate written evidence of understanding of importance of habitat loss.

Assessment: Written presentation of regional case study on habitat loss. (not optional).

Outcome: 2. Invasive species

Knowledge and Skills: On completion of this unit, the candidate will have conducted a literature search in order to be able to understand the importance of invasive species in reducing marine biodiversity.

Evidence: Written demonstration from literature search

Assessment: Oral presentation on invasive species based on relevant literature search (optional)

Outcome: 4. Pollution



Knowledge and Skills: On completion of this unit, the candidate will have conducted a literature search in order to be able to complete an optional part of the unit, the regional case study on pollution sources.

Evidence: Written presentation of regional case study on local pollution sources. (optional).

Assessment: Written presentation of regional case study on local pollution sources. (optional).

Outcome: 5. Global climate change

Knowledge and Skills:

On completion of this unit, the candidate will have conducted a literature search in order to be able to complete an optional part of the unit, an assessment of the impact of global climate change.

Evidence: Written presentation of assessment of impact of global climate change. (optional).

Assessment: Written presentation of assessment of impact of global climate change. (optional).

Unaccredited sectoral skill acquisition

Professional short training courses

x. Introduction to Salmon Production



Course title: Introduction to Salmon Production

This course is designed to provide candidates with the ability to work in the salmonid aquaculture and fisheries management industries, as well as for those wishing to improve their knowledge and understanding of salmonid fish rearing.

This Course is intended to prepare you for work in the salmonid aquaculture and fisheries management industries but is equally valuable if you have a particular interest in salmonid fish.

The Course has 2 units. Each unit has separate Outcomes. In Unit 1 you will study Fish Hatchery Management. This Unit is designed to enable candidates to gain knowledge



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and understanding of hatchery operations and develop the skills required to assess potential, plan production, manage fish stocks and conduct hatchery operations.

In Unit 2 you will study cage fish farm operations. The Unit is designed to enable candidates to develop an appreciation of the use of floating cages in freshwater and marine fish farming. On completion, candidates will be able to recognise the main types of cage, the types of materials used in cage construction and the types of mooring system. Candidates will also gain experience in working on these structures.

It is recommended that you supplement your learning by gaining as much practical experience as possible. Visits or voluntary work would allow you to increase both your practical skills and knowledge and understanding of the many different aspects of work in the salmonid industry

Course Type: Training Course

Entry Level: At the discretion of the centre. No prior aquaculture knowledge required.

Credit Points: N/A

Credit Points, Level and Framework: Level 7 (SCQF)

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
50%	25%	None%	None%	None%	25%	None%

Unit title: Fish Hatchery Management

Purpose: This Unit is designed to enable candidates to gain knowledge and understanding of hatchery operations and develop the skills required to assess potential, plan production, manage fish stocks and conduct hatchery operations.

On completion of the Unit the candidate should be able to:

- 1 Describe the design and function of hatchery equipment.
- 2 Estimate the production potential of a hatchery.
- 3 Explain the principles of hatchery stock management.
- 4 Conduct ova production and husbandry operations.
- 5 Conduct juvenile fish rearing operations.

Entry Level: Access to this Unit is at the discretion of the centre, however it would be beneficial if candidates have achieved the following National Units: D854 11 Fish Farming: Water Supply and D853 11 Fish Farming: Salmonid Ova Production or equivalent or if they had some previous hatchery work experience.

Assessment: N/A

Optional Supplementary Information: While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

This Unit is intended for candidates who are working in or seeking a career in the salmonid aquaculture industry or for candidates working in the fisheries management industry.

The teaching and learning of this Unit should be delivered in this context.

Health and safety procedures should always be followed especially in the practical components of this Unit.

Outcome: Describe the design and function of hatchery equipment

Knowledge and Skills: - Commercial ova incubation systems

- Holding units for juvenile fish
- Hatchery environmental control equipment
- Ova and juvenile fish production equipment

Evidence: Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can describe the operation and design of:

- ◆ two types of commercial salmonid ova incubation system
- ◆ two types of holding Unit for juvenile salmonid fish
- ◆ salmonid hatchery environmental control equipment to include one example of equipment used to control each of the following: water supply; water quality; lighting
- ◆ salmonid ova and juvenile fish production equipment, to include one type of equipment for each of the following: administering feed; controlling hygiene; grading fish; treating disease; vaccinating fish

All of the above must be carried out in closed-book conditions.

Assessment: This Outcome could be assessed using extended response questions.

Outcome: Estimate the production potential of a hatchery

Knowledge and Skills: - Hatchery water supplies

- Physical hatchery design characteristics
- Ova and fish production potential
- Hatchery operation equipment

Evidence: Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ analyse the quantity and quality of a given water source with reference to its suitability for use in a salmonid hatchery
- ◆ produce a hatchery design from given physical characteristics to ensure efficient use of

available space

- ◆ estimate the number of salmonid ova and juvenile fish that could be produced from a given situation and water supply
- ◆ produce a list of equipment, with justification for each item and type, that would be required in order to produce the estimated number of salmonid ova and fish

The evidence for this Outcome should relate to an existing hatchery site.

Assessment: This Outcome could be assessed by a case study carried out in open-book conditions.

Outcome: Explain the principles of hatchery stock management

Knowledge and Skills: - Principles of salmonid broodstock selection

- Principles of sex reversal in salmonids
- Husbandry of salmonid broodstock
- Salmonid broodstock stripping
- Salmonid ova incubation
- Ova husbandry and hygiene procedures
- Alevin husbandry and hygiene procedures
- Principles of rearing juvenile salmonid fish

Evidence: Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ explain the selection criteria for salmonid broodstock, to include age and size of fish, origin, genetics and conformation
- ◆ explain the principles and techniques used to achieve single sex and sterile populations of salmonid fish
- ◆ describe the husbandry requirements of salmonid broodstock, including reference to holding units, stocking density, nutrition, disease control and life span
- ◆ describe salmonid broodstock stripping techniques, to include production of mixed sex, single sex and triploid ova
- ◆ describe industry recognised salmonid ova hygiene and husbandry procedures from the point of fertilisation to hatching, to include washing off excess milt, water hardening, counting, incubation, picking out mortalities, shocking and transportation techniques
- ◆ describe industry recognised alevin hygiene and husbandry procedures from hatching to first feeding to include lighting, picking out mortalities and assessment of yolk sac utilisation
- ◆ describe industry recognised procedures used to rear juvenile salmonid fish, to include hygiene, feeding, grading, stocking density, sample weighing, environmental control and disease control

All of the above must be carried out in closed-book conditions.

Assessment: This Outcome could be assessed using extended response questions.

Outcome: Conduct ova production and husbandry operations

Knowledge and Skills: - Salmonid broodstock selection

- Salmonid broodstock sexual products
- Salmonid ova fertilisation and incubation
- Quantifying salmonid ova production
- Salmonid ova and alevin hygiene

Evidence: Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ select ripe salmonid broodstock based on physical indications of sexual maturity on three occasions
- ◆ remove sexual products from salmonid broodstock females and males on three occasions
- ◆ fertilise and prepare salmonid ova for incubation, on three occasions
- ◆ count the number of fertilised salmonid ova produced on three occasions
- ◆ incubate salmonid ova, monitor their environment and development and record the results twice weekly over the period from incubation to hatching
- ◆ remove dead salmonid ova and alevins at appropriate stages of development on three occasions

All of the above must be carried out under supervised conditions.

Assessment: This Outcome could be assessed using performance evidence observed and recorded at an existing hatchery site together with candidates' records.

Outcome: Conduct juvenile fish rearing operations

Knowledge and Skills: - Juvenile salmonid fish husbandry

- Sample weighing of juvenile fish
- Disease treatment of juvenile fish

Evidence: that they can, over a period of twelve weeks:

- ◆ monitor juvenile salmonid fish development and behaviour when the yolk sac is nearly depleted on two occasions
- ◆ monitor daily feed utilisation and feed juvenile salmonid fish accordingly
- ◆ monitor the environmental conditions for juvenile salmonid fish to include daily water temperature check and weekly water flow rate check
- ◆ monitor and remove waste and mortalities on a daily basis
- ◆ grade juvenile salmonid fish according to size on three occasions

- ◆ monitor and record on a weekly basis, juvenile salmonid fish sample weights in two holding units
- ◆ observe and record any abnormal behaviour in a juvenile salmonid fish population in a hatchery holding Unit on two occasions
- ◆ record disease treatments and daily mortalities in a population of juvenile salmonid fish

All of the above must be carried out under supervised conditions.

Assessment: This Outcome could be assessed using performance evidence observed and recorded at an existing hatchery site together with candidates' records.

Unit title: Floating Cage Fish Farm Operations

Purpose: The Unit is designed to enable candidates to develop an appreciation of the use of floating cages in freshwater and marine fish farming. On completion, candidates will be able to recognise the main types of cage, the types of materials used in cage construction and the types of mooring system. Candidates will also gain experience in working on these structures.

Entry Level: Entry is at the discretion of the centre.

Assessment: N/A

Optional Supplementary Information: GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Introduction to floating cages including types, materials used in manufacture, cage mooring and the use of cage nets could be delivered in a classroom situation with sessions used to investigate the appropriate cage type for a selection of sites.

A visit to a working floating cage site could be used to demonstrate the cage types, materials, mooring and cage nets. If possible, visits to more than one site would help candidates to appreciate differences in cage type and mooring system.

Access to floating cages is necessary to fulfil the requirements of Outcome 3.

Candidates must feed fish, fit predator nets, clean and repair cage nets, monitor fish in cages for growth and disease as well as the environment around the cages.

There is scope for student-centred learning exercises based on text references, internet-based resources and interactive IT-based learning objects presented within a virtual learning environment (VLE).

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence

and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence.

DISABLED CANDIDATES AND/OR THOSE WITH ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required.

Outcome: Describe floating cage systems

Knowledge and Skills: (a) Identify and describe the types of floating cage commonly used.

(b) Consider the suitability of different types of floating cage systems with regard to given site conditions.

(c) Describe cage configurations and mooring systems used for a given site.

(d) Outline the procedures involved in fitting and maintaining cage nets.

Evidence: Written and/or recorded oral evidence

The candidate must:

- ◆ identify and describe three types of floating cages commonly used in commercial fish farming
- ◆ select suitable cages for two given sites
- ◆ describe one cage configuration and mooring system for a given site
- ◆ describe the tasks involved in fitting and maintaining cage nets for a given farm

Assessment: Outcomes 1 and 2 could be assessed using an integrated open-book approach such as a portfolio of evidence.

Outcome: Describe husbandry operations for a floating cage fish farm

Knowledge and Skills: (a) Outline the processes used to stock floating cages with fish.

(b) Describe feeding systems used to feed fish in floating cages.

(c) Describe the monitoring procedures used on a floating cage farm.

(d) Describe the methods used to remove fish from floating cages.

Evidence: Written and/or recorded oral evidence

The candidate must describe the following husbandry operations for a floating cage fish farm:

- ◆ One method of stocking fish
- ◆ Two methods of feeding fish
- ◆ Procedures for monitoring fish growth, feeding response and health
- ◆ Procedures for monitoring two environmental conditions
- ◆ Two methods for moving live fish from a floating cage
- ◆ Two methods for removing fish mortalities from a floating cage

Assessment: Outcomes 1 and 2 could be assessed using an integrated open-book

approach such as a portfolio of evidence.

Outcome: Carry out husbandry operations for a floating cage fish farm

Knowledge and Skills: (a) Maintain given floating cage nets in accordance with appropriate health and safety requirements.

(b) Feed fish in a given floating cage in accordance with appropriate health and safety requirements.

(c) Conduct monitoring procedures for a given floating cage fish farm in accordance with appropriate health and safety requirements.

Evidence: The candidate must be able to perform the following tasks on a floating cage system in accordance with recognised health and safety requirements:

Candidates will:

- ◆ assist in the maintenance of a cage net
- ◆ assist in the fitting of a top net
- ◆ feed fish on a minimum of one occasion
- ◆ monitor fish growth, feeding response and health
- ◆ monitor two environmental conditions

Assessor observation checklists and other assessment records should be maintained and kept up to date to keep track of candidate progress and to provide evidence for internal and external verification purposes.

Centres must be satisfied that the evidence submitted is the work of individual candidates.

Assessment: Outcome 3 requires the observation of practical activity with the results recorded on checklists to satisfy the Performance Criteria. Evidence could be gathered on an ongoing basis through the observation of candidates performing routine operations and monitoring of the fish and the cage environment.

Unaccredited sectoral skill acquisition

Professional short training courses

xi. Basic principles of aquaculture production



Course title: Introduction to basic principles of aquaculture

Learning the basic principles of aquaculture, the major farmed species for human consumption and methodology used and the environmental issues that can affect



Lifelong Learning Programme

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aquaculture

Course Type: Training Course

Entry Level: No specific prior knowledge in aquaculture required. Students should have finished secondary education or equivalent.

Credit Points: N/A

Credit Points, Level and Framework: Desired 3 ECTS

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	20%	20%	20%	20%	None%	None%

Unit title: Introduction to basic principles of aquaculture

Purpose: This unit is designed to introduce students to the Basic principles of aquaculture. Candidates will gain in understanding of the variety of species, cultivation methods and environmental considerations.

On the completion the candidate will be able to:

- Identify the principal species farmed
- Describe cultivation methods
- Identify environment issues which may affect aquaculture

Entry Level: No specific prior knowledge in aquaculture required. Students should have finished secondary education or equivalent.

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: Describe the main cultivation methods used in aquaculture

Knowledge and Skills: Extensive, semi-intensive and extensive aquaculture

Types of cultivation:

- tank,
- box,
- long-line/rope,
- sea ponds,
- floor
- cages

Evidence: Candidates will be able to:

Describe what is meant by, and give examples of:

- Extensive farming
- Semi-intensive farming
- Intensive farming

Describe the different types of cultivation, and species in each one:

- tank,
- box,
- long-line/rope,
- sea ponds,
- floor
- cages

Assessment: Assessment will be done at the end of each unit by an exam of 90 minutes.

This Outcome may be assessed holistically using a series of questions to identify key major farmed species for human consumption.

Outcome: Identify major farmed species

Knowledge and Skills: The study of native and non-native species

Evidence: Candidates will need to show that they can:

- identify and name the native species
- identify and name the non-native species

Assessment: Assessment will be done in end of unit in an exam of 90 minutes.

From this Outcome may be assessed holistically using a series of questions to identify key major farmed species for human consumption

Outcome: Identify environment issues that may affect aquaculture

Knowledge and Skills: Climate

Hydrological conditions such as wave, currents, tidal, temperature and so on

Water availability and quality

Land/sea uses such as protected areas, national parks, leisure activities

Natural/controlled environments

Legal considerations local/nationally/european

Evidence: Identify:

- A range of environment conditions which can affect aquaculture
- The optimal condition for selected methods of cultivation
- The main legislation

Assessment: Assessment will be done in end of unit in an exam of 90 minutes.

From this Outcome may be assessed holistically using a series of questions to identify environmental issues that may affected aquaculture

Unaccredited sectoral skill acquisition

Professional short training courses

xii. Introduction to aquaculture productions



Course title: Basic course in aquaculture

Learning the basic principles of aquaculture, the major farmed species for human consumption and methodology used and the environmental issues that can affect aquaculture

Course Type: Training Course

Entry Level: None or level 1

Credit Points: N/A

Credit Points, Level and Framework: 3 ECTS

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
20%	20%	40%	20%	None%	None%	None%

Unit title: Introduction to basic principles of aquaculture

Purpose: This unit is designed to introduce students to the Basic principles of aquaculture. Candidates will gain in understanding of the variety of species, cultivation methods and environmental considerations.

On the completion the candidate will be able to:

Identify the principal species farmed

Describe cultivation methods

Identify environment issues which may affect aquaculture

Entry Level: Level 1 - 2

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: Describe the main cultivation methods used in aquaculture

Knowledge and Skills: Extensive, semi-intensive and extensive aquaculture

Types of cultivation:

- tank,



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- box,
- long-line/rope,
- sea ponds,
- floor
- cages

Evidence: Candidates will be able to:

Describe what is meant by, and give examples:

- Extensive farming
- Semi-intensive farming
- Intensive farming

Describe the different types of cultivation, and species in each one:

- tank,
- box,
- long-line/rope,
- sea ponds,
- floor
- cages

Assessment: Assessment will be done in end of unit in an exam of 90 minutes.

From this Outcome may be assessed holistically using a series of questions to identify key major farmed species for human consumption

Outcome: Identify major farmed species

Knowledge and Skills: The study of native and non-native species

Evidence: Candidates will need to show that they can:

- identify and name the native species
- identify and name the non-native species

Assessment: Assessment will be done in end of unit in an exam of 90 minutes.

From this Outcome may be assessed holistically using a series of questions to identify key major farmed species for human consumption

Outcome: Identify environment issues that may affect aquaculture

Knowledge and Skills: Climate

Hydrological conditions such as wave, currents, tidal, temperature and so on

Water availability and quality

Land/sea uses such as protected areas, national parks, leisure activities

Natural/controlled environments

Legal considerations local/nationally/european

Evidence: Identify:



- A range of environment conditions which can affect aquaculture
- The optimal condition for selected methods of cultivation
- The main legislation

Assessment: Assessment will be done in end of unit in an exam of 90 minutes.
From this Outcome may be assessed holistically using a series of questions to identify environmental issues that may affected aquaculture

Non-standard aspects of higher education courses

Course work units

xiii. Water transport and water treatment in aquaculture



Course title: water transport and water treatment in aquaculture

The course is designed to give the student basic knowledge on technical equipment, methods and systems used for water transport and water treatment on aquaculture facilities.

Course Type: Training Course

Entry Level: Bachelor degree in life science or ongoing bachelor degree studies at the Norwegian University of Life Sciences (UMB).

Credit Points: N/A

Credit Points, Level and Framework: 2,5 ects, EQF 5-6

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
100%	None%	None%	None%	None%	None%	None%

Unit title: water transport systems

Purpose: To gain knowledge and understanding of water transport systems used in aquaculture and be able to evaluate common used systems and select components in new systems. On completion of the unit the student shall be able to:

- select pipe material, pipe parts and valve type for common simple water transport systems in aquaculture



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- calculate water velocity and head loss in common piping systems
- select water pumps for common aquaculture situations

Entry Level: Candidates should have experience or knowledge on EQF level 5 (factual/theoretical knowledge in a broad context)

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: select pipe material, pipe parts and valve type for common simple water transport systems in aquaculture

Knowledge and Skills: - know which materials are used in pipings systems with their advantages and disadvantages

- know design and function of major pipe parts and valves and where to use them

Evidence: - be able to select pipe material, pipe parts and valves for use in aquaculture piping system

- be able to calculate water velocity and head loss in a given aquaculture common piping system
- be able to select a pump for a given common situation in aquaculture

Assessment: part of a written exam

Outcome: select water pumps for common aquaculture situations

Knowledge and Skills: - know design and function of common types of water pumps used in aquaculture with advantages and disadvantages

- know how to use a pump diagram for showing the pump performance under different conditions
- know the most actual methods for regulating water pumps with advantages and disadvantages and how it affects the pump performance

Evidence: - be able to select water pumps for common aquaculture situations

Assessment: Written exam, part of overall course

Outcome: calculate water velocity and head loss common simple piping systems in aquaculture

Knowledge and Skills: - calculate water velocity in pipes

- calculate head loss in pipes and pipe parts
- use diagrams to find water velocity and head loss



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Evidence: - be able to calculate water velocity and head loss for given simple piping systems in aquaculture

Assessment: part of written exam

Unit title: water treatment equipment

Purpose: To gain knowledge and understanding of various water treatment equipment and systems in aquaculture and be able to evaluate common used equipment and select necessary components in new systems. This includes inlet water treatment, outlet water treatment and water reuse systems.

On completion of the unit the student shall be able to:

- select equipment for treatment of inlet water to aquaculture facilities
- select equipment for treatment of outlet water from aquaculture facilities
- select equipment for treatment of water in a water reuse system

Entry Level: Candidates should have experience or knowledge on EQF level 4 (factual/theoretical knowledge in a broad context)

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: select equipment for treatment of inlet water to aquaculture facilities

Knowledge and Skills: - know general water quality requirements for optimal fish farming

- know general effects on surroundings of waste water from aquaculture facilities
- know how pH can be regulated in water and common equipment/systems used for regulation of pH with advantages and disadvantages
- know design and function of common methods for particle removal for inlet water in aquaculture with advantages and disadvantages
- know design and function of common methods for water disinfection for inlet water in aquaculture with advantages and disadvantages
- know design and function of common methods/equipment for heating and cooling of water for aquaculture facilities with advantages and disadvantages
- know design and function of common methods/equipment for aeration and oxygenation of water for aquaculture facilities with advantages and disadvantages

Evidence: - be able to select necessary equipment for treatment of inlet water to an aquaculture facility for a chosen fish specie

Assessment: part of written exam

Outcome: select equipment for treatment of outlet water from aquaculture facilities

Knowledge and Skills: - know general characteristics of waste water from aquaculture facilities

- know general effects on surroundings of waste water from aquaculture facilities
- know actual methods for waste water treatment and the purpose of using them
- know design and function of common methods for particle removal for outlet water in aquaculture with advantages and disadvantages

Evidence: - be able to select necessary equipment for treatment of outlet water from an aquaculture facility with a given production sending the outlet water to a given recipient

Assessment: part of written exam

Outcome: select equipment for treatment of water in a water re-use system

Knowledge and Skills: - know general water quality requirements for optimal fish farming

- know advantages and disadvantages with water re-use systems (RAS)
- know methods for description and characterisation of different water re-use systems
- know design and function of common methods for water treatment in water re-use systems in aquaculture with advantages and disadvantages

Evidence: - be able to select equipment for treatment of water in a specified aquaculture water re-use system

Assessment: part of written exam

Non-standard aspects of higher education courses

Course work units

ix. Water treatment as a tool for improvement in traditional carp farming



Course title: Water Treatment as a tool for improvement in Traditional Carp farming



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The candidates are the European fishfarmers practicing the traditional traditional earth pond fish farming. On EQF scale, user is defined on level 3 before the course and graded to level 4 after completion of the course. Some traditional pond farmers are under social-/economical and environmental pressure. The most important action for meeting new requirements are increase in productivity and reduction in environmental impact from the activity. Amongst many solutions, treatment of rearing water is perhaps the most efficient action to be taken.

In this course, two first units are based on an earth pond farm and its operation. The following units are focusing on the elementary knowledge in fish nutrition and physiology, followed by methods and detailed definitions of water treatment equipments and their function, relevant to the fish farmers needs. The success criteria is >25% increase in productivity of the farm and return on investment within 5 years.

Course Type: Training Course

Entry Level: Knowledge:

- Have the factual knowledge in broad contexts within a field of carp farming, technology and management.
- Have no or limited knowledge in fields of water quality and water treatment technologies.

Skills:

- Have the ability to apply expertise in a range of cognitive and practical skills in generating solutions to specific problems in a field of water quality and water treatment technologies.

Competence:

- Have the competence in self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change
- Have the competence to supervise technical improvements of the farm and the routine operational work on new technologies.

Credit Points: N/A

Credit Points, Level and Framework: Grade 4 on EQF scale

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course	Work Team	Work	Other
70%	None%	None%	30%	None%	None%	None%	None%

Unit title: 1. Definition of a Carp earth pond farm

Purpose: The unit defines together with candidates a fish farm, growing carp in earth ponds.



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The aim of this unit is: 1) Getting a common understanding of an earth pond farm and 2) opening and training discussion amongst participants in a field in which they identify themselves with.

Entry Level: Candidates should be highly skilled in practical carp pond farming.

Assessment: N/A

Optional Supplementary Information: Assessment:

Optional Supplementary Information: Participation in debates. Duration: 30 min.

Outcome: 1.1. Flow through Farm

Knowledge and Skills: 1. The candidate should have the competence to perform practical work, take independent decisions and to manage a carp pond farm.
2. The candidate should be able to give a general description of a flow through farm and its operation.
3. The candidate should be able to discuss methods enabling increase in productivity and/or saving use of natural resources.

Evidence: 1. Can explain the technology of a earth pond fish farm and the function of it..
2. Can compare technology and its function on an earth pond with a farm using manufactured self cleaning rearing tanks and raceways.

Assessment: The candidate should be able to participate in discussion comparing and evaluating the technical aspects and management of different types of flow through farms.

Outcome: 1.2. Carp Production cycle.

Knowledge and Skills: Candidate should have the knowledge of the carps production cycle over 1 year in one pond (water parameters, biomass, feeding, flow, quality of inlet-/ outlet water, harvest)

Evidence: Can predict seasonal growth, feeding rate, water flow and other environmental impact related to feeding.

Assessment: The candidate should be able to debate about productivity in a grow earth pond farm and the environmental impact of the production.

Outcome: 1.3. Economics of a carp farm.

Knowledge and Skills: Candidate should have the knowledge of productivity, market and



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basic economical principles in carp farming.

Evidence: Appraise a financial sheet.

Assessment: Candidate should be able to predict the close future perspectives (production methods, market etc.) for the business.

Unit title: 2. The carp and feeding

Purpose: Unit 2 is based on information given on the content declaration of at least two different manufactured food types. Aim of this unit is to illustrate the connection between food quality (macro nutrients), fish growth and water quality.

Entry Level: Candidates should be highly skilled in practical carp pond farming.

Assessment: N/A

Optional Supplementary Information: Assessment: Participation in debates.

Duration: 30 min.

Outcome: : 2.1. The Food formula for carp.

Knowledge and Skills: Candidate should be able to relate different declarations of manufactured carp food to fish nutrition and fish growth.

Evidence: Discriminate the content declaration labels on different types of food.

Assessment: Candidate should be able to point out the different nutrients and energy content in digestible and indigestible food.

Outcome: 2.2. Impact on pond from feeding.

Knowledge and Skills: Candidate should be able to relate the food distributed into the pond to water quality and environmental impact.

Evidence: Can outline the relationship between, digested, undigested food, the nutritional content and excretion.

Assessment: 1. Able to appraise how feeding affects the carp and its environment, inside the pond.
2. Able to debate energy consumption, excretion and how excretion and uneaten food affects the pond.

Outcome: 2.3. Feeding and water quality. optimal values for carp.

Knowledge and Skills: The candidate should be able to list main water quality parameters for carp, related to other species.

Evidence: 1. Can outline for the carp the optimal values/concentrations for main water quality parameters (oxygen, pH, ammonia, nitrate and phosphor compounds)
2. Can identify the sequence of necessary water treatment operation for maintaining the water quality in the pond.

Assessment: 1. The candidate should be able to discuss how much new water is needed for keeping the level of metabolites at optimal-/acceptable level for the carp.
2. The candidate should be able to discuss the different water quality parameters interaction and the influence of these on physiology of the carp.

Unit title: 3. Particle Removal

Purpose: Unit 3 explains the connection between particle size and settlement of particles, inside a pond. User will be able to get an understanding of the relevant techniques and how the use of these techniques improve the water quality and diminish the environmental effect of the farming activity.

Entry Level: Candidates should be highly skilled in practical carp pond farming, but with a limited experience in water treatment, including particle removal.

Assessment: N/A

Optional Supplementary Information: Assessment: Participation in debates about particles characteristics in fish farming and particle removal methods.

Duration: 30 min.

Outcome: 3.1. Sedimentation pond

Knowledge and Skills: Candidate should have insight into the basic principles of designing a sedimentation pond, including settlement of particles, relates to particle size, water flow rate and optimal hydrodynamic for settlement.

Evidence: Outline the criteria for a settlement pond and the maintenance of it.

Assessment: Candidate should be able to participate in a debate of how to (re)construct a settlement pond.

Outcome: 3.2. Whirl separator

Knowledge and Skills: Candidate should have insight into the use of different types of whirl separators and their efficiency.

Evidence: Discriminate different types of whirl separators and efficiency of the technique.

Assessment: The candidate should have the ability to participate in a discussion about integration of the technique into an existing farm.

Outcome: 3.3. Particle filters

Knowledge and Skills: Candidate should have insight into different types and different particle filter products, efficiency, energy consumption and prices.

1. Whirl separators
2. Sandfilters
3. Belt filters.
4. Drumfilters.

Evidence: Can describe different types of mechanical filters and influence of different mesh size on efficiency.

Assessment: Candidate should be able argue for a selection of different types of particle filters for different purposes.

Outcome: 3.4. Bacterial removal

Knowledge and Skills: Candidate should have basic insight into the use UV light and ozone in fish farming

Evidence: List different types of whirl separators and efficiency of the technique.

Assessment: The candidate should have the ability to participate in a discussion about integration of the sterilization technique into an existing farm and the benefits of the sterilization technology.

Unit title: 4. Oxygenation in fish farming

Purpose: Unit 4 explains the available oxygen for the fish based on relative or absolute values for the oxygen level in inlet- and outlet water. The user will get an understanding of the use of pure oxygen in fish farming, including economical considerations.

Entry Level: Candidates should be highly skilled in practical carp pond farming, but with little or no experience in use of oxygen in the production.

Assessment: N/A

Optional Supplementary Information: Assessment: Candidate should be able to participate in a debate about different oxygenation equipments and of how to implement these on a flow through farm.

Presence of a technical supplier(s) is favourable.

Duration: 90 min.

Outcome: 4.1. Available oxygen for fish in rearing water.

Knowledge and Skills: Candidates should be able to:

1. Read from tables the relation between oxygen saturation and temperature.
2. Know the carps lethal- and optimal temperature for growth.
3. Calculate available oxygen for a given biomass in a pond for a given water flow and possible increase in biomass by aeration or addition of pure oxygen.

Evidence: Can outline available oxygen in inlet water for fish and the benefits of adding oxygen to the rearing water.

Assessment: Candidate should be able to discuss and define different methods in providing oxygen to the farmed fish and the benefits and disadvantages of the different methods.

Outcome: 4.2. Airation and CO2 removal.

Knowledge and Skills: Candidate should be able to describe the use of different equipments for raising oxygen level and stripping of CO₂. (leaky hoses, stones and paddling, Stripping tower, small, and large types)

Evidence: Can compare different aeration and stripping techniques in price, operating cost and efficiency.

Assessment: Candidate should be able to debate choice of aeration techniques and the management of these.

Outcome: 4.3. Oxygenation; Low pressure oxygenation

Knowledge and Skills: Candidate should be able to recognise and understand following aeration techniques, use and prices: Leaky hoses, air stones; reabsorbing oxygenators (home made and on market) and oxygen towers.

Evidence: Can compare different low pressure oxygenation techniques in use, price and operating cost.

Assessment: Candidate should have the ability to choose low pressure techniques for use on a farm and describe advantages and disadvantages.

Outcome: 4.4. High pressure oxygenation

Knowledge and Skills: Candidates should be able to define:

1. the design and use of an Oxygenation U-tube.
2. the design and use of an Oxygen cones, prices operating cost and efficiency.

Evidence: Can in co-operation with experts from oxygen companies define benefits and disadvantages of use of pure oxygen in fish farming.

Assessment: Candidates should have the ability to intergrade the technique and management of it into an existing farm and predict the benefits for efficiency and economy.

Outcome: 4.5. Oxygen from supplier or produced on site

Knowledge and Skills: Candidate should be able to define the choice of technique for oxygen supply in a fish farm (rent of an oxygen tank, installation and operation of an oxygen generator, oxygen bottles).

Evidence: Can compare price, level of expertise and reliability of different oxygen supply methods.

Assessment: Candidate should be able to debate the most cost efficient and reliable solutions for a fish farm.

Unit title: 5. Biofiltration

Purpose: Unit 5 explains the function of a biofilter and basic elements in its function. In areas with eufhorisational problems, the user will get an overview over the benefits of treating the water inside the farm instead of, because of new legalisations or treat the effluents. The user will be able to build and operate a small size biofilter. Presence of a technical supplier(s) is favourable.

Entry Level: Candidate should have experience in the flow through technology on a fish farm.

Assessment: N/A

Optional Supplementary Information: Duration: 90 min.

Outcome: 5.1. Biofilter as a living organism.

Knowledge and Skills: 1. the substrate-bacteria relation in a biofilter and different materials for creation of biofilter volume with high surface/volume ratio (m²/m³), 2. the chemical processes causing removal of nitrogen- and organic compounds and the influence of these on pH and oxygen level of the water.

Evidence: Can explain the role and function of nitrifying bacteria in a biofilter.

Assessment: Candidates will be able to explain the biological processes in an active biofilter and how removal of organic compounds enables re-use of the water.

Outcome: 5.2. Building a small biofilter.

Knowledge and Skills: The candidate should be able to implement a small biofilter in an operating flow system:

A. Small biofilters

1. Fluidized bed biofilter
2. Hatcheri biofilter open.
3. Hatcheri biofilter, closed.

B. Large biofilters:

4. Horizontal biofilter.
5. Trickling biofilter.
6. Submerged/up flow biofilter.
7. Submerged/down flow biofilter

Evidence: Can discuss different types of biofilters and compare in price and efficiency.

Assessment: Te candidate will be able to design, build and operate with a small biofilter.

Outcome: 5.3. Visit to a carp farm.

Knowledge and Skills: The candidate should be able in groups to debate and define implementation of water equipmenrs and water quality measurements on the farm.

Evidence: Candidate should have received new knowledge at the course and participated in debates and discussions.

Assessment: Candidates in groups of 2-5 persons will be asked to define some water treatment action, possible to implement and cost efficient on the farm.



Unit title: Unit 1. Definition of a Carp earth pond farm

Purpose: The unit defines together with candidates a fish farm, growing carp in earth ponds.

The aim of this unit is: 1) Getting a common understanding of an earth pond farm and 2) opening and training discussion amongst participants in a field in which they identify themselves with.

Entry Level: Candidates should be highly skilled in practical carp pond farming. Entry level 6

Assessment: Duration: 30 min.

Optional Supplementary Information: N/A

Non-standard aspects of higher education courses

Field trips

x. Aquatic Farm Management Training



Course title: Aquatic Farm Management Training

This course will enable you to describe a particular Aquaculture-enterprise in terms of zootechnical and managerial aspects and to develop an up-to-date view on current aquaculture practice in a particular European environment.

Upon completion of this course, the applicant will be able to present a critical view on the workings of any Aquaculture enterprise.

Course Type: Training Course

Entry Level: Applicants are expected to have basic science training (demonstrable in the transcripts) in at least 5 out of 7 of the following fields:

- Mathematics, including basic statistics
- Physics
- Chemistry
- Biochemistry
- Biology
- Microbiology



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- Engineering

Some background in aquaculture is recommended

Credit Points: N/A

Credit Points, Level and Framework: 5 ECTS

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
None%	None%	None%	None%	None%	None%	None%

Unit title: Species orientation

Purpose: The purpose of this unit is for the candidate to construct a reference-framework of species, relevant to the locations that will be visited during the excursion.

Upon completion of this unit, the candidate should be able to:

- describe the species that are present at the different locations to be visited
- present an overview of commercial aquaculture-activities dealing with this species at the locations to be visited
- anticipate possible problems on a zootechnical and managerial level for the different commercial enterprises to be visited
- Propose a list of questions for the local entrepreneur concerning zootechnical and managerial elements in order to be able to come to a critical view on the mode of operating of the local enterprise.

Entry Level: Applicants are expected to have basic science training (demonstrable in the transcripts of a Bachelor-degree) in at least 5 out of 7 of the following fields: - Mathematics, including basic statistics - Physics - Chemistry - Biochemistry - Biology - Microbiology - Engineering Some background in aquaculture is recommended

Assessment: Applicants are assessed on the basis of a 15 min. anticipatory presentation for current aquaculture-practice at the locations to be visited on a zootechnical and managerial level and on the basis of the provision of a list of possible critical questions to be asked at the different locations to be visited.

Optional Supplementary Information: This first unit is meant to orientate the candidate towards the different locations and enterprises to be visited during the 10-day Aquaculture-excursion in a European country.

Outcome: evaluate the current state of aquaculture in reference to a particular species in a particular location and socio-economic environment

Knowledge and Skills: - describe current characteristics of species, relevant to particular

aquaculture-sites to be visited

- analyse existing information on the aquaculture-sites to be visited
- predict general zootechnical and managerial problems in reference to the commercial processing of these species at the enterprises to be visited.
- present an overview of current problems and possible questions for further investigation concerning Aquaculture-sites to be visited to a broad audience.
- inform peers about managerial and zootechnical aspects of aquaculture-sites to be visited and instigate a critical attitude towards the commercial processes

Unit title: Investigation and consultancy on current Aquaculture-practice

Purpose: The aim is to visit a particular fish, shrimp, mussel or oyster farm and analyse it. Economical, managerial and zoo-technical aspects will be discussed. It is furthermore important to get a critical view on the farm by the student. Zoo-technical aspects will be water treatment systems, tank design, hygiene, prevention, life food department, transport, culture aspects, etc. Economical aspects are: market prices larvae, finished product, production schedule vs expenses.

Entry Level: Applicants should have successfully finished unit 1 (species orientation) of this course.

Assessment: The applicant is assessed on the basis of a report and presentation, covering the evidence requirements.

Optional Supplementary Information: This unit offers practical insight into realtime aquaculture-practice. The applicant is taken on a 10-day excursion to a European country where a given set of Aquaculture-enterprises is visited.

Each applicant is given the role of interviewer at a given Aquaculture-site and has to gather enough information on the given Enterprises in order to be able to compile an evaluation report to be presented in written and oral format.

Outcome: Interview aquaculture-enterprise-representatives in order to obtain information about the zootechnical and managerial aspects of his Aquaculture-enterprise

Knowledge and Skills: - knowledge of general species-related zootechnical and managerial problems

- ability to predict zootechnical and managerial problems in reference to the species dealt with at a particular aquaculture-enterprise
- ability to compile relevant questions for elaboration of information on the relevant aquaculture-site
- ability to take into account interpersonal barriers when investigating a particular mode of operating at a particular Aquaculture-site in order to obtain site-specific information

Outcome: Provide objective description of aquaculture-site and propose creative

solutions to detected problems

Knowledge and Skills: - compiling an objective descriptive report, based on individual research, interviews of enterprise-representatives and inspection of fieldwork
 - discerning true information from commercial information
 - synthesizing obtained information and evaluating it against a scientific aquaculture-background.
 - formulating creative solutions to observed problems

Non-standard aspects of higher education courses

Field trips

xi. Aquaculture work placement



Course title: Aquaculture Work Placement

The course 'Work Placement' covers a training period of minimum 4 – 6 weeks in a mainly industrial, entrepreneurial or research environment in the field of aquaculture. Students will be engaged in normal working activities at a level corresponding to their final degree. Upon completion, the training-students will write a report and the report will be defended for a jury. In the report students will pay attention not only to the practical work they performed but also to aspects such as the economic position of the company, the strategy and management of the company etc.

Course Type: Work Placement

Entry Level: Applicants should have knowledge about General Aquaculture, Farming principles and production techniques of aquatic organisms and Aquatic resources management.

Credit Points: N/A

Credit Points, Level and Framework: 5 ECTS

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course	Work Team	Work	Other
None%	20%	None%	None%	None%	80%	None%	None%

Unit title: Work placement



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Purpose: The course 'Work Placement' covers a training period of minimum 4 – 6 weeks in a mainly industrial, entrepreneurial or research environment in the field of aquaculture. Students will be engaged in normal working activities at a level corresponding to their final degree. After finishing the training students will write a report and the report will be defended for a jury. In the report students will pay attention not only to the practical work they performed but also to aspects such as the economic position of the company, the strategy and management of the company etc.

Upon completion of this unit, candidates should be able to present a technical description of the company visited from different angles:

- Production performance
- Biological performance
- Environmental performance
- Marketing performance
- Financial performance

Candidates should after completion of this unit also be able to identify the problems for the company visited and describe them financially, technically and marketwise.

Candidates should after completion of this unit be able to produce creative solutions to the problems identified.

Entry Level: Candidates should have prior knowledge about general aquaculture, farming principles and production techniques of aquatic organisms and aquatic resources management

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: integrate oneself within the daily workings of a given enterprise or research facility

Knowledge and Skills: - basic accountancy

- interpersonal skills
- team-work-oriented attitude
- General aquaculture
- zootechnical knowledge on the species dealt with at the work placement location

Evidence: - describe the economic activity at the work placement location
- describe the key technical procedures at the work placement location
- identify and fulfill (in house) personal training needs in order to be able to participate in economic activities of the work placement
- organise a work-plan in concordance with the local supervisor
- carry out "on the job training" under supervision



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Assessment: This outcome will be assessed periodically by the local host and finally by the course-promoter.

The local host will assess the candidate on the basis of the work he performed during the work placement and will give a general appraisal of the candidate in terms of aptitude (technical and interpersonal), initiative, perseverance and punctuality.

The Course promoter will finally evaluate the candidate's work on the basis of a written report and an oral presentation, followed by cross-examination.

Non-standard aspects of higher education courses

Virtual Mobility courses (substitution for actual mobility exchanges)

xii. Tropical Ecology



Course title: Tropical Marine Ecology

Students will be given insight into the different integrated components of a tropical seascape, and their interactions between the ecosystems (mangrove, seagrass, coral) and the anthropogenic impacts they re exposed to. Students can carry out the course units in 3 ways: i) internet-based as all course materials can be accessed through the dedicated course website; ii) CD-ROM for those students with limited internet access; iii) from downloaded PDFs if printed materials are preferred. At the end of the course, students should be able to use the knowledge gained to prepare for ecosystem management roles, or as decisionmakers at the local or regional level. Assessment and accreditation will take place after registration with the course administrators.

Course Type: Training Course

Entry Level: Higher technician, postgraduate, professional management

Credit Points: N/A

Credit Points, Level and Framework: Desired: EQF Level 6. 6 ECVET (proposed)

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
None%	None%	None%	None%	None%	None%	100%

Unit title: The seagrass ecosystem



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Purpose: On completion of this unit, candidates will know the distribution and habitat requirements of the seagrass ecosystem, the biology of sea grass, seagrass flora and fauna and the seagrass food web. Candidates will be able to present a factual reasoned case for seagrass goods and services and understand and show how seagrass ecosystems can be sustained. These elements will be pursued via the sub-topics of protected areas, ecotourism, climate change and resilience.

Entry Level: Higher technician, postgraduate, management trainee

Assessment: Written examination on ONE of the above topics. Case study set by course tutor.

Optional Supplementary Information: This internet-based course has many similarities with Open University courses run throughout Europe. The main feature for its success is good communication (via email) with the course tutor.

Outcome: 1. Seagrass ecosystems biology

Knowledge and Skills: Candidates will be able to describe in detail the biology of seagrass ecosystems. Candidates will be able to recognise the threat to seagrass ecosystems.

Evidence: Candidates will be asked to describe in detail one aspect of the threat to seagrass ecosystems.

Assessment: Written essay, summative assessment

Outcome: 2. Seagrass ecosystems (flora and fauna)

Knowledge and Skills: Candidates will be able to identify seagrass flora and fauna. Candidates will be able to describe in detail the flora and fauna of seagrass ecosystems.

Candidates will be able to describe in detail threats to seagrass meadows.
Candidates will know and recognize regional and local habitats.
Candidates will be able to identify a specific case of a seagrass habitat under threat

Evidence: Candidates will demonstrate knowledge of seagrass flora and fauna on online interrogation.

Candidates will submit online written descriptions of specific flora and fauna.
Candidate will demonstrate knowledge of specific threats to flora and fauna in specific regional and/or local habitats.

Assessment: Candidates will prepare a case study for management intervention.



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Outcome: 3. Seagrass ecosystems (goods and services)

Knowledge and Skills: Candidates will be able to prepare a short review arguing the case for specialized goods and services deriving from seagrass meadows.

Evidence: Candidates will prepare a short review deriving from literature or online search, arguing the case for specialized goods and services deriving from seagrass meadows.

Assessment: Written review submitted online

Outcome: 4. Threats to seagrass ecosystems

Knowledge and Skills: Candidates will be able to describe in detail threats to seagrass meadows.

Candidates will be able to identify seagrass flora and fauna.

Candidates will know and recognize regional and local habitats.

Candidates will be able to identify a specific case of a seagrass habitat under threat

Evidence: Candidates will prepare a case study for management intervention, using local/regional data and information.

Assessment: Case study for management intervention concerning a regional or local threat to a specific seagrass system.

Unit title: Mangrove systems

Purpose: On completion of this unit, candidates will know and understand how best to manage mangrove ecosystems, their adaptations, fauna and interactions, mangrove diversity, the ecosystem goods and services, and all sustainability issues. These elements will be pursued via the sub-topics of ecotourism, climate change, resilience, introduced species, aquaculture and protected areas.

Entry Level: Higher technician, postgraduate, management trainee.

Assessment: Written examination on ONE of the above topics. Case study set by course tutor.

Optional Supplementary Information: This internet-based course has many similarities with Open University courses run throughout Europe. The main feature for its success is good communication (via email) with the course tutor.

Outcome: 1. Mangrove ecosystems (morphological specialisation)



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Knowledge and Skills: Candidates will be able to describe in detail mangrove ecosystems(morphological specialization).

Evidence: Candidates will demonstrate accurate knowledge of morphological specialisation of mangrove ecosystems by means of online interactive interrogation.

Assessment: Final written submitted test

Outcome: 2. Mangrove ecosystems (physiological specialisation)

Knowledge and Skills: Candidates will be able to describe in detail physiological specialization of mangrove ecosystems.

Candidates will be able to identify fauna in mangrove ecosystems

Evidence: Candidates will respond to interactive interrogation concerning physiological specialization of mangrove ecosystems.

Candidates will be able to identify fauna in mangrove ecosystems

Assessment: Interactive online interrogation by tutor.

Outcome: 3. Mangrove ecosystems (taxonomic specialisation)

Knowledge and Skills: Candidates will be able to describe in detail mangrove ecosystems(taxonomic isolation).

Candidates will be able to identify fauna in mangrove ecosystems

Evidence: Candidates will provide evidence for the taxonomic isolation of mangrove ecosystems.

Candidates will identify the flora and fauna of mangrove ecosystems, in relation to the taxonomic isolation aspect.

Assessment: Written online submission

Outcome: 4. Mangrove ecosystems (adaptations)

Knowledge and Skills: Candidates will be able to describe in detail mangrove adaptations(salinity).

Candidates will be able to describe in detail mangrove adaptations(waterlogging).

Candidates will be able to describe in detail mangrove adaptations (reproduction).

Evidence: Candidates will identify mangrove adaptation in a specific given case and prepare a case study for management intervention, presenting relevant aspects as above)



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Assessment: Case study for mangrove intervention.

Outcome: 5. Mangrove ecosystems (specialised goods and services including aquaculture)

Knowledge and Skills: Candidates will be able to understand and identify possible interactions of fauna and the ecosystem

Candidates will know and recognize regional and local patterns.

Candidates will know and understand the case for specialized goods and services deriving from well-managed mangrove systems.

Evidence: Candidates will be able to prepare a short review arguing the case for specialized goods and services deriving from well-managed mangrove systems.

Candidates will be able to present the case for and against aquaculture in mangrove ecosystems.

Assessment: Written review

Powerpoint presentation of case FOR and case AGAINST aquaculture

Unit title: Coral reefs

Purpose: On completion of this unit, candidates will know and understand how to sustain coral reefs and their complex ecosystems, their types, zonation, physiology, reproduction, and coral reefs goods and services. These elements will be pursued via the sub-topics of coral reef limitation, protected areas, ecotourism, climate change and resilience.

Entry Level: Higher technician, postgraduate, management trainee

Assessment: Written examination on ONE of the above topics. Case study set by course tutor.

Optional Supplementary Information: This internet-based course has many similarities with Open University courses run throughout Europe. The main feature for its success is good communication (via email) with the course tutor.

Outcome: 1. Coral reef ecosystems (types, zonation, physiology, reproduction)

Knowledge and Skills: On completion of this unit, candidates will be able to describe in detail:

- coral reef ecosystems (types, zonation, physiology and reproduction)
- threats to coral reefs.
- Candidates will be able to identify fauna in coral reefs.



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Evidence: Candidates will recognise in detail coral reef ecosystems (types, zonation, physiology and reproduction)

Candidates will identify fauna in coral reefs.

Assessment: interactive online interrogation of coral reef types, zonation, physiology, reproduction

Short inline submission of threats to coral reef ecosystems

Outcome: 2. Coral reefs ecosystem (specialised goods and services)

Knowledge and Skills: Candidates will know and recognize regional and local patterns of coral reef ecosystems.

Candidates will be able to prepare a short review arguing the case for specialized goods and services deriving from coral reefs.

Candidates will be able to identify a specific case of coral reefs under threat.

Evidence: Candidates will give written evidence of knowledge of regional and local patterns.

Candidates will prepare a short review arguing the case for specialized goods and services deriving from coral reefs.

Candidates will identify a specific case of coral reefs under threat and prepare a case study for management intervention.

Assessment: Short online review

Case study calling for management intervention

Non-standard aspects of higher education courses

Virtual Mobility courses (substitution for actual mobility exchanges)

xiii. **Age determination of marine fish**



Course title: Age Determination of marine fish

The course is stand-alone and comprises 6 weekly lectures with one hour practical lab work.



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Course Type: Training Course

Entry Level: Undergraduate at EQF Level 4 (specialized factual and theoretical knowledge, with practical skills to find solutions to specific problems).

Credit Points: N/A

Credit Points, Level and Framework: Irish NQF Level 6 ECTS 1

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
60%	20%	None%	None%	20%	None%	None%

Unit title: Direct methods: otoliths

Purpose: The use of otoliths in age determination is a well-established method, in use since the 19th century. Over the past century there are a countless number of publications on otoliths. They were first used to determine the age of fish in the 19th century (Reibisch, 1899).

Entry Level: Undergraduate at EQF Level 4 (specialized factual and theoretical knowledge, with practical skills to find solutions to specific problems). By the end of this unit, the candidate will know and be able to implement methods of extraction, preparation, thin sectioning, otolith morphology (species-specific -Gadiformes, Clupeiformes, Anguilliformes, Perciformes).

Assessment: Candidates will be assessed on a continual assessment basis, with short oral and laboratory final test.

Optional Supplementary Information: N/A

Unit title: Direct methods: vertebrae

Purpose: Vertebrae can be used as an alternative aging structure to otoliths where the latter are only of marginal value. By the end of this unit, the candidate will know and be able to implement use of vertebrae in determining age, finrays & spines, validation methods, tagging.

Entry Level: Undergraduate at EQF Level 4 (specialized factual and theoretical knowledge, with practical skills to find solutions to specific problems). By the end of this unit, the candidate will know and be able to implement the use of vertebrae in determining age, finrays & spines, validation methods, tagging.

Assessment: Candidates will be assessed on a continual assessment basis, with short

written and laboratory final test.

Optional Supplementary Information: N/A

Unit title: Indirect aging methods

Purpose: This is the final unit of the course Age Determination of Marine Fish. By the end of this unit, the candidate will be able to know how and when to use the techniques of marginal increment analysis and radiochemical dating.

Entry Level: Undergraduate at EQF Level 4 (specialized factual and theoretical knowledge, with practical skills to find solutions to specific problems). By the end of this unit, the candidate will know how to use indirect methods for aging marine fish.

Assessment: Short written test.

Optional Supplementary Information: N/A

Non-standard aspects of higher education courses

Virtual Mobility courses (substitution for actual mobility exchanges)

xiv. Larviculture for marine cultured species



Course title: Larviculture for marine cultured species

This is one component of a 3-unit course on the production of live food for the larval stages of cultured fish species.

Course Type: Training Course

Entry Level: Undergraduate; semi-skilled technician.

Credit Points: N/A

Credit Points, Level and Framework: EQF Level 3

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course Work	Team Work	Other
25%	50%	None%	None%	25%	None%	None%



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Unit title: Artemia Cultivation: the culture of filter-feeding herbivores

Purpose: Species selection criteria, main species and cultures growth pattern in relation to the need for live food during the early larval stages of cultured fish and crustaceans. By the end of this unit, the student should know the life cycle of Artemia (cyst, larval stage), biological characteristics, nutrition, production, storage and use as live food.

Entry Level: Candidates should have experience or knowledge at EQF Level 3 (factual/theoretical knowledge in broad contexts, accompanying practical skills, ability to take responsibility for completion of tasks. Undergraduates should have some knowledge of biology at EQF Level 3. Technicians(semi-skilled) should have 6 months' experience in hatchery techniques.

Assessment: N/A

Optional Supplementary Information: N/A

Outcome: Produce artemia

Knowledge and Skills: know the life cycle of Artemia (cyst, larval stage), biological characteristics, nutrition, production, storage and use as live food.

Evidence: know the life cycle of Artemia (cyst, larval stage), biological characteristics, nutrition, production, storage and use as live food.

Assessment: ...

Unit title: Cultivation of Rotifers

Purpose: Species selection criteria, main species and cultures growth pattern in relation to the need for live food during the early larval stages of cultured fish and crustaceans. By the end of this unit, the student should know the suitability of zooplankton (esp *Brachionus plicatilis*) as live food, its biological characteristics, its life cycle, its nutritional value, methods of intensive production in small, medium and large volumes.

Entry Level: Candidates should have experience or knowledge at EQF Level 3 (factual/theoretical knowledge in broad contexts, accompanying practical skills, ability to take responsibility for completion of tasks. Undergraduates should have some knowledge of biology at EQF Level 3. Technicians(semi-skilled) should have 6 months' experience in hatchery techniques.

Assessment: Candidates will be assessed on a continual assessment basis, with short oral and practical laboratory final test.

Optional Supplementary Information: N/A

Unit title: Cultivation of phytoplankton/microalgae

Purpose: Species selection criteria, main species and cultures growth pattern in relation to the nutritional needs during the early larval stages of cultured fish and crustaceans. By the end of this unit, the student should know the methods for the cultivation of microalgae (monospecific, polyspecific), growth patterns, culture conditions, control of growth (blooms), stock preparation and maintenance.

Entry Level: Candidates should have experience or knowledge at EQF Level 3 (factual/theoretical knowledge in broad contexts, accompanying practical skills, ability to take responsibility for completion of tasks. Undergraduates should have some knowledge of biology at EQF Level 3. Technicians(semi-skilled) should have 6 months' experience in hatchery techniques.

Assessment: Candidates will be assessed on a continual assessment basis, with short oral and practical final test.

Optional Supplementary Information: N/A

Non-standard aspects of higher education courses

Virtual Mobility courses (substitution for actual mobility exchanges)

xv. Introduction to the marine environment



Course title: Introduction to the Marine Environment

This course, designed as an online distance ODL unit, asynchronously accessed through the course web pages, gives an overview of the marine environment showing its basic principles and how it functions, so that the effects of disturbing its equilibrium can be more easily understood, by the undergraduate or the vocational student, or the interested non-specialist or layman.

On completion of this course, candidates will know, understand and be able to give out information and make informed decisions based on their acquired knowledge of the marine environment (abiotic elements, biotic elements, functional elements, zonation, anthropogenic effects and methods of monitoring).



The course aims i) to provide basic knowledge on the marine environment for those whose profession requires them to take decisions relating to, or having an effect on, these basic parameters; ii) to provide an overview of the marine environment for those engaged in environmental studies at varying levels.

The course content is arranged in 6 sections which cover the subject base comprehensively. The course may be studied following the order in which it is presented. Alternatively, since each section is programmed as a stand-alone unit, it may be entered at any point preferred by the user.

Course Type: Training Course

Entry Level: No prior learning required. The course can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit for re-training purposes.

Credit Points: N/A

Credit Points, Level and Framework: Desired: 2 ECTS or 2 ECVET

Delivery Method:

Lectures	Practical	Distance	Field Trip	Course	Work Team	Work	Other
None%	None%	None%	None%	100%	None%	None%	None%

Unit title: Abiotic elements in the marine environment

Purpose: On completion of this unit, the candidate will know and understand the importance of the following in the marine environment: light, properties of sea water, temperature, salinity, osmoregulation, water movements (waves, tides, currents), organisms' adaptations, upwellings, oxygen, hard substrate, soft substrate, sediment composition, redox potential.

Entry Level: No prior learning required. The unit can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit for re-training purposes.

Assessment: This unit is assessed by a combination of extended response written questions, set by course tutor and a case study (EIA on abiotic factors only)

Optional Supplementary Information: N/A

Unit title: The Living Element (Biotic Elements)

Purpose: On completion of this unit, the candidate will know, understand and be able to write a coherent report concerning the important roles played in the marine environment



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by pelagic fauna, plankton, phytoplankton, zooplankton, nekton, sea birds.

Entry Level: No prior learning required. The course can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit for re-training purposes.

Assessment: Extended written responses on questions set by the course tutor (such as What is the function of the swimbladder?) Candidate will demonstrate, using examples and relevant illustrations, how animals in areas of extreme tidal fluctuation adapt to these conditions.

Optional Supplementary Information: N/A

Unit title: Stability of bottom-living marine communities (benthos)

Purpose: On completion of this unit, the candidate will know, understand and be able to use as evidence in Environmental Impact Assessments and Statements, the important role played by the benthos (microbenthos, meiobenthos, macrobenthos), size and structure, feeding types (type A, herbivores, carnivores and detritivores; type B, suspension feeders, filter feeders, detritus feeders, scavengers, predators) as well as microbes.

Entry Level: No prior learning required. The course can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit for re-training purposes

Assessment: Case study on vital role played by a specific benthic organism as predictor of instability;

Case study on specific benthic organism to monitor short and long-term change in specific environment.

Optional Supplementary Information: N/A

Unit title: Functional Aspects of the Marine environment

Purpose: On completion of this unit, the candidate will know, understand and be able to use as evidence in Environmental Impact Assessments and Statements, the important role played by the food chain concept in all its complexity, how the stability of the ecosystem depends crucially on the critical population size. The candidate will understand the importance of coastal management, will understand and be able to articulate at the appropriate level, the need for biological monitoring.

*

Entry Level: No prior learning required. The course can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit



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for re-training purposes

Assessment: Preparation of role in role-playing online simulation game.

Optional Supplementary Information: N/A

Unit title: Marine Pollution

Purpose: On completion of this unit, candidates will understand the need for environmental impact assessment and be able to assess in specific cases what is the most important factor in the monitoring of the marine environment. Candidates will also know how to distinguish man-made and natural environmental perturbations. Candidates will know how to find evidence for long-term cycles by means of literature searches in the gray literature. Candidates will be able to know and use factual information provided on marine pollution: categories, biodegradable and non-biodegradable materials, bio-accumulation, solid wastes, plastic, organic enrichment, BOD, sewage treatments, pesticides, fertilisers, oil pollution and its effects, heavy metals and effects, nuclear wastes, public health issues.

Entry Level: No prior learning required. The course can be used at entry level for first-time students, as a vocational module for decision-makers or as a life-long learning unit for re-training purposes

Assessment: Extensive written responses to specific detailed questions as shown above.

Undertaking role in online role-playing environmental impact study game.

Optional Supplementary Information: N/A



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