



Co-funded by
the European Union

TRAINING PLAN

for teachers according to the project (WP3)

AFISHE

**Development of Aquaculture and Fisheries Education for Green Deal in
Armenia and Ukraine: from Education to Ecology**

Grant Agreement Number: 101082557



SVEUČILIŠTE U DUBROVNIKU
UNIVERSITY OF DUBROVNIK



Sumy
National
Agrarian
University



National University of Water
and Environmental
Engineering

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General part

The overall goal of AFISHE project is to decrease the negative impact of the aquaculture and fishery industry on the environment in Armenia and Ukraine through the designing and development of Master's degree programs in aquaculture and fisheries, that are benchmarked to high-quality similar programs in Europe and responsive to national and regional needs, and strengthening the university-enterprise-research cooperation (concept "from education to ecology").

AFISHE project will create a network between Armenia, Ukraine, and EU partner countries in the fields of aquaculture and fisheries. This network will serve as a platform for the implementation of joint educational and research activities with the purpose of promoting the best ecology-based approaches and activities in these fields in line with SDG goals and the Green Deal.

AFISHE project will strengthen university-enterprises cooperation resulting in the implementation of research-based and ecology-based operations and increasing operational effectiveness of aquaculture and fishery enterprises.

The main activities of the project are the creation and development of Master's degree study programs with all supporting materials, the establishment of laboratories, and the training of teaching and non-teaching staff of Armenia and Ukraine.

The main results of the project are:

- ≈ 3 new and updated Master's degree programs in Armenia and Ukraine,
- ≈ teaching and learning materials,
- ≈ modernized infrastructure and well-trained teaching and non-teaching staff,
- ≈ a network, established between HEIs and the labor market, that will contribute to the education and retraining of needed specialists in Armenia and Ukraine.

During the implementation of the project, 44 teaching staff and 8 non-teaching staff will benefit. Due to this project, a sustainable network will be created between Armenian, Ukrainian, and EU universities and the labor market, which will act jointly on behalf of a sustainable environment.

Taking into account the fact that the participating universities of Armenia and Ukraine will create and develop new educational programs and materials, it is necessary to prepare teaching staff armed with professional knowledge and capabilities. In particular, 58 new modules will be fully implemented, and 32 existing modules will be updated. Especially for the creation of new modules, and the preparation of teaching materials, as well as their subsequent teaching, professors of Armenian (AM) and Ukrainian (UKR) universities should undergo training on specific modules.

Training of AM and UKR teaching and technical staff is summarized in WP3 of the project.

WP3 – Development of human resources (lead – NUWEE, assisted by SNAU)

This WP is devoted to strengthen and development of human resources. Three types of trainings will be realized:

- a) training of teaching staff on new modules in EU universities;
- b) training of teaching staff on student-centered education, interactive methods, and practice-based education at AM and UKR universities;
- c) training of non-teaching staff on how to operate the newly established laboratories.

Only the 1st training will be conducted at EU universities. Upon returning from the training the participants will train their colleagues at local universities, thus realizing one of the modern tendencies - internationalization at home. For cost-effectiveness, the 2nd and 3rd types of training will be conducted at AM and UKR universities by local experts. For this reason, AM and UKR universities will

make a contract with local experts, who are good at lab equipment and they will train the non-teaching staff. This contract will have the subcontracting base. In this case, the AM and UKR universities will avoid spending finances on travel and accommodation of their staff. For the same reason, the training of AM and UKR teaching staff on student-centered education and interactive teaching methods will be implemented at home universities as well. This contract will have the subcontracting base.

The training of non-teaching staff, which will be organized at home universities, AM and UKR universities will make a contract with local experts, who are good at lab equipment and they will train the non-teaching staff. This contract will have the subcontracting base. In this case, the AM and UKR universities will avoid spending finances on travel and accommodation of their staff. For the same reason, the training of AM and UKR teaching staff on student-centered education and interactive teaching methods will be implemented at home universities as well. This contract will have the subcontracting base.

The main objectives of WP3 are the following

- ≈ To train the staff on new modules, that are part of the Master's degree curricula.
- ≈ To train and educate the staff on how to operate in the newly established laboratories.

The main tasks of WP3 are mentioned in the next table:

T3.1	Training of the teaching staff on the new modules, interactive and practice-based teaching methods and tools	In total 44 teachers from AM and UKR will be trained at EU universities on new modules, which are involved in new Curricula of Master's Degree program. It is very important, because due to this training the participants will get enough knowledge and capabilities on the modules and fields they are going to teach. After returning to their home universities they will be involved in creation and development of modules, teaching and learning materials. They will organize local trainings of other teachers as well, ensuring the sustainability of the teaching resources. For cost effectiveness, AM and UKR staff training on interactive and practice-based teaching methods and tools will be implemented at participants' universities. For this reason, the universities will employ specialists with subcontracted base. The participants will be introduced to interactive teaching methods and modern technologies, which are used in classrooms.
T3.2	Training of the non-teaching staff on how to operate in the new established laboratories	In total 8 non-teaching staff (4 from AM, 4 from UKR) will be trained in their countries on usage of lab equipment, purchased during the project. For cost effectiveness, these training will be organized at home universities. AM and UKR universities will rent experts who are good at lab equipment based on subcontracting. After the training they will organize local trainings of other teachers ensuring the sustainability of the human resources for usage of lab. The training of non-teaching and teaching staff on lab equipment will ensure of sustainable work of newly established labs and realizing the activities carried out by them (practical lessons for the students, joint research projects, lab services for public sector).

The specific objectives of the given project are combined into 3 main groups and the 2nd one is connected to the implementation of trainings.

Specific objective 2. Creation of a conducive academic environment, development of human resources

- 2.1. Establishment of labs with modern equipment (hardware) and software to build and modernize the academic environment as a platform for training and retraining, PhD, LLL.
- 2.2. Training of the staff on new modules that are part of the Master's degree curricula.
- 2.3. Training and education of the staff on how to operate in the newly established laboratories.

The hereby training plan is developed for the organization, management, smooth implementation of planned trainings. The main goal of this Training Plan is to increase the efficiency of the training process. The Training Plan acts as a roadmap and sets realistic expectations for participants because everyone already has a clear idea of how things should go.

All modules for which pieces of training are planned at EU universities are listed in the tables below.

Need assessment

It is clear, that AM and UKR universities must develop human resources for the creation and designing of new modules, for updating the present ones, and for future teaching activities. For 3 (ANAU, ISEC NAS+SCZHE, SNAU) from 4 participants the modules are totally new and they must develop new modules. NUWEE needs only to update some modules and create some new ones.

New modules – totally new modules have never been taught at the master's level at this university and the education materials need to be developed from the beginning; the module is completely new for the teacher or the teacher doesn't have enough skills and knowledge in the field. ANAU, ISEC, and SNAU have totally new modules. NUWEE has new and updated modules.

Updated modules – the modules have been taught at the master's level for some time (at least 3-4 years) and the education materials need to be updated; the module is planned to be taught by a new teacher.

The list of new and updated modules per university is given in the next table.

Module	new	updated
ANAU + ISEC NAS		
Professional foreign language		
Research methodology		
Aquaculture		
Fishery		
General Ichthyology		
Genetics for Aquaculture		
Biodiversity conservation		
Environmental and Water Management		
Biostatistics		
General hydrobiology		
Ichthyopathology		
General Hydroecology		
Food safety of aquatic animals' products		
Technology of aquatic products		
Biology of Cultured Algae		
Aquatic animals' biochemistry and physiology		
Management in fishery and aquaculture		
Ecotoxicology		
Aquatic Animal feeding and Nutrition		
Basic Aquaculture Engineering		
Entrepreneurship in fishery and aquaculture		

Standardization of aquaculture products		
Hydrobionts microbiology		
Total	17	6
SNAU		
Mandatory modules		
Methodology and organization of scientific research		
Production management, business organization and personnel management in animal husbandry		
Modern technologies of fodder and feed additives		
Innovative technologies for the production of animal husbandry products		
Breeding of farm animals		
Innovative technologies for processing livestock products		
Aquaculture of artificial and natural reservoirs		
Hydroecology		
Aquaculture processing technology		
Elective modules		
Philosophical problems in biology		
Scientific basis of rational fish feeding		
The raw material base of the fish farming industry		
Fishery		
Ornamental fish farming		
Agrarian policy		
Ichthyopathology		
Aquatic microbiology		
Standardization of aquaculture products		
Basics of fish protection and fisheries legislation		
Fish genetics		
Bioresources of the hydrosphere and their use		
Introduction to Ecology		
Diversification of Fish Farming		
Diversification of Shelfish Farming		
Mariculture – Status and Perspectives		
Genetics of Mediterranean Fish and Shelfish		
Physiology of Stress and Adaptation		
New Technologies in Mariculture		
Breeding Technologies in Mariculture		
Entrepreneurship in aquaculture		
Strategic Planning of Mariculture Production Diversification		
Economy, Accounting and Management		
Marine Biology and Ecology		
Population Dynamics		
Animal Ethology		
Bioactive Marine Natural Products		
Animal Welfare in Aquaculture and Public Aquariums		
Food Nutrition and Technology		
Ornamental Fish Production		
Aquatic Production and Aquaculture Systems		

Fisheries Technology and Evaluation of Fisheries Resources		
Technology and Food Safety of Fishery Products		
Total	35	7
NUWEE		
Mandatory disciplines		
Foreign language of professional communication		
Psychological and pedagogical foundations of professional activity		
Methodology of scientific research		
Theoretical foundations of fish farming		
Ecological Physiology and Biochemistry of Hydrobionts		
Technical equipment of aquaculture		
Organization of business and financial activities of fishery enterprises		
Prevention and treatment of fish diseases		
World fisheries. Protection and reproduction of hydrobiological resources		
Theory of fish population dynamics		
Ichthyofauna of reservoirs of complex purpose		
Fish products sanitary control, standardization, and certification		
Elective disciplines		
Population ecology		
Integrated multitrophic aquaculture		
Recirculating aquaculture		
Ornamental aquaculture		
Water quality and fish health		
Lake fisheries		
Farming household		
Pond fish farming		
Acclimatization of hydrobionts		
Fishery Legislation of Ukraine		
Organization of sport diving in fisheries		
Organization of sport and amateur fishing		
Rehabilitation ichthyocenology of natural water bodies		
Total	6	19

Another training direction is interactive teaching and student-centered methods. The preliminary done research showed that AM and URK teaching staff need to improve the capabilities of new teaching methods and new technologies, that can be used during classes.

It is visible, that for full and successful implementation of new or updated Master's degree programs the teaching staff, parallel to professional skills, must have soft skills and pedagogical skills also. It will be done due to local trainings at AM and URK universities. The topics of training will cover the methods of interactive studying and student-centered approaches.

Within the framework of AFISHE project ANAU, ISEC NAS and SCZHE, SNAU and NUWEE are going to purchase lab equipment and software and establish modern labs on aquaculture and fishery. For usage of all purchased equipment AM and URK universities need to train technical staff also. For cost-effectiveness, these trainings will be implemented via locally organized experts. The topics of trainings will depend on the types and possibilities of purchased equipment at each university.

The place and form of training

University of Dubrovnik (UNIDU)

Department of Applied Ecology

The University of Dubrovnik (UNIDU) is a public university consisting of six departments: the Department of Economics and Business, the Department of Maritime Studies, the Department of Electrical Engineering and Computing, the Department of Applied Ecology, the Department of Communication Sciences and the Department of Arts and Restoration. The University offers 14 three-year undergraduate university programmes, 3 three-year undergraduate professional programmes, 12 two-year graduate university programmes, 2 two-year specialised graduate programmes, 1 specialised postgraduate programme and 6 inter-university postgraduate (PhD) programmes. The Institute for Marine and Coastal Research and the Institute for Mediterranean Cultures are also part of the University. All programmes are compatible with the Bologna Declaration and UNIDU is also one of the few universities in Croatia to offer double degree Master's programmes.

The Department of Applied Ecology is part of the Integrated University of Dubrovnik, which offers two degree programmes: Bachelor in Applied Marine Ecology and Master in Mariculture, as well as an inter-university postgraduate (doctoral) programmes Applied Marine Sciences. Human resources include 13 people, 9 professors, one postdoc, one assistant and two technical staff. Teaching and research focus on aquaculture and management of the marine environment. Scientific teaching and the development of scientific skills among students are enhanced by practical work performed in well-equipped biological, chemical and biotechnological laboratories. The Laboratory for Mariculture is located in Mali Ston Bay and is used for research and education in the field of marine aquaculture, as well as for conducting various interdisciplinary activities related to the sea. It has a fully equipped and functional bivalve hatchery.

UNIDU is a partner or coordinator in a number of international projects funded by Programmes and Funds from the European Union. Currently, there are around forty (40) projects funded from Interreg, European Structural and Investments Funds, Horizon, Erasmus etc. All UNIDU units are involved in the implementation of projects that are often interdisciplinary oriented and tackle a wide range of different topics, such as ecology, economy, digitalization, computing, electrical engineering and the use of recycled materials in arts and restoration and other segments.

University of Porto (U.Porto)

School of Medical and Biomedical Sciences (ICBAS)

Department of Aquatic Production (DPA)

Interdisciplinary Centre of Marine and Environmental Research (CIIMAR)

The University of Porto (U.Porto) is composed by 14 Faculties, one of them the School of Medical and Biomedical Sciences (ICBAS). Main graduations are Medicine, Veterinary and Aquatic Sciences, among some others degrees that ICBAS share with other Faculties.

The Department of Aquatic Production (DPA) was created in 1994 and is one of the 10 Departments of ICBAS, dedicated to teaching (around 3000 h/year) and research (publishing around 70 scientific articles/year) focused on aquaculture, aquatic physiology, fish health, fish nutrition, aquatic food processing, technology and food safety (sensory, microbiological and physical methods), fish welfare and waste management of the fishing and aquaculture industries.

Human resources include around 20 persons, among professors, external teachers and technicians.

DPA is divided in 8 Laboratories: Applied Physiology, Aquatic Engineering and Production Systems, Fish Immunology and Health, Developmental Biology, Aquatic Ecology, Ichthyology, Aquatic Food Technology and Microbiology and Food Technology.

DPA also performs services to the community, including mainly support to aquaculture projects, from the implementation of farming units to companies working indirectly in the sector of aquatic production, as well as support on nutrition and fish health in farms, and food product development, quality and safety. Research is focused on applied areas, like fish growth and nutrition, seafood preservation and quality, food and environmental microbiology, parasitology, waste management and fish welfare.

Apart from the official graduation and post-graduation courses, DPA also organizes smaller presential and on-line (e-learning) training courses for aquaculture professionals, the last focused on oysters (safety and farming) and sea urchins (safety and product development).

U.Porto also houses almost 50 R&D centres, one of them CIIMAR, where many of the researchers on water areas (more than 550 persons, working on more than 125 international competition projects, and publishing more than 600 international publications/year), from ICBAS and other Faculties have their research centralized. All areas of research in aquaculture, environment, biotechnology and other aquatic sciences are studied at CIIMAR.

Slovak University of Agriculture (SUA in Nitra)

Institute of Animal Husbandry

Institute of Nutrition and Genomics

Institute of Applied Biology

The Slovak University of Agriculture in Nitra, with its educational and scientific research activities, is today an important part of the European and world education space. It has become a modern, open university, reflecting the needs of the agri-food sector both locally and globally. Its mission is to prepare competitive professionals for all areas of the agri-food sector and other areas of the national economy - engineering, finance, government institutions and bodies, etc. Its six faculties provide a wide range of opportunities for acquiring knowledge in the field of natural, economic, technical and social sciences in 90 study programmes, of which 12 are in English.

The main role of the Institute of Animal Husbandry, belonging to the Faculty of Agriculture and Food Resources (FAFR), is to integrate and creatively develop educational, scientific and research activities in the field of animal breeding, reproduction and production of animal commodities. The institute has various specialized centres located apart from the university campus, including fishponds and fish breeding sampling locations. The research activities of the institute focus on basic and applied research in the field of breeding and reproduction of farm animals, pollinators, freshwater fish, game and exotic species of animals, with an emphasis on the production of healthy animal commodities.

The Institute of Nutrition and Genomics (FAFR) fully covers the process of education and scientific research in animal nutrition following the current genomic approaches used in breeding procedures aimed at producing and improving the quality of animal food and human nutrition. The institute provides teaching of subjects focused on the importance of nutrients in animal and human nutrition and their determination, energy and metabolism, biochemistry and physiology of nutrition, and principles of various methods of feed treatment and preservation. Within the genomic part, teaching is focused on genetics and breeding of livestock, biometrics and livestock biodiversity, as well as nutritional genomics and human genetics using information obtained through the newest methods in genomics.

The Institute of Applied Biology is part of the Faculty of Biotechnology and Food Science.

The institute is focused on diverse processes and current challenges in the field of biology and biotechnology, including the characterization of new and alternative biologically active compounds, investigation of the impact of selected bioactive, bioprotective and environmental risk factors on animal tissues, cells, reproductive potential; effects of toxic substances on animal health under natural conditions, as well as the study of new molecular biomarkers of sperm quality in mammals, birds and reptiles and the standardization of techniques for their efficient and practical application in veterinary and livestock practice. Teaching activities at the institute cover many areas, including ecophysiology and animal physiology, physiology of regulatory mechanisms, immunobiology, microbiology and parasitology, neurobiology, pathophysiology and animal toxicology.

Evaluation of training

The Quality Assurance Team (QAT) will be the main body for the monitoring and evaluation of the quality of the training. It will be implemented via face-to-face meetings and questionnaires. To get the real evaluation of the trainings, implemented as at the EU partner institutions (UNIDU, U.PORTO and SUA), as well as at the local institutions, the questions will cover all the activities connected to the training.

A survey/questionnaires on training and trainer will be developed before finishing the training, which include the following question: level of satisfaction of trainers and participants (%), ratio of staff who

are able to give examples of incremental innovations, and of staff who are able to give examples of radical innovations (entirely new knowledge) (%) and so on.

The results of training will be discussed during the next meeting, planned at UNIDU, Dubrovnik, in May 2024. The team leaders and QAT will take into account the strong and weak point of training, outcomes and implemented activities after training and so on.

Feedback and outcomes of training

One of the main goals of the AFISHE project is the updating, design and implementation of a new Master's educational program. One of its most important prerequisites is the improvement of human resources, that is, to have teaching personnel with appropriate capabilities and knowledge in the field of aquaculture and fishery.

As a result of the trainings, it is expected that the participating AM and UKR universities will have capable teaching staff who will undertake the preparation of new module programs, and study materials, and also teach the modules developed by them. Through trainings, Armenian and Ukrainian universities will ensure the ability and sustainability of educational research work in the field of aquaculture and fishery.

In addition to professional module trainings, the teaching staff of AM and UKR universities will also be trained in interactive teaching methods and student-centered methods. Due to this, the educational environment will become more student-centered, and professors will use interactive teaching methods, thanks to which graduate students will become active carriers of learning.

Thanks to the third type of training, the main goal of which is to increase the capabilities of technical staff working in newly opened laboratories, AM and UKR universities will have employees who will work in the laboratories and ensure their normal operation.

Armenian National Agrarian University

Title of the module	1. Biodiversity conservation
New or updated	New
LOs of the module	1. Will know the basic concepts of biodiversity and their classification. 2. Will be able to explain the patterns of formation of biodiversity and methods of its conservation. 3. Will be able to explain the role and significance of the elements of biodiversity, as well as show connections between individual levels. 4. Will be able to analyze and evaluate biodiversity data and ensure the use of various methodological approaches. 5. Will implement biodiversity monitoring, as well as methodology for predicting spatial changes in biodiversity.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	SUA in Nitra
Topics of the training	Theoretical lectures: 1) Introduction a) Definition of biodiversity and animal genetic resources (AnGR) b) Factors affecting AnGR biodiversity c) Sustainable use and conservation of AnGR 2) Basic indicators of AnGR genetic diversity a) Inbreeding coefficient b) Average relatedness c) Effective population size d) Population structure and consequences of population fragmentation 3) Population management of AnGR a) Monitoring of AnGR populations. Strategy for their development b) Mating plans for control of inbreeding 4) Analysis and quantification of AnGR genetic diversity a) Use of molecular genetic markers in the analysis of AnGR diversity b) Assessment of genetic diversity at the intra and inter-population level 5) AnGR management in the genomic era a) Diversity indicators derived from genomic data b) Molecular genetic technologies and marker/genomic-assisted selection c) Use of genomic information for the development and management of AnGR genetic diversity Practical lectures: 1) Input data file and quality control of molecular-genetic data. Calculation of frequency of alleles and genotypes, testing of Hardy-Weinberg equilibrium 2) Basic data manipulation in the Genalex program. Evaluation of genetic diversity indicators at the intra and inter-population level in a selected AnGR population 3) Analysis of the genetic structure of a selected AnGR population 4) A model example of a selection and breeding management procedure in an endangered AnGR population 5) Practical evaluation of genetic diversity of selected AnGR population
LOs of the training	At the end of the training, participants should:

	- explain the importance of AnGR biodiversity used in agriculture and food production and describe the main factors that affect AnGR biodiversity as well as methods commonly used for their evaluation and conservation -be able to describe commonly used indicators of AnGR biodiversity - be able to use molecular-genetic data for estimation of diversity indicators at the intra and inter-population level - be able to propose ways to optimise the level of genetic diversity in endangered AnGR population
Delivery Mode and form of training	Instructor-led training
Duration:	Two weeks (10 working days) Theory: 10 hours (5 theoretical lectures) Practical work: 8 hours (4 days) Individual work: 10 hours – preparation of example class 1 day - discussion and evaluation of the classes
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	2. Environmental and Water Management
New or updated	New
LOs of the module	1. Will know the general characteristics and key indicators of RA water resources. 2. Will be able to present the ecological characteristics of various types of water bodies. 3. Will be able to explain and monitor the forms of pollution of water basins and the main pollutants. 4. They will be able to present the impact of fish farming and aquaculture on the environment. 5. Will be able to implement conservation and restoration of water resources. 6. Will be able develop and implement measures to mitigate the negative impact of fish farming and aquaculture.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h) • Introduction to the requirements of aquaculture and protection of the environment (2 h) • Identification of the physico-chemical water quality parameters relevant for aquacultures (2 h) Suspended solids, nitrogen compounds, phosphorous compounds, dissolved and oxygen, chemical and biochemical oxygen demand • Sampling, transport and storage (1 h) Water inflow and outflow of the fish farm, transportation with refrigeration and immediate analysis versus freezing and time of storage. • Legislation and maximum legal limits of water quality for aquaculture purposes (3 h) Recommended limits and maximum allowable limits. Limits according to purpose of the water. Frequency of analysis. • Analytical methods (4 h) Spectrophotometric, volumetric and gravimetric methods • ISO standards (3 h)

	Scope, interferences, reagents and protocols • Equipment (4 h) Filtration manifold, incubators, spectrophotometer, automatic titrator • Reagents and glassware (2 h) • Quality control (2 h) • Reports (1 h)
LOs of the training	The training should provide the participants the general view of how frequent and how to monitor the water quality of an aquaculture facility and its outflow into the environment. The most relevant chemical parameters should be recognized and the methods of analysis known as well as the required limits of each parameter to be in accordance with legal limits. ISO standards should be adopted to develop certified methodology leading to good quality of results. The essential equipment available must be enumerated and the concept of quality assurance and control must be present, as well as reagents of laboratory grade and glassware of appropriate quality without neglecting the quality of the water used in the laboratory.
Delivery Mode and form of training	Presentations showing the main issues of each topic and hands-on in the laboratory to have a practical understanding of the water management process. Videos can be produced to demonstrate chemical techniques and theoretical concepts supporting the practical activities.
Duration:	24 h (6h/day x 4 days)
Assessment Method	A presentation addressing the fundamental pillars that can be implemented in order to establish a pilot analytical laboratory for water monitoring in and out of an aquaculture.

Title of the module	3. Biostatistics
New or updated	Updated
LOs of the module	1) Knowledge: The graduate of the course will understand the theoretical and practical knowledge in the field of statistical evaluation of biological data. 2) Skills: Can apply and present basic statistical methods in the analysis of biological data and processes of livestock and humans. 3) Competences: Is able to independently statistically analyze biological data in the preparation of final theses, professional and scientific publications.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	1. Introduction, basic analytic and statistical concepts, basic principles of setting up experiments, data collection and classification, working with statistical software. 2. Basic statistical characteristics of biological data, 3. Distribution analysis, 4. Statistical hypothesis testing, parametric and nonparametric tests, 5. Correlation and regression analysis, 6. Analysis of variance,

	7. More complex examples of statistical analysis of biological data.
LOs of the training	At the end of this training, participants should: 1) know the basics of the theory and practice of statistical analysis of biological data and processes in fish farming and breeding; 2) know the basics of using standard and specific statistical software
Delivery Mode and form of training	Instructor-led training
Duration:	Two weeks (10 working days) Theory: 4 lectures (8 hours), practical work: 5 lectures (10 hours), individual work: 8 hours – preparation of practical statistical analysis of biological data, 2 hours - discussion and evaluation
Assessment Method	Practical statistical analysis of data sample, presentation, and class discussion by each participant.

Title of the module	4. Food safety of aquatic animals' products
New or updated	New
LOs of the module	1. To understand and explain current food safety issues and terms. 2. To do risk assessment based on collected necessary data. 3. To determine the risks for aquatic animal food. 4. To be able to prevent and reduce human consumption of aquatic animal food with hazardous factors. 5. To collect, analyze and interpret quantitative and qualitative data related to the professional field.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials

Information about the place and form of the training

EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Importance of quality and product safety standards in aquaculture b) Programme forming, topics covered, justification of the chronological order of the listed topics c) Human resources, facilities and equipment for support of teaching and research d) Literature e) Internet and other teaching materials f) Visits and practical sessions 2) CHARACTERISTICS OF AQUATIC ANIMALS' MEAT (3 h) a) Structure and organoleptic properties b) Nutritional composition c) environmental effects on meat quality d) Storage effects on the meat quality 3) BIOLOGICAL HAZARDS OF AQUACULTURE PRODUCTS (2 h) a) Bacterial hazards

	b) Fungal hazard c) Viral hazards d) Parasitic Hazards e) Biotoxins f) histamine
	4) CHEMICAL HAZARDS OF AQUACULTURE PRODUCTS (2 h) a) Inorganic chemicals: arsenic, cadmium, lead, mercury, selenium, copper, zinc, iron b) Organic compounds: polychlorinated biphenyls, dioxins, pesticides c) Processing-related compounds: sulphites, polyphosphates, nitrosamines, residues of unauthorized substances
	5) QUALITY ASSESSMENT (2 h) a) Sensory Evaluation b) Chemical Testing
	6) FOOD PRESERVATION TECHNIQUES (2 h) a) Refrigeration b) Freezing c) Drying d) Salting e) Canning f) Smoking
	7) GOOD MANUFACTURING PRACTICE (GMP) (3 h) a) Pathogen Transmission b) Health Management c) Personal Hygiene d) Record Keeping
	8) GOOD HYGIENE PRACTICE (GHP) (3 h) a) Introduction and control of food hazards b) Primary production c) Establishment – design of facilities and equipment d) Training and competence e) Personal hygiene f) Control of operation g) Product information and consumer awareness h) Transportation
	9) SSOP-STANDARD SANITARY OPERATING PROCEDURES (3 h) a) Safety of water b) Condition and cleanliness of food contact surfaces c) Prevention of cross contamination d) Maintenance of hand washing, hand sanitizing and toilet facilities e) Protection of food from adulterants f) Proper labelling, storage, and use of toxic compounds g) Control of employee health conditions h) Exclusion of pests
	10) HACCP SYSTEM (4 h) a) HACCP principles b) Code of Hygienic Practice for the Products of Aquaculture (FAO)
	11) TRACEABILITY IN AQUACULTURE (3 h) a) Basic characteristics of a traceability system b) Data on inputs c) Data on production d) Data on outputs e) Recording, storage and retrieval of data f) Internal and external traceability g) Traceability tools
	12) CERTIFICATION IN AQUACULTURE (3 h)

	a) Principles of certification in aquaculture b) Minimum substantive criteria c) Institutional and procedural requirements d) Special considerations for implementation PRACTICAL CLASSES AND ACTIVITIES: - Laboratory experiments: evaluation of fish freshness using Torrymeter, determination of histamine. - Determination of hazards and critical control points for aquaculture facility. - Videos about GHP and GMP in aquaculture facilities. - Visits to external institutions (aquaculture farms, seafood markets).
LOs of the training	After this training period, participants are expected to: - Explain the importance of quality and product safety standards in aquaculture - Be acquainted with quality assessment methods of aquatic animals' products - Support the standard sanitary operating procedure - Validate the Good Manufacturing Practice as well as the Good Hygiene Practice - Justify the need for HACCP in aquaculture facility - Propose a traceability chain in aquaculture facility - Explain different certifications used in aquaculture - Prepare theoretical classes and practical activities that support them, focused on (and adapted to) local reality and regional and national resources, needs and preferences All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	4. Fish Biochemistry and Physiology
New or updated	New
LOs of the module	1. To understand the distribution of water in aquatic animals; types of water; peculiarities of water-mineral exchange; vitamin and mineral composition. 2. To gain knowledge of enzyme markers of aquatic animals, their modifications under conditions of hypoxia and toxic impact from water 3. To be able to interpret key protein and non-protein nitrogen compounds of aquatic animals, the specificities of fat composition and biochemical characteristics during a period of starvation

	4. To explain the physiological features of osmosis management of aquatic animals, respiratory system and gas exchange, excretory organs and characteristics of blood elements 5. To understand the characteristics of the nervous, reproductive and endocrine systems of the fish, physiological mechanisms of the digestive tract, and artificial feeding 6. To shape an understanding of key issues related to the fish immune system, its adaptation to new climatic conditions and the stress impact 7. To develop the capacity of working with state-of-the-art equipment in the laboratory and an ability to do research on aquatic animals applying biochemical and physiological methods.
New educational materials which planned to create	The syllabus consists of chapters, sub-chapters, instructional strategies (such as theoretical seminars and hands-on activities that involve creating experimental protocols), and supplementary resources. Visiting laboratories as part of experimental activity.
Information about the place and form of the training	
EU hosting university	SUA in Nitra
Topics of the training	Theoretical topics: 1. Introduction to biochemistry and physiology of fish 2. External description, shape and body parts of the fish 3. Movement system 4. Body cavities 5. Circulatory system, biochemistry of blood 6. Respiratory system 7. Gastrointestinal system 8. Urogenital and Reproduction system 9. Endocrine system 10. Nervous system 11. Sensory system 12. Skin/cutaneous system 13. Anatomical dissection of the fish 14. Adaptations to Aquatic Environments Practical activities: 1. Laboratory classes: dissection of a fish, standard ichthyology evaluation, identification and presentation according to theoretical topics 2. Preparation of protocols 3. Visits the laboratories of AgroBioTech research centre Note: All topics, procedures, protocols, and experimental tasks will be consulted, adapted, and optimised according to the possibilities and needs of the participants.
LOs of the training	At the end of this training, participants should: 1) know describe the complex biological systems of fish, and detailed exploration of their structure and function 2) describe the anatomical systems such as the skeleton, muscles, respiratory and circulatory systems, as well as the study of the physiological adaptations of fish to life in aquatic environments. 3) know the basics of avaluation methods in fish biology 4) Prepare theoretical lectures and the related practical exercises that centre on all of the discussed topics
Delivery Mode and form of training	Instructor-led training as well as discussion of issues, topics, preparation of presentations, tests, experimental tasks, analyses, protocols, and evaluation of acquired skills and results.
Duration:	Two weeks (10 working days) including 1 day visit

	Theory: 8 hours (4 days of module sessions) Practical and field work: 8 hours (4 days working on pre-defined subject - individual (trainer)assisted work of participants) Individual work: 10 hours - preparation for example class 1 day - discussion and evaluation of the classes
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	6. Management in fishery and aquaculture
New or updated	New
LOs of the module	The master will be able to: 1. Analyze the management process and propose a toolkit to solve the observed problems, 2. Develop fisheries and aquaculture development programs using effective strategic and business planning tools, 3. To prepare operational, annual plans and budgets for fish industry and aquaculture, 4. To introduce digital technologies and information systems for resource management of the fishing industry, 5. Apply effective communication skills, forming an effective communication process and a friendly working environment, 6. Apply conceptual knowledge of management in order to make effective managerial decisions.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	SUA
Topics of the1 training	THEORETICAL TOPICS History of fisheries and aquaculture management in Slovakia over the last 100 years. (2 h) Problems of fisheries and aquaculture management in Slovakia over the last 100 years. (2 h) Economically important fish species in Slovakia in free/open waters. (2 h) Criteria for obtaining fish for sport fish and fish for stocking for natural reproduction. (2 h) Selection and modification of restocking environments for individual fish species. (2 h) Creation and evaluation of conditions for natural spawning of economically important fish species. (2 h) Environmental assessment through fish. (2 h) Fish migrations (food, reproduction...). (2 h) Migratory passage of open waters. (2 h) Sport fishing in Slovakia. (2 h)
LOs of the training	At the end of this training, participants should: Gain an understanding of the risks, problems and management of fish farming in open waters. Know the genetic and non-genetic factories influencing the management of fish farming in open water. Know how to modify environmental conditions in order to exploit natural fish reproduction and how to assess the environment through fish (environmental bioindicators).
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods to support classes.

	At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	10 days (5 days/week, 2 weeks), 4 days of module sessions (total 21 h), 1 day for preparation of one class (on a pre-defined subject) at SUA. Theory: 20 hours Individual work: 15 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	7. Entrepreneurship in fishery and aquaculture
New or updated	New
LOs of the module	Upon successfully finishing the course, the graduate student will have the capability to: 1. articulate the fundamental aspects of entrepreneurship, including its essence, motives, and effective implementation principles, 2. identify the problems of entrepreneurship in the field of fisheries and aquaculture of the Republic of Armenia, 3. conduct market analyses for the fishing industry and aquaculture, discerning the impact of the competitive environment, 4. by using various methods analyse the internal and external factors affecting the business environment, 5. in order to minimise and prevent business risks formulate the strategies, 6. evaluate the efficiency of business activities and derive well-informed conclusions.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials

Information about the place and form of the training

EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (4 h) a) Introduction to aquapreneurship b) The role of the extensionist in aquapreneur development c) Criteria for a successful business d) Evaluating entrepreneurs e) Defining the business idea 2) EVALUATING THE KEY SKILLS INVOLVED IN RUNNING A BUSINESS (6 h) a) Evaluating the different skills involved in running a business

	3) IDENTIFYING MARKETS, MAPPING RESOURCES AND CONDUCTING BUSINESS PLANNING (6 h) a) Identifying market opportunities b) Managing key activities and partners in a business c) Business planning: From canvas to business plan 4) FINANCIAL MANAGEMENT, SALES AND RISK MANAGEMENT (6 h) a) Identifying sources of finance b) Managing financial resources c) The basics of sales d) Assessing risk 5) RECORD KEEPING (4 h) a) Operations record keeping b) Financial record keeping 6) BUILDING A BUSINESS AND MANAGING RELATIONSHIPS (6 h) a) Putting plans into action and monitoring progress b) Managing relationships PRACTICAL CLASSES AND ACTIVITIES: - Workshop – how start a business - Videos about aquapreneur in aquaculture facilities - Visits to external institutions (Centre for entrepreneurship, enterprises in fish industry)
LOs of the training	After this training period, participants are expected to: - Explain the importance of aquapreneurship - Define a business idea - Outline the elements to consider when starting a business - Identify and analyse the cost of resources needed to start a business - Identify the main business opportunities in location - Conduct planning from business canvas to business plan - Use calculators and digital applications in cost and revenue calculations - Manage cash flow - Identify opportunities for growing sales - Manage relationships - Introduce innovations to manage change All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	8. Research Methodology
New or updated	New
LOs of the module	1. To know the principles and methodology of scientific research planning. 2. To define effective principles for selecting a methodology in research. 3. To apply universal, theoretical, and empirical methods. 4. To identify and develop research problems and hypotheses. 5. To illustrate ethical aspects of research through consideration of various research approaches. 6. To plan and implement various research projects related to the given field.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	FORMAL ASPECTS OF PUBLISHING 1) Regulations at the level of academic institution 2) Publishing ethics 3) Intellectual property 4) Plagiarism THE BASIC STRUCTURE OF SCIENTIFIC PUBLICATION 1) Study and review of scientific literature 2) Electronic information sources 3) Scientometric tools for evaluation of the quality of scientific work 4) Standards and regulations 5) Registration of scientific publishing at the level of the Institution PRESENTATION OF SCIENTIFIC WORK 1) Basics of scientific writing 2) Forms of presentation
LOs of the training	At the end of this training, participants should: 1) know the basic skills needed to publish scientific outcomes. 2) understand how to use these skills in the design of scientific methodology based on literature review and how to progress on the preparation of the manuscript of final thesis or other scientific outputs.
Delivery Mode and form of training	Instructor-led training
Duration:	Two weeks (10 working days), including 1 day visit Theory: 8 hours (4 days of module sessions) Practical and fieldwork: 8 hours (4 days working on the pre-defined subject - individual (trainer)assisted work of participants) Individual work: 10 hours - preparation for example class 1 day - discussion and evaluation of the classes
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	9. Basic aquaculture engineering
New or updated	New
LOs of the module	1. To know the basic concepts of farm designing and recent trends in aquaculture engineering.

	2. To explain site selection, construction, and design of tanks, ponds, cages and hatcheries. 3. To explain and differentiate the equipment used for water treatment in farms and processes of disinfection. 4. To present the design and fabrication of different types of aerators used in aquaculture farms.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) BASIC ASPECTS OF ENGINEERING APPLIED TO AQUACULTURE 1) Choice of species Zootechnical characteristics Biological characteristics Interaction with the environment Markets issues Public perception Exotic species issues 2) Production system Historical aspects Intensive / extensive / semi-intensive Salt water / fresh water / brackish water Cages / ponds / tanks / moluscs production Warm water / fresh water Big companies / small companies Human consumption / other water productions 3) Unit sizing aspects Land Access Labor Production Water Oxygen Sales / market Equipment Financial aspects Routines 4) Main equipment Prophylactic and pathological equipment Water control equipment Oxygen and/or aeration equipment Sales related equipment. Financial aspects 5) Labor aspects Number of people needed. Educational and professional level Financial aspects 6) Sales Differences in fish consumption Public perception of aquaculture Continuous and sporadic sales Local / national / international sales

	Regulation 7) Legislation National legislation and UE legislation Production licensing Environmental licensing Other restrictions on the activity 8) Environmental impact Approach to the main aspects of environmental impact applied to small, medium and big size aquaculture. Legislation and bureaucratic process. Critical evaluation of the process. All sessions will be theoretical and practical and in all sub-themes practical exercises or demonstrations will be realized.
LOs of the training	After this training period, participants are expected to identify the main characteristics of an aquaculture at the level of: - economical aspect on the region in what concerns to employment, production of high-level protein, acquisition of services and goods, educational training and/or other aspects. - negative and positive environmental impact. - technological aspects, both in equipment and work routines. - possible improvements
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

**International Scientific-Educational Center of NAS RA and
Scientific Center of Zoology and Hydroecology of NAS RA**

Title of the module	1. Aquaculture
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Know the vocabulary of aquaculture. ➤ Be able to deal with all aspects of aquaculture production. ➤ Assess the value of aquaculture in terms of ecological, social and economic importance. ➤ Know the basis of technologies of aquaculture, to understand the principles of its importance, purpose and application. ➤ Know the fisheries and aquaculture schemes used in breeding, rearing and feeding technologies in fish farms. ➤ Be able to explain which water parameters are essential for fish and need to be monitored. ➤ Be able to use the measuring equipment. ➤ Know about different aquaculture production systems and can discuss advantages and disadvantages of these systems. ➤ Know which factors influence the health of fish and be able to propose a treatment plan for diseased fish.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	THEORETICAL TOPICS I – FISH CULTURE SYSTEMS IN SLOVAKIA (1 h) a) Pond management (warm-water fish species farming) b) Trout culture (cold-water fish species farming) II – POND MANAGEMENT (4 h) a) Ponds – history and characteristics b) Technical pond facilities c) Classification of ponds d) Pond bed e) Essence of the pond production f) Method of pond farming III – CULTURE OF CARP (6 h) a) Origin and distribution of carp b) Characteristics of carp c) Reproduction of carp d) Rearing of carp e) Pond fishing f) Wintering IV – SUPPLEMENTARY FEEDING OF CARP (4 h) a) Characterization of natural food

	b) Nutrition requirements of carp c) Option and properties of feeds d) Efficiency of feed utilization e) Technique of supplementary feeding V – TROUT CULTURE (6 h) a) Cultural systems and facilities b) Characteristics of cultured fish species c) Reproduction, eggs incubation, rearing d) Feeding
LOs of the training	At the end of this training, participants should: – Gains knowledge from the fish cultural systems (cold- as well as warm-water systems). – Know the origin and main characteristics of cultured fish species in both cultural systems. – Acquaints with culture methods and final products technology. – Be able to applied obtained knowledge in aquaculture.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	10 days (5 days/week, 2 weeks), 4 days of module sessions (total 21 h), 1 day for preparation of one class (on a pre-defined subject) at SUA. Theory: 21 hours Individual work: 14 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	2. Fishery
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Assess fish abundance and distribution. ➤ Discuss and analyze global fisheries, fish production and consumption, resource conditions, fisheries conservation and management frameworks, fisheries and environmental protection, actions aimed at improving the ocean environment. ➤ Discuss and analyze the most important characteristics and research methods of commercially valuable fish species. ➤ Conduct scientific research and develop projects in the field of fish stock management.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	THEORETICAL TOPICS I – WATER AS AN ENVIRONMENT (4 h) a) Physical properties of water

	b) Chemical properties of water c) Types of aquatic environments II – THE BASE OF BIOLOGY, MORPHOLOGY, ANATOMY AND PHYSIOLOGY OF FISH (6 h) a) Morphology of fish b) Anatomy of fish c) Physiology of fish d) Reproduction of fish III – TAXONOMY OF FISH (10 h) a) Petromyzontiformes – lampreys b) Acipenseriformes – sturgeons and paddlefishes c) Anguilliformes – eels and morays d) Cypriniformes – carps e) Siluriformes – catfish f) Esociformes – pikes and mudminnows g) Salmoniformes – salmon h) Gadiformes – cods i) Cyprinodontiformes - rivulines, killifishes and live bearers j) Gasterosteiformes - sticklebacks and seamoths k) Scorpaeniformes - scorpionfishes and flatheads l) Perciformes - perch-like IV – ANGLING (FISHING) (4 h) a) Base methods of angling b) Fishing equipment and baits
LOs of the training	At the end of this training, participants should: – Make the acquaintance of morphology, anatomy and physiology of fishes and types of aquatic environments. – Deepen knowledge on generic composition of ichthyofauna and be able to distinguish between different fish species. – Learn about the fishing methods, especially angling in the context of current legislation, which he/she can apply in practice.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	10 days (5 days/week, 2 weeks), 4 days of module sessions (total 21 h), 1 day for preparation of one class (on a pre-defined subject) at SUA. Theory: 24 hours Individual work: 14 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	3. General Ichthyology
New or updated	New
LOs of the module	Upon successful completion of this educational program, the graduate will be able to: 1. Study the biological and ecological issues of fish community assessment and modeling. 2. Apply survey and sampling methods accepted in ichthyology.

	3. Carry out qualitative and quantitative analysis of research results and comparison of curves. 4. Acquire knowledge in the field of taxonomy, anatomy and basic principles of ontogenesis of bony fishes. 5. Acquire knowledge about the role of fishes of lake Sevan in the food chain of the limnosystem.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Modern fishes b) History of Ichthyology c) Fish classification d) Literature e) Internet and other teaching materials 2) FORM AND MOVEMENT (2 h) a) External anatomy and body shape b) Skeletal system c) Muscular system d) Locomotion 3) RESPIRATION, BLOOD AND ITS CIRCULATION (2 h) a) Gills b) Air-breathing fishes c) Oxygen requirements d) Blood e) Heart structure f) Circulation 4) BOUYANCY, THERMAL REGULATION AND OSMOREGULATION (2 h) a) Buoyancy b) Thermal regulation c) Osmoregulation 5) FEEDING, NUTRITION, DIGESTION AND EXCRETION (2 h) a) Anatomy of digestive system b) Feeding c) Nutrition d) Digestion and absorption e) Excretion 6) REPRODUCTION (4 h) a) Reproductive anatomy b) Breeding behavior

	c) Mating system d) Sex change in fish 7) SENSORY PERCEPTION (2 h) a) Chemoreception b) Hearing c) Equilibrium and balance d) Lateral line e) Electroreception f) Vision 8) BEHAVIOUR AND COMMUNICATION (2 h) a) Migratory behavior b) Shoaling behavior c) Feeding behavior d) Communication 9) HAGFISHES AND LAMPREYS (2 h) a) Hagfishes b) Lampreys 10) CHONDRICHTHYES (2 h) a) Characteristics b) Adaptation c) Reproduction d) Diversity 11) RELICT BONY FISHES AND TELEOSTEI (4 h) a) Sarcopterygii b) Actinopterygii c) Teleostei 12) ZOOGEOGRAPHY (2 h) a) Zoogeography of freshwater fishes b) Zoogeography of marine fishes 13) INTRODUCTION TO ECOLOGY (2 h) a) Filters b) Predation c) Competition d) Symbiosis e) Parasites and pathogens 14) CONSERVATION (2 h) a) Status of fish fauna b) Aquaculture c) Fisheries management d) Fish conservation PRACTICAL CLASSES AND ACTIVITIES - Laboratory classes: fish morphology and anatomy, fish gonad histology, - Videos about fish behavior - Visits to external entities (aquaria, natural museum)
LOs of the training	After this training period, participants are expected to: - Explain the origin and evolution of fishes - Describe fish morphology and anatomy - Discuss about fish respiration, osmoregulation and feeding processes - Explain different types of fish reproduction and reproductive strategies - Describe different types of fish sensory perceptions - Discuss about fish behavior and communication - Describe different fish groups - Explain basics of fish zoogeography and fish conservation

Delivery Mode and form of training	The sessions are planned as a combination of theoretical and practical activities. At the end of the training, participants will prepare a complete lesson plan, it will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the whole training at UNIDU. Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation and discussion of an example class chosen and fully designed by each participant.

Title of the module	4. General Hydrobiology
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Assess potential impacts on aquatic ecosystems, contributing to improved biodiversity and water quality and sustainability. ➤ Apply practical skills in field, experimental and laboratory research and data processing.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) THEORETICAL FRAMEWORK 1) The Hydrosphere – from freshwater to estuaries, seas, and oceans. 2) Key physical-chemical properties of water. 3) The major living players – from non-cellular to cellular organisms. 4) Planktonic organisms – viruses, bacteria, algae, fungi, protozoans, fish larvae. 5) Macroalgae, plants and animals. 6) Life and ecology in the aquatic environment. 7) Major energetic pathways and productivity. 8) Impact of climate change and human activities on the aquatic environment PRACTICAL FRAMEWORK 1) Fieldwork – visit to the Atlantic coast at the vicinity of Porto and use of multiparametric probes. 2) Fieldwork - visit to an estuarine/freshwater environment and use of multiparametric probes and other field equipment. Water sample collection. 3) Lab work to get acquaintance with express and traditional methods for the evaluation of water quality (physical, chemical, and microbiological).
LOs of the training	After this training period, participants are expected to know and understand key aspects on the field of General Hydrobiology.

	Describe the use of most common field and lab equipment. Apply state-of-the-art protocols for the evaluation of water quality
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	5. Ichthyopathology
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Get an idea about main contagious and non-contagious diseases of fish and other aquatic organisms. ➤ Get an idea about stress in fish and its impact on fish health, and welfare, as well as about mechanisms of immunity in fish, and its regulation ways. ➤ Get an idea about “parasite-host” relations in aquatic ecosystems, as well as about mechanism of development, and basic concepts of epidemic process. ➤ Master the modern tools for detection and diagnosis of pathogens infecting aquatic organisms. ➤ Organize and implement the treatment, prevention and control of diseases of fish and other aquatic organisms to ensure the health of farmed fish, and sustainable aquaculture.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Aquatic environment b) Characteristics of water c) Classification of fish diseases d) Literature

	e) Internet and other teaching materials 2) ANATOMY AND PHYSIOLOGY OF TELEOSTS (6 h) a) Integumentary system b) Musculoskeletal system c) Respiratory system d) Circulatory system e) Haemopoietic tissue f) Renal and excretory system g) Digestive system h) Nervous system i) Reproductive system j) Nutrition, metabolism and growth 3) PATOPHYSIOLOGY (4 h) a) Systematic pathology b) Stress and adaptation 4) IMMUNOLOGY (3 h) a) Nonspecific defence mechanisms b) Specific defence mechanisms 5) VIROLOGY (4 h) a) General biology of virus infection b) Virus infections of fish 6) PARASITOLOGY (4 h) a) Life cycles of parasites b) Parasites of the integument 7) BACTERIOLOGY (4 h) a) General bacteriology b) Taxonomy 8) MYCOLOGY (2 h) a) Oomycetes b) Chytridiomycetes c) Zygomycetes d) Deuteromycotina 10) NUTRITIONAL PATHOLOGY (3 h) a) Starvation b) Deficiencies and imbalances of major dietary components PRATICAL CLASSES AND ACTIVITIES - Processes in histopathology - Diagnosis of virus diseases - Taxonomy of fish parasites - Diagnosis of bacterial diseases - Visit to the fish market
LOs of the training	At the end of this training, participants should: - Know the main characteristics of the aquatic environment - Understand the influence of environment on the physiology - Know the pathological processes - Know how to recognize the changes in fish behaviour - Know and identify the most relevant diseases in fish - Describe and choose the adequate method for diagnosis - Prepare theoretical classes and practical activities that support them, focused on (and adapted to) local reality and regional and national resources, needs and preferences. (all these learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in

	teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	6. General Hydroecology
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ master the basic knowledge and skills about the principles of the structure and functioning of freshwater ecosystems, ➤ describe the biological and ecological features of the development of freshwater organisms, ➤ present the general regularities of influence of environmental factors on freshwater ecosystems and their components, ➤ assess and analyze the anthropogenic impact on freshwater ecosystems, ➤ define the main problems of conservation and use of freshwater ecosystems and their components, ➤ apply basic methods of hydroecological research.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) THEORETICAL FRAMEWORK 1) Brief acquaintance with Hydroecology. 2) The Hydrosphere – from freshwater to estuaries, seas, and oceans. 3) Key physical-chemical properties of water. 4) The major living players – from non-cellular to cellular organisms. 5) Life and ecology in the aquatic environment. 6) Biological indicators of water quality.

	7) Impact of climate change and human activities on the aquatic environment. 8) Water management in the European Union – the Water Framework Directive PRACTICAL FRAMEWORK 1) Fieldwork – visit to the Atlantic coast at the vicinity of Porto and use of multiparametric probes. 2) Fieldwork - visit to an estuarine/freshwater environment and use of multiparametric probes and other field equipment. Water sample collection. 3) Lab work to get acquaintance with express and traditional methods for the evaluation of water quality (physical, chemical, and microbiological).
LOs of the training	After this training period, participants are expected to know and understand key aspects on the field of General Hydroecology. Describe the use of most common field and lab equipment. Apply state-of-the-art protocols for the evaluation of water quality towards the management of the aquatic environment.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	7. Biology of Cultured Algae
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Understand and explain the structure, development fundamentals and perspectives use of algae. ➤ Master the basic knowledge and skills of the biology, reproduction and nutrition of the main species of algae. ➤ Evaluate and justify the safety, nutritional and economic benefits of using algae. ➤ Describe and differentiate the effects of increased algal biomass in aquatic environments and assess the subsequent implications for human health and aquaculture. ➤ Apply practical skills in field, experimental and laboratory research and data processing. To know and explain the problems in the field, the standards, the experience of different countries and the ways of development of "blue economics". ➤ Explain the cultivation of algae economic, biological, ecological foundations and modern research methodology.

New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (3 h) - Introduction to algae - Phycology basics - Basics in aquaculture - Introduction to concepts of Plankton, Nekton, Benthos - Literature - Internet and other teaching materials 2) MICRO AND MACROALGAE (3 h) - Structure and morphology - Cytology and ultrastructure - Photosynthesis - Storage and structural components 3) CULTIVATION OF ALGAE (4 h) - Emerging opportunities for algae aquaculture - Cultivation of micro and macroalgae - Culture methods - Farming in controlled environments - IMTA - Production and status 4) APPLICATION AND USE (4 h) - Algae in Food and Feed - Algae in biomedical research - Phycocolloids - Application in soil - Other uses of algae 5) BIOLOGY AND CULTURE OF CHLOROPHYTES (3 h) - Ulvophyceae - Green algae cultivation methods - Ulvaes and Ulotrichales - Bryospidales - Cladophorales 6) BIOLOGY AND CULTURE OF RHODOPHYTES (3 h) - Application and use of red algae - Gelidiales and Gracilariales - Carragenophyte - Porphyra 7) BIOLOGY AND CULTURE OF PHEOPHYCEAE (3 h) - Laminaria, - Sargassum

	c) Ascophyllum d) Undaria e) Hizikia f) Brown algae in IMTA 8) ALGAE AS A SOURCE OF DRUGS FROM THE SEA (3 h) a) Bioactive compounds in microalgae b) Bioactive compounds in green macroalgae c) Bioactive compounds in red algae d) Bioactive compounds in brown algae 9) ALGAE AS BIOFUEL (3 h) a) Factors in growth for fuels b) Biodiesel c) Gases d) Alcohol e) Efficacy 10) ALGAE SUSTAINABILITY (3 h) a) Algae bio resources b) Conservation c) Analytical methods d) Biotechnology PRACTICAL CLASSES AND ACTIVITIES: - Laboratory skills; microscope use and care, herbarium presses, - Use of taxonomic keys for seaweed ID, - Focus on Ulvophyceae–green algae, - Overview of red algal classes and orders, - Overview of Phaeophyceae orders
LOs of the training	After this training period, participants are expected to: - Be familiar with algal systematics, evolution and phylogeny. - Know the characteristics of algal groups. - Know the biology of selected algal species. - Be familiar with the temporal variation and biogeography of algae. - Have knowledge of important algal species in aquaculture - Have knowledge in application of algae in various industries - Be familiar with algae sustainability All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	8. Ecotoxicology
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New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: 1. Apply basic research methods in ecotoxicology and academic communication skills of relevance for professional career. 2. Discuss and analyze trends and prospects for the development of ecotoxicology as well as the risks of environmental pollution and the possibilities of reducing them. 3. Develop and propose ideas for the efficient use of natural resources and sustainable development, taking into account economic, social and environmental aspects. 4. Apply best practice for developing, operating a sustainable fishery and aquaculture based on ecological concepts. 5. Conduct scientific research and develop projects in various fields of ecotoxicology.
New educational materials which planned to create	The syllabus consists of chapters, sub-chapters, instructional strategies (such as theoretical seminars and hands-on activities that involve creating experimental protocols), and supplementary resources. Visiting laboratories as part of experimental activity.
Information about the place and form of the training	
EU hosting university	SUA in Nitra
Topics of the training	Theoretical topics: 1. Introduction to ecotoxicology: history, basic terms, main principles, dependence of toxicant effects 2. Toxic substances in the environment, bioaccumulation and biotransformation 3. Heavy metals and nanoparticles 4. Persistent organic substances 5. Pesticides, insecticides and herbicides 6. Endocrine disruptors 7. Bioavailability of chemical contaminants in water systems 8. Action of toxicants at the molecular, subcellular and cellular level 9. Toxicant detection methods, quantitative evaluation of biochemical markers and their interpretation 10. Reactive oxygen species and oxidative stress in relation to toxicants 11. Organ toxicity – hepatotoxicity, nephrotoxicity, pneumotoxicity 12. Neurotoxicity, immunotoxicity 13. Mutagenicity, carcinogenicity 14. Resistance to toxicity and ecological risk assessment Practical activities: 1. Laboratory classes: analyses of fish health status, monitoring of biomarkers in blood and selected tissues; analysis of environmental pollutants 2. Statistical evaluation of the obtained results, preparation of protocols 3. Visits the laboratories of AgroBioTech research centre Note: All topics, procedures, protocols, and experimental tasks will be consulted, adapted, and optimised according to the possibilities and needs of the participants.
LOs of the training	At the end of this training, participants should: 1) know the history, basic terms, and main principles of ecotoxicology

	2) describe the most important toxic substances, environmental pollutants, and xenobiotics that affect aquatic organisms in the environment 3) know the basics of research methods in the evaluation of ecotoxicology interactions 4) Prepare theoretical lectures and the related practical exercises that centre on all of the discussed topics
Delivery Mode and form of training	Instructor-led training as well as discussion of issues, topics, preparation of presentations, tests, experimental tasks, analyses, protocols, and evaluation of acquired skills and results.
Duration:	Two weeks (10 working days) including 1 day visit Theory: 8 hours (4 days of module sessions) Practical and field work: 8 hours (4 days working on pre-defined subject - individual (trainer)assisted work of participants) Individual work: 10 hours - preparation for example class 1 day - discussion and evaluation of the classes
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	9. Aquatic Animal Feeding and Nutrition
New or updated	New
LOs of the module	Upon successful completion of this course, the graduate will be able to: ➤ Apply acquired knowledge to analyze the nutritional requirements of aquatic animals, design and formulate diets, and recommend effective and appropriate feeding methods; ➤ Formulate and develop proper and effective management of cultured animal diets as well as aquatic animal feed consumption; ➤ Be able to use the knowledge gained through this course as a basis for either undertaking further research in aquaculture nutrition, participating in agricultural activities or working in the feed industry. ➤ Be able to competently discuss issues related to aquafeeds ➤ From the academic point of view become skilled in different aspects of fish nutrition including the design of nutrition experiments, formulation and preparation of experimental diets ➤ From the industrial point of view become familiar with different types of feeds, technology related to it and feeding practices
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Learning and studying materials
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) THEORETICAL TOPICS I-Introduction – basics in fish nutrition - 1h

	II-Protein nutrition and metabolism - 2h Functions of proteins Essential, semi-essential, and non-essential amino acids Digestion, absorption, and metabolic use of amino acids Protein turnover. Estimation of protein requirements Protein and amino acids requirements of aquatic animal II-Lipids nutrition and metabolism - 2h Classification of lipids and fatty acids. Functions of lipids. Digestion, absorption, catabolism, and synthesis of fatty acids. Optimum dietary lipid level Essential fatty acid requirements. Replacing fish oil in diets Lipid and whole-body composition IV-Carbohydrates nutrition and metabolism - 2h Definition and functions. Classification. Digestibility in different species Glucose metabolism Glucose homeostasis. Levels of carbohydrates in diets. V-Energy nutrition – 2h Diet energy partition scheme Gross energy; fecal energy losses; digestible energy; Loss of urinary and branchial energy; metabolizable energy; heat production; energy retention and maintenance Direct and indirect calorimetry. Energy efficiency for maintenance and growth. VI-Micronutrients in fish nutrition -1h Classification and biological functions of vitamins and minerals. Nutritionally important vitamins and minerals Dietary sources of vitamins and mineral Vitamins and minerals' roles in fish health VII-Fish Feeding and growth – 1h Evaluation of growth Prevision of growth rate Feed conversion Feed ration Feed management PRACTICAL CLASSES AND ACTIVITIES: (Analysis of the learning objectives of the practical activities, including laboratory experiments, demonstrations and workshops, visualization and comments of internet resources like videos, animations, etc.), and also visits to companies and entities related to the area) I-Experimental systems to study fish nutrition requirement – 3h II-Fish feeding habits and the anatomy of the digestive tract of different fish species – 2h III-Fish bioenergetics and growth – 2h
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	IV-Feed formulation - Adequacy of the diet formulation to the animal's nutritional and energy requirements 2h V-Analytical procedures to study diet and body composition and plasma metabolites – 2h VI- Critical analysis of scientific works on nutrition– 2h
LOs of the training	After this training period, participants are expected to: - Know the basics in fish nutrition and feeding, namely: Nutrition, metabolism and requirements: proteins and amino acids, lipids and essential fatty acids, carbohydrates, vitamins, minerals. Energy nutrition. Nutritional energy Fish nutrition and health. Feed management. Growth and feeding models. Production and rationing models. Critical analysis of scientific works on nutrition. Evaluation of experimental data from nutrition trials.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	1. Breeding Technologies in Mariculture
New or updated	New
LOs of the module	1) learn about the variety of products of marine origin, 2) learn about the technology of mollusk cultivation, 3) study the technology of marine fish breeding.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following 14 chapters are not designed as a common plan of classes for students. The topics will be discussed with the participants (also teachers) to find and define the best ways of presenting them to future students, explaining how classes are organized and which details and teaching methods are more effective. Adaptation to regional needs will be discussed and planned. References about bibliography, internet sources, support materials (images, infographics, photos, text, slides, videos, etc.), laboratory equipment and experimental protocols will be made. All teaching resources will be deeply analysed. THEORETICAL TOPICS 1) INTRODUCTION (3 h) - Overview of course content - Bibliography and other teaching materials - Human resources, facilities and equipment for support of teaching and research - Planned visits and practical classes - Overview of exams and other contributions to final grade - Reproduction in aquatic animals (asexual and sexual) - Basic genetics and heredity - Early development of aquatic animals 2) FISH REPRODUCTION (3 h) - Reproduction strategies in fish - Gametogenesis in fish 3) REGULATION OF REPRODUCTION IN FISH (2 h) - Regulation by external factors - Endocrine regulation of reproduction 4) REPRODUCTION OF FISH IN CAPTIVITY (2 h) - Reproductive dysfunctions of fish in captivity - Conditioning and induction of spawning 5) BROODSTOCK HUSBANDRY, SPAWNING AND EGG INCUBATION PROTOCOLS AND TECHNOLOGY FOR FRESHWATER FISH SPECIES (3 h) - Case study - <i>Cyprinus carpio</i> - Case study - <i>Oncorhynchus mykiss</i> - Case study - <i>Oreochromis mossambicus</i> 6) BROODSTOCK HUSBANDRY, SPAWNING AND EGG INCUBATION PROTOCOLS AND TECHNOLOGY FOR MARINE FISH SPECIES (3 h) - Case study - <i>Sparus aurata</i> - Case study - <i>Seriola dumerili</i> - Case study - <i>Labrus bergylta</i> 7) LARVICULTURE AND CULTURE OF JUVENILE FISH - CRITICAL POINTS DURING EARLY DEVELOPMENT (2 h)

	a) Importance of selecting system/technology, stocking density, feeding method and intensity, control of environmental parameters b) Overview of culture process for larvae and juveniles c) Mouth opening and first feeding d) Swim bladder inflation e) Metamorphosis f) Weaning to artificial diets g) Growth, development, survival, disease and deformities 8) LIVE FEED PRODUCTION (2 h) a) Importance of live feed for larviculture of fish b) Production and use of microalgae c) Production and use of rotifers d) Production and use of Artemia e) Production and use of copepods and other live feeds 9) LAYOUT AND MANAGEMENT OF FISH HATCHERY (2 h) a) Components of a fish hatchery b) Designing and planning a fish hatchery c) Starting up and running a fish hatchery 10) BREEDING OF CRUSTACEANS IN CAPTIVITY (2 h) a) Reproductive biology of crustaceans b) Early developmental stages of commercially important crustaceans c) Reproductive dysfunctions of crustaceans in captivity 11) REPRODUCTION OF COMMERCIALLY INTERESTING CRUSTACEANS FOR AQUACULTURE (2 h) a) Case study - <i>Litopenaeus vannamei</i> b) Case study - <i>Macrobrachium rosenbergii</i> c) Case study - <i>Hommarus gammarus</i> 12) BREEDING OF BIVALVES IN CAPTIVITY (2 h) a) Reproductive biology of bivalves b) Early developmental stages bivalves c) Wild spat collection vs hatchery produced bivalves 13) HATCHERY PRODUCTION OF COMMERCIALLY INTERESTING BIVALVES (2 h) a) Case study - <i>Ostrea edulis</i> b) Case study - <i>Pecten maximus</i> c) Case study - <i>Ruditapes philippinarum</i> and <i>Ruditapes decussatus</i> 14) BREEDING TECHNOLOGIES FOR OTHER SPECIES IN AQUACULTURE (2 h) a) Hatchery production of Abalone b) Comparison of <i>Sepia officinalis</i> and <i>Octopus vulgaris</i> c) Breeding of Holothurians (sea cucumbers) and Echinoideans (sea urchins) PRACTICAL CLASSES AND ACTIVITIES: - Laboratory classes: dissection of fish (reproductive organs, comparison of juvenile and adult male and female, calculation of GSI), histology of gonads before, during and after gametogenesis, small-scale rotifer production, Artemia decapsulation, observing development of embryo and larvae in currently available aquatic species - Visit to other in-house facilities: bivalve hatchery, bivalve farm and overview of wild bivalve spat collection process for the purpose of aquaculture - Visits to external entities (fish farm and bivalve farm)
LOs of the training	After this training period, participants are expected to: - Cover basic reproductive and developmental biology of aquatic organisms

	- Learn about external and internal regulation of reproduction in aquatic organisms - Implement known conditioning, spawning, egg incubation and larviculture methods for the breeding of aquatic organisms - Understand the requirements and importance of different live feeds - Know which practices are most commonly used breed, spawn, collect, incubate and hatch eggs, culture larvae and juveniles of staple commercial species - Understand other methods of breeding, spawning, egg collection, incubation and hatching, larviculture and juvenile culture used to cater to specific needs of other species All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	2. Diversification of Shelfish Farming
New or updated	New
LOs of the module	1) learn how to develop, implement and apply new effective technological processes of production of products aquaculture, to ensure its quality. 2) to learn how to apply modern new modeling methods, digital technologies and specialized software provision for solving production, technological and scientific problems in the field of bioresources and aquaculture. 3) to learn how to identify and evaluate the types of aquatic biological resources their number and biomass and make predictions stocks and catch volumes of aquatic biological resources objects and aquaculture. 4) to learn how to develop and implement scientific and applied projects on the problems of water bioresources and aquaculture and interdisciplinary projects related to it, taking into account production, legal, economic and environmental aspects.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU

Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Introduction to bivalve farming; general concepts and definitions b) Program forming, topics covered, justification of the chronological order of the listed topics c) Human resources, facilities and equipment to support teaching and research d) Literature e) Internet and other teaching materials f) Visits and practical exercises 2) BIVALVES BIOLOGY (9 h) a) Morphology and anatomy b) Filtration and feeding c) Respiration d) Circulation, excretion, osmoregulation e) Reproduction and offspring f) Growth g) Ecology, taxonomy and systematics 3) BIVALVE ECOSYSTEM SERVICES - NATURAL POPULATIONS: POPULATION DYNAMICS AND MANAGEMENT (2 h) 4) BIVALVE CULTURE BASICS (4 h) a) Introduction to methodology b) Overview of current bivalve farming practices c) Seed supply 5) SITE SELECTION CRITERIA (5 h) a) Water quality b) Physical and chemical factors c) Biological factors d) Economic and legal factors 6) DISEASES AND PARASITES (2 h) 7) PREDATION (2 h) 8) PUBLIC HEALTH (2h) 9) CARRYING CAPACITY FOR SUSTAINABLE BIVALVE FARMING (2h) 10) FARMING IN THE MEDITERRANEAN AND WORLDWIDE (2h) PRACTICAL CLASSES AND ACTIVITIES: - Laboratory: bivalve determination and dissection - Visit to a bivalve farm and hatchery– overview of farming methods - Visits to aquarium and natural history museum
LOs of the training	After this training period, participants are expected to: - Choose the adequate system to farm the specific species - Design the adequate bivalve system to farm the specific species - Critically judge the current bottlenecks of production systems

	- Prepare theoretical classes and supportive practical, adjusted to regional and national resources, needs and preferences All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	3. Diversification of Fish Farming
New or updated	New
LOs of the module	1) learn how to develop, implement and apply new effective technological processes of production of products aquaculture, to ensure its quality. 2) to learn how to apply modern new modeling methods, digital technologies and specialized software provision for solving production, technological and scientific problems in the field of bioresources and aquaculture. 3) to learn how to identify and evaluate the types of aquatic biological resources their number and biomass and make predictions stocks and catch volumes of aquatic biological resources objects and aquaculture. 4) to learn how to develop and implement scientific and applied projects on the problems of water bioresources and aquaculture and interdisciplinary projects related to it, taking into account production, legal, economic and environmental aspects.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary

materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail.

THEORETICAL TOPICS

1) INTRODUCTION (2 h)

- a) Overview of course content
- b) Bibliography and other teaching materials
- c) Human resources, facilities and equipment for support of teaching and research
- d) Planned visits and practical classes
- e) Overview of exams and other contributions to final grade
- f) History of modern aquaculture
- g) Domestication of fish

2) DIVERSIFICATION OF FISH FARMING AND CRITERIA FOR CHOOSING NEW SPECIES (2 h)

- a) Reasons behind diversification
- b) Criteria for choosing a new species
- c) Overview of staple and emerging species in mariculture

3) OVERVIEW OF CURRENT FARMING AND HATCHERY TECHNOLOGY THAT CAN BE USED FOR INTRODUCTION OF NEW SPECIES (3 h)

- a) Extensive, semi-intensive, intensive and super-intensive production systems
- b) Hatchery and Juvenile production systems
- c) Land-based systems
- d) Sea-based systems

4) ISSUES WITH REPRODUCTION, QUALITY OF OFFSPRING AND LARVICULTURE OF FISH NEW TO AQUACULTURE (3 h)

- a) Broodstock procurement and husbandry
- b) Circumventing reproductive dysfunctions
- c) Obtaining quality offspring
- d) Specific larval requirements
- e) Setting up breeding programs

5) ISSUES OF FEEDING FISH NEW TO AQUACULTURE (3 h)

- a) Live feed requirements (size, movement, nutritive composition) during larval period
- b) Cannibalism and other issues during weaning
- c) Tailoring feeds to meet requirements of juvenile and adult life stages (on-growing)

6) STATUS OF RESEARCH INTO NEW SPECIES AND INTRODUCTION TO COMMERCIAL PRODUCTION (2 h)

- a) Overview of current advances in field
- b) Species on onset of commercialisation

7) DIVERSIFICATION WITH FISH FROM FAMILY SCOMBRIDAE AND CORYPHAENIDAE (2 h)

- a) Overview of species of high commercial importance and interest to mariculture
- b) Reproduction
- c) Larviculture

- d) On-growing
- e) Specifics of species from family
- 8) DIVERSIFICATION WITH FISH FROM FAMILY CARANGIDAE (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 9) DIVERSIFICATION WITH FISH FROM FAMILY SCIAENIDAE (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 10) DIVERSIFICATION WITH FISH FROM FAMILY SERRANIDAE AND POLYPRIONIDAE (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 11) DIVERSIFICATION WITH FISH FROM FAMILY SPARIDAE (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 12) DIVERSIFICATION WITH FISH FROM MUGILIDAE AND ANGUILLIDAE (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 13) DIVERSIFICATION OF FLATFISH (PLEURONECTIFORMES) PRODUCTION (2 h)
 - a) Overview of species of high commercial importance and interest to mariculture
 - b) Reproduction
 - c) Larviculture
 - d) On-growing
 - e) Specifics of species from family
- 14) DIVERSIFICATION OF PRODUCTION WITH OTHER FISH SPECIES (3 h)

	a) Overview of species of high commercial importance and/or interest to mariculture b) Reproduction c) Larviculture d) On-growing e) Specifics of species from family PRACTICAL CLASSES AND ACTIVITIES: - Laboratory experiments: setting up a controlled greenwater system and maturing a simple mesocosm system - Practical work: Designing an experiment with live fish in controlled systems (feeding experiment) - Visit to external institutions: fish farm, seafood market, public aquarium
LOs of the training	After this training period, participants are expected to: - Identify reasons and needs for diversifying farmed fish species - Understand main bottlenecks of introducing new species - Familiarise with current state of industry in context of diversifying production with commercially important species - Select new candidate species for aquaculture from those regionally present - Adapt available spawning, hatchery and on-growing technologies for the introduction of new species to mariculture - Understand importance of live feeds and dedicated formulated feeds for introduction of new species to mariculture - Familiarise with specific bottlenecks of a wide range of species on the onset of commercial production or currently under research and consideration for diversification All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	4. New Technologies in Mariculture
New or updated	New
LOs of the module	1) learn about modern methods and technologies of seaweed cultivation, 2) familiarize yourself with the technological standards for the cultivation of crustaceans, 3) familiarize yourself with the equipment and facilities for the industrial cultivation of aquaculture objects in the marine water area.

New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) - Introduction to mariculture technology; general concepts and definitions - Programme forming, topics covered, justification of the chronological order of the listed topics - Human resources, facilities and equipment to support teaching and research - Literature - Internet and other teaching materials - Visits and practical exercises 2) OVERVIEW OF CURRENT MARICULTURE PRACTICES (3 h) - Pond farming system - Raceway farming system - Cage farming system - Recirculation aquaculture system (RAS) 3) OFFSHORE MARICULTURE (3 h) - Design challenges for offshore aquaculture - Nets - Cages - Mooring - Vessels 4) AQUAPONICS (4 h) - Introduction to aquaponics - Water quality in aquaponics - Design of aquaponic units - Bacteria in aquaponics - Plants in aquaponics - Fish in aquaponics 5) INTEGRATED MULTITROPHIC AQUACULTURE (3 h) - Principles of IMTA - System Design for IMTA - Criteria for selection of farming organisms 6) Macroalgae farming systems (4 h) - Floating systems - Bottom systems - Off-bottom systems - Tank systems - IMRAS 7) CRUSTACEANS FARMING SYSTEMS (4 h)

	a) Shrimp farming in biofloc systems b) Shrimp farming in aquamimicry systems c) Lobster farming in RAS d) IMRAS 8) ECHINODERMS FARMING SYSTEMS (3 h) a) Sea cucumber farming b) Urchin farming c) Starfish farming 9) MARICULTURE OF BIOTECHNOLOGICALLY INTERESTING SPECIES (3 h) a) Microalgae b) Sponges c) Corals 10) ROBOTICS IN MARICULTURE (3 h) a) Remotely operated vehicles for aerial and underwater surveillance b) Automatic feeders c) Automatic counters PRACTICAL CLASSES AND ACTIVITIES: - Laboratory experiments: microalgae farming, urchin spawning induction. - Demonstration of aquaponic and/or IMTA principles at pilot-scale level. - Videos about new farming technology at commercial level. - Visits to external institutions (mariculture facilities, public aquaria, museums, ornamental fish and equipment stores).
LOs of the training	After this training period, participants are expected to: - Choose the adequate mariculture system to farm the specific species - Design the adequate mariculture system to farm the specific species - Critically judge the current bottlenecks of mariculture production systems - Invent technological solutions that fit the specific requirements of mariculture production systems - Prepare theoretical classes and practical activities that support them, focused on (and adapted to) local reality and regional and national resources, needs and preferences All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	5. Introduction to Ecology
New or updated	New

LOs of the module	1) learn about the optimal requirements for aquatic ecosystems: lighting, temperature, content of basic gases, etc., 2) learn about ecological groups of hydrobionts of aquatic ecosystems, 3) learn about the self-cleaning processes of water bodies, 4) learn about the ways and methods of regulating the ecological parameters of water ecosystems.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analyzed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Concepts of ecology and ecosystems b) Branches of Ecology c) Diversity and organization in the living world d) Literature e) Internet and other teaching materials 2) ECOLOGICAL FACTORS AND ECOLOGICAL VALENCE (2 h) abiotic and biotic factors 3) POPULATION ECOLOGY (3 h) a) Spatial distribution b) Population density and age structure c) Population growth 4) ORGANIZATION AND FUNCTIONING OF THE ECOSYSTEM (2 h) 5) TERRESTRIAL ECOSYSTEMS (2 h) 6) AQUATIC ECOSYSTEMS (3 h) a) Freshwater ecosystems b) Ocean ecosystems 7) ENERGY FLOW AND MATERIALS DISTRIBUTION IN ECOSYSTEMS (2 h) 8) PRIMARY PRODUCTION IN ECOSYSTEMS (3 h) 9) SECONDARY PRODUCTION IN ECOSYSTEMS (2 h) 10) FOOD CHAINS, FOOD WEBS AND TROPHIC LEVELS (3 h) a) Ecological pyramids 11) CYCLE OF MATTER IN NATURE (2 h) a) Biogeochemical cycles of nitrogen, phosphorus, sulphur, carbon, oxygen and hydrogen 12) HUMAN IMPACT ON THE ENVIRONMENT (3 h) a) Global (climate) changes: global warming, acid rain, ozone depletion, habitat (biotope) degradation and destruction 13) PROTECTION OF NATURE AND ENVIRONMENT (3 h) a) Sustainable development PRACTICAL CLASSES AND ACTIVITIES:

	- Laboratory work - Field work - Videos about effects of global climate changes and sustainable development. - Visits to external institutions (Institute for Marine and Coastal Research).
LOs of the training	At the end of this training period, participants are expected to: - Define basic ecological concepts; - Explain the interdependence of living beings and their environment; - Describe the change in the complexity of different organizational levels of biosphere; - Compare the adaptation of organisms to abiotic and biotic environmental conditions; - Explain energy flow and cycle of matter in the biosphere; - Explain trophic relationships in food webs of different ecosystems; - Identify the impact of man on nature and the need to maintain a balanced state of nature and connect his/her own behavior and responsibility with sustainable development and nature conservation. All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	6. Fisheries Technology and Evaluation of Fisheries Resources
New or updated	New
LOs of the module	1) to do characteristics, métiers, catch mechanisms, selectivity, impacts on target species, impacts in terms of by-catch and discards, impacts on the marine environment, and methods to mitigate negative impacts of fishing; 2) knowledge of the most important aspects of the behavior of harvested species in relation to fishing gear; 3) Understanding the basics of fish detection using acoustic methods (e.g. sonar); 4) knowledge of the main methods and models used in the assessment of living resources, their limitations, assumptions and requirements in terms of data and parameters; 5) competency analysis and interpretation of data and the use of models for assessing the status of a stock; 6) ability to propose management measures and conservation; 7) to discuss the consequences of climatic changes on fisheries and on how these two factors might interact.

New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analyzed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Status of world fisheries b) The fishery problems c) Literature d) Internet and other teaching materials 2) THE STATUS OF MARINE FISHERY RESOURCES (4 h) a) Status of resources b) Status and trends by major species c) Status and trends by fishing area 3) DEVELOPMENT OF FISHING GEAR AND METHODS (2 h) 4) SELECTIVITY AND CATCH EFFICIENCY (6 h) a) Discard management – Case Studies b) Bycatch management – Case Studies 5) FISHERIES IMPACT ON THE ECOSYSTEM (2 h) 6) OVERFISHING (2 h) a) Introduction b) Management c) Case study 7) POLLUTIN DAMAGES TO COMMERCIAL FISHERIES (2 h) a) Introduction b) Assessing the economic effects c) Case study 8) FISHERIES STOCK ASSESSMENT (8 h) a) Introduction b) Population dynamics models c) Applying stock assessment Models to data 9) Improving fisheries management (2 h) a) Objectives and targets b) Better governance and policy reform c) Better management and production 10) Fisheries adaptations to climate change (2 h) a) Mainstreaming climate change into fisheries management b) Developing and implementing transformative adaptation plans PRACTICAL CLASSES AND ACTIVITIES: - Visualization and comments of internet resources - Visits to local fish market
LOs of the training	At the end of this training, participants should:

	- Know the global status of fisheries - Know the most important fishing gear - Understand and know how to apply the methods to analyse state of commercial fish stocks - Know the methods to reduce negative consequence of fisheries - Understand the policy of fishery management - Understand consequences of climatic changes on fisheries
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	7. Entrepreneurship in aquaculture
New or updated	New
LOs of the module	1) to learn how to apply acquired knowledge to identify, set and solve problems in various practical situations in entrepreneurial activities related to aquaculture. 2) learn how to demonstrate entrepreneurship in various areas of professional activity and take responsibility for results in the field of aquaculture. 3) to learn how to master the methods and tools for substantiating management decisions regarding the creation and functioning of business and trade structures in aquaculture. 4) to learn how to solve professional tasks and carry out entrepreneurial activities in the agricultural sector, taking into account the requirements of balanced nature management
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), are given. All teaching materials are analyzed in detail.

	THEORETICAL TOPICS 1) INTRODUCTION (4 h) a) Introduction to entrepreneurship in aquaculture b) The role of the extensionist in aquaculture entrepreneur development c) Criteria for a successful business d) Evaluating entrepreneurs in aquaculture e) Defining the business idea 2) EVALUATING THE KEY SKILLS INVOLVED IN RUNNING A BUSINESS (6 h) a) Evaluating the different skills involved in running a business 3) IDENTIFYING MARKETS, MAPPING RESOURCES AND CONDUCTING BUSINESS PLANNING (6 h) a) Identifying market opportunities b) Managing key activities and partners in a business c) Business planning: From canvas to business plan 4) FINANCIAL MANAGEMENT, SALES AND RISK MANAGEMENT (6 h) a) Identifying sources of finance b) Managing financial resources c) The basics of sales d) Assessing risk 5) RECORD KEEPING (4 h) a) Operations record keeping b) Financial record keeping 6) BUILDING A BUSINESS AND MANAGING RELATIONSHIPS (6 h) a) Putting plans into action and monitoring progress b) Managing relationships PRACTICAL CLASSES AND ACTIVITIES: - Workshop – how start a business - Videos about entrepreneurs in aquaculture facilities - Visits to external institutions (Centre for entrepreneurship, enterprises in industry).
LOs of the training	After this training period, participants are expected to: - Explain the importance of entrepreneurship in aquaculture - Define a business idea - Outline the elements to consider when starting a business - Identify and analyse the cost of resources needed to start a business - Identify the main business opportunities in location - Conduct planning from business canvas to business plan - Use calculators and digital applications in cost and revenue calculations - Manage cash flow - Identify opportunities for growing sales - Manage relationships - Introduce innovations to manage change All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching

	skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	8. Aquaculture processing technology
New or updated	New
LOs of the module	1) learn about the technological properties of hydrobionts, 2) learn about technological processes at fish processing enterprises, 3) to study best practices in the field of raw fish processing.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h) THEORETICAL TOPICS I - INTRODUCTION (2 h) a) Scope of the farmed fish processing technology area; general concepts and definitions. b) Discipline programming, topics covered, justification for the chronological order of the subjects mentioned. c) Human resources, facilities and equipment for support of teaching and research. d) Bibliography. e) Internet and other teaching materials. f) Visits and practical sessions. II - HISTORICAL PERSPECTIVE (2 h) a) Seafood processing at pre-history. b) Classical civilizations: from Egypt to the Roman Empire. c) Products and processing in the Middle Age. d) Modern and Contemporary Ages. e) Processing technologies in the world, Europe and Portugal. f) Future of seafood in human nutrition. III - AQUATIC BEINGS AS RAW MATERIALS (1 h) a) Main groups and species. b) General characterization of main species. c) Chemical and nutritional composition of aquatic organisms.

	IV - SEAFOOD DEGRADATION (2 h) a) General degradation process. b) Autolysis. c) Putrefaction. d) Factors that influence degradation. e) Sensory degradation in fish, crustaceans and mollusks. f) Other degradation phenomena. V - SEAFOOD PRESERVATION (3 h) a) Preservation methods and their principles. b) Types and groups of methods. c) Refrigeration. d) Freezing. e) Canning. f) Smoking. VI - FISH PROCESSING AT FARMS (2 h) a) Concerns during farming. b) Pre-slaughter procedures. c) Slaughtering methods. d) Post-slaughter operations. e) Packaging and preparation for transport. f) Farming and aquatic animal welfare. VII - INDUSTRIAL PROCESSING TECHNOLOGIES (2 h) a) Manual and mechanized processes. b) Fresh fish chain. c) Frozen fish chain. d) Canned fish chain. e) Traditional fish technologies (drying, salting, smoking, etc.). f) Modern and future technologies. g) Distribution. VIII - AQUACULTURE PRODUCTS SALES (1 h) a) Fresh, packaged, pre-cooked and ready-to-eat seafood. b) Development of aquaculture products. c) Transport. d) Distribution. e) Fish stores, display and selling-related technologies. IX - FROM BUYING TO CONSUMPTION (1 h) a) Transport. b) Handling at home. c) Preparation for cooking. d) Cooking methods. e) Catering and restauration. X - AFTER CONSUMPTION: SEAFOOD EFFECTS ON HUMAN HEALTH (2 h) a) Wild versus farmed aquatic food. b) Nutritional recommendations. c) Benefits and problems of aquatic food. d) Certification and future of farmed products. XI - BY-PRODUCTS OF THE SEAFOOD INDUSTRY (2 h) a) Fish meal or FPC (fish protein concentrates).
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	b) Fish oil. c) Fish mince and main derivatives. d) Surimi. e) Fish silage. f) Fish protein hydrolysates. g) Other by-products. XII - NON-FOOD PRODUCTS (1 h) a) Fish leather. b) Chitin and chitosan. c) Fish glue. d) Pearl essence. e) Shells. f) Fertilizers. g) Grey amber. h) Extraction and isolation of pharmaceutical, nutraceutical, cosmetical and other bioactive compounds. XIII - SEAFOOD QUALITY (1 h) a) Quality along history. b) Seafood quality attributes. c) Good Manufacturing Practices (GMP). d) Good Hygiene Practices (GHP). e) Methods for quality and freshness evaluation. XIV - SEAFOOD SAFETY (2 h) a) Seafood safety concerns. b) Seafood main dangers and risks. c) Safety management: seafood HACCP. d) Traceability of seafood. PRACTICAL CLASSES AND ACTIVITIES: (Analysis of the learning objectives of the practical activities including laboratory experiments, demonstrations and workshops, visualization and comments of internet resources like videos, animations, etc.), and also visits to companies and entities related to the area) - Laboratory classes: evaluation of fish freshness, definition of shelf-life, microbial analysis of water, farms and animal surfaces, fish canning, fish smoking, fish salting and drying, etc. - Demonstration of fish processing methods at pilot-scale level. - Videos about processing equipment at factory level. - Visits to external entities (fishing harbors, fish farms, fish markets, fish stores, refrigeration and freezing industries, canning factories, distribution logistic centers, museums, public aquaria, ornamental fish stores).
LOs of the training	After this training period, participants are expected to: - Know the general history of fish processing and technology. - Know the origin and main characteristics of aquatic organisms as raw materials for the food industry. - Be able to describe main fish degradation phenomena. - Describe the preservation methods (including methods, principles and equipment) applied to aquatic products. - Know the main characteristics of the more common fish handling (including associated welfare), slaughter and processing technologies, at farms and at industry.

	- Describe the most common seafood products and establish relations between aquatic food characteristics and the main products, display and selling methods and related technologies. - Describe the main benefits and problems of seafood in human health. - Know the main by-products of the seafood industry. - Know characteristics of main non-food products from water living organisms. - Know current methods for evaluation of fish freshness and quality. - List the main dangers associated with seafood and strategies to minimize their risks of occurrence. - Prepare theoretical classes and practical activities that support them, focused on (and adapted to) local reality and regional and national resources, needs and preferences. (all these learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	9. Animal Welfare in Aquaculture and Public Aquariums
New or updated	New
LOs of the module	1). to acquaint with the features of care and placement of fish kept on farms and laboratories and aquaculture facilities; 2). learn about the peculiarities of the physical and chemical requirements of fish, and the ecology of each type of fish; 3). learn to assess the welfare of fish bred on farms, research laboratories and aquaculture premises; 4). learn to control the physico-chemical parameters of water, indicators of well-being, complexity of the environment, stocking density, search for food; 5). develop skills in using physical and behavioral indicators to assess fish welfare by observing fish using non-invasive monitoring; 6). learn to control the ecological complexity of the environment and its parameters, design features of aquariums and aquaculture systems, farms; 7). learn about feeding behavior, stocking density and social behavior of fish; 8). to acquaint with the European procedural protocols for aquaculture and fishing; 9). learn about breeding technologies and fish care.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO

Topics of the training	Theoretical topics: 1- Introduction to the module and background (1h) 2- Introduction to animal welfare (1h) • Animal sentience • Understanding the concept of animal welfare • Key ethical considerations in animal care and use • Basics of animal welfare assessment 3- Importance of ethology in aquaculture and public aquariums (1h) • Recognition of normal and abnormal behaviours • Communication in aquatic animals • Behavioural valence 4- Stress in fish (3h) • Physiological responses • Behavioural responses • Coping styles • Environmental stressors in aquaculture and public aquariums • Stress mitigation strategies 5- Welfare concerns in aquaculture and public aquariums (3h) • Water quality • Density • Feeding practices • Health and disease management • Handling and Transportation • Slaughter 6- Evaluation plan for welfare assessment (2h) • Operational indicators • Laboratory indicators • Individual and group indicators • Assessment frameworks and Quality Behavioural analysis (QBA) 7- Environmental enrichment (1h) • in aquaculture • in public aquariums • Enrichment plan and efficacy assessment Practical activities: • Opportunity to discuss different animal welfare topics with researchers of the field (CCMAR, i3S) (6h) • Development of a project aiming to assess animal welfare and strategies to improve it. (6h)
LOs of the training	1. to understand the animal welfare concept; 2. to recognize the importance of animal welfare in aquaculture and public aquariums; 3. to recognize the importance of behaviour and physiology to assess animal welfare. 4. to develop knowledge to recognize signs of concern and to improve animal welfare in aquaculture and public aquariums
Delivery Mode and form of training	This plan is designed to capacitate teachers to deliver the contents of this module to students. The rationale behind the plan will be elucidated and discussed with participants for adaptation to the country's context. Diverse teaching methods will be employed, including lecture-based learning, technology-based learning, inquiry-based learning, individual learning, design thinking, project-based learning with final presentation, and general discussions with field experts.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of a sample class, individually selected and fully developed by each participant. During the final session,

	participants will share their insights and opinions on the overall U.Porto training experience.
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Title of the module	10. Food Nutrition and Technology
New or updated	New
LOs of the module	1) the student should be able to know and understand the basics and principles relating to food, nutrition, and the relationship of food to human health. 2) the student will have knowledge and familiarity with the ways of food processing and food preservation. 3) the student should be able to conduct chemical and biological food tests and adjust the quality of food in factories. 4) the student will know the laws and regulations relating to the quality of food and its relationship to food manufacturing. 5) the student will be able to use analysis and critical thinking to grasp the reality and the problems of the food industry, and participate in resolving them. 6) the student should be able to apply the principles and knowledge related to nutrition and food manufacturing methods in the field of labor and management. 7) the student should be able to communicate and work with others and to provide advice, guidance, and knowledge transfer. 8) the student will be able to keep up with the use and transfer of technology. 9) the student should be able to demonstrate professional and ethical responsibility and assess the health risks resulting from negligence in this area.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) THEORETICAL TOPICS I – Introduction: Overview of aquaculture feeds - global impacts of ingredient use (2 h) b) Discipline program, topics addressed, discussion of the selected topics. c) Facilities and equipment used in teaching and research activities. d) Feed ingredients. e) Fish meal and oil. f) Land use for plant-based ingredients. g) Water pollution. II – Nutritional requirements of cultured fish (1.5 h) a) Nutrient requirements of fish. b) Feed ingredients. c) Theory behind feed formulation. d) Conclusions III – Replacing fishmeal and fish oil in industrial aquafeeds (1.5 h) a) Introduction b) Fishmeal sparing in aquafeeds

	c) Fish oil sparing in aquafeeds. d) Conclusions IV – Feed manufacture (1.5 h) a) Common processes in aquafeed manufacture. b) Structuring of the feed. c) Methods of characterizing textured feeds. d) Conclusions. PRACTICAL CLASSES AND ACTIVITIES: V- Formulation of feeds for aquaculture (2.5 h) a) General principles. b) Features linked to the animals, feeds, and the environment. c) Requirements, recommendations, and safety margins. d) Formulation and quality of the final product. e) Calculation of threshold price. VI – Aquafeed production (2.5 h) a) Identifying ingredients. b) Quantify and mix ingredients. c) Pelletizing. d) Finishing processes. VII – Practical feed testing – Visiting BOGA (2.5 h) a) Feeding practices. b) Feed application and characteristics. c) Experimental systems for aquafeed testing. d) Discussion and conclusions. VIII - Digestive physiology in fish (2.5 h) a) Feeding behavior and regulation of food intake. b) Anatomy and physiology of different fish species. c) Fish anatomy and aquafeed characteristics. d) Conclusions. IX – Select the adequate aquafeeds for different fish species (2.5 h) a) Carnivorous fish species. b) Herbivorous fish species. c) Aquafeeds analysis – comparison between different trophic levels. d) Conclusions. X – Aquafeed composition analysis (2.5 h) a) Protein determination. b) Lipid determination. c) Dry matter determination. d) Ash determination. XI – Production model – Extrusion vs Pelletting (2.5 h) a) Planning production using a growth model. b) Planning production using a feeding model. c) Comparative approach using extruded or pelleted aquafeed. d) Doubts and conclusions.
LOs of the training	After this training period, participants are expected to: - Know the most common ingredients used in aquafeeds. - Identify the major constraints on aquafeed production.

	- Be aware of the main strategies to reduce fishmeal and fish oil utilization in aquafeeds. - Know how to formulate a basic aquafeed for a proposed fish species. - Describe an aquafeed manufacturing process. - Be able to explain fish anatomy and digestive tract according to fish trophic level. - Describe the main benefits and problems of seafood in human health. - Know how to choose an adequate aquafeed according to the target fish species. - Acquire competencies to assess the protein, lipid, dry matter, and ash content of aquafeed. - Be able to use and teach how to use a growth and feed model in an industrial aquaculture scenario. (all these learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	11. Bioresources of the hydrosphere and their use
New or updated	New
LOs of the module	1) learn about the processes of biological production of the hydrosphere, in particular seas and oceans, 2) learn about the biological resources of the hydrosphere and their distribution, 3) familiarize yourself with the sources of the use of aquatic living resources.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h/module) THEORETICAL TOPICS I - INTRODUCTION (2 h) a) Worldwide evolution of marine, transition and inland fisheries, and the need of the aquaculture as an alternative and sustainable sector for facing the growing human needs for animal protein. b) Discipline programming, topics covered, justification for the chronological order of the subjects mentioned. c) Human resources, facilities and equipment for support of teaching and research. d) Bibliography.

	e) Internet and other teaching materials. f) Visits and practical sessions. II - HISTORICAL PERSPECTIVE (2 h) a) Evolution of fisheries captures from 1950 until now. b) Role of fisheries vessels, boat equipment's, fishing devices and associate sectors. c) Sustainable maximum worldwide fisheries captures. d) Evolution of aquaculture production with particular emphasis on health management. e) New trends to increase aquaculture sustainability. f) Novel methodologies to improve animal health management. III – SOCIOECONOMIC PERSPECTIVE (2 h) a) Worldwide seafood consumption. b) Overfishing and conservation issues. b) The Portuguese case-study. c) Production of bio-active compounds to increase human and animal health. d) Tools to improve fish health and welfare. e) Aquaculture contribution to the UN development goals. IV – ECOLOGICAL PERSPECTIVE (2 h) a) Rational and sustainable fisheries issues. b) Best fisheries practices and alternatives to overfishing. c) The effect of climate changes on the fisheries. d) Effects of climate change on aquaculture production. e) Contribution of aquaculture to circular production systems. f) Novel tools to reduce of the negative impacts of antibiotic rich waste from aquaculture on human and animal health. V – FISHERIES & AQUACULTURE AS A CLASSROOM SUBJECT (4 h) a) How to use innovative learning and pedagogical tools: Flipped Classroom Model and Problem-Based Learning methodologies. b) Importance of public museums and aquaria as citizen outreach concepts. c) Classic outdoor activities as a learning tool. d) The One Health concept. PRACTICAL CLASSES AND OUTDOOR ACTIVITIES: (Analysis of the learning objectives of the practical activities including laboratory experiments, demonstrations and workshops, visualization and comments of internet resources like videos, animations, etc.), and also visits to companies and entities related to the area) (12 h) - Laboratory classes: learning some basic concepts about fish & fisheries using post-mortem organism, including fish health assessment. - Use of articles, videos and other physical-online resources in classroom. - Visits to external entities (such as museums and public aquaria). - Other planned outdoor activities.
LOs of the training	After this training period, participants are expected to: - Understand the reasons behind the worldwide evolution of the fisheries landings. - Know the need of a rational and sustainable management of fish stocks. - Describe alternatives to overfishing and to preserve the more traditional and over-exploited fish species.

	- Understand the expected effects of the climate change on fisheries & aquaculture. - Understand how aquaculture is the most sustainable alternative for animal protein production. - Know novel tools to improve animal health management and decrease aquaculture sustainability. - Know alternative tools for aquaculture development in a climate change scenario. - Use fisheries & aquaculture examples as commons problems to be focused in the classroom context to explore the one-health concept. - Develop modern learning concepts and knowledge tools to help student's skills acquisition. - Prepare theoretical classes and practical-laboratorial activities that support them, focused on (and adapted to) local reality and regional and national resources, needs and preferences. All these learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the University of Porto training period as a whole.

Title of the module	12. Aquaculture of artificial and natural reservoirs
New or updated	New
LOs of the module	1) learn about the main objects of industrial aquaculture, 2) familiarize yourself with the fisheries and biological standards for the cultivation of aquaculture facilities in natural reservoirs, 3) familiarize yourself with the equipment and facilities used in industrial aquaculture.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	THEORETICAL TOPICS I - INTRODUCTION (2h) a) Fisheries and aquaculture b) Aquaculture in the world c) Trends d) Aquaculture main species

	e) Inland aquaculture f) Fresh water: a scarce good. g) European approach to water issues h) Lakes, Dam reservoirs and rivers. Their potential and limitations for aquaculture development. II - Aquaculture facilities (3h) a) Pens b) Ponds c) Raceways d) Fishing parks e) Mega intensive installations f) RAS g) Cages i) surface ii) submerged iii) Off-shore III - Licensing (1h) a) Environment Impact assessment EIA b) Activity c) Water use (taxation) d) EU Framework IV - Cages (2h) V - Nets (1h) a) Design b) Netting c) Anti-fouling d) Maintenance i) washing ii) repair iii) certifying VI - Mooring (2h) VII - Fresh water species reproduction. Juveniles (1h) VIII - Daily routines (3h) a) Interface Land/Water b) checking the nets c) cleaning the nets d) harvesting/fishing e) feeding i) What do the farmed fish eat (feed) 1) raw materials 2) properties 3) FCR 4) Carrying capacity ii) feeders g) sampling i) manual (fishing) ii) camera iii) akvi IX - Health plan (2h) a) Antibiotics and biocides b) Emerging diseases c) Vaccination strategy d) EU Regulation X - General perception of aquaculture by the society (1h) a) Welfare b) Escapes
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	c) alien species i) problems ii) examples iii) EU legislation. Portugal: case study . e) - Visit to a cage farm in a lake in the north of Portugal(6h)
LOs of the training	After this training period, participants are expected to: - Know the general history of aquaculture and the state of the sector. - Know its potential and constraints. - To know the different kind of facilities where aquaculture can be developed. - To know the different parts that constitute a productive unit. - Know the basic daily routines of a fish farm - Prepare an health planning for a farm - To have a general overview of the European legal framework - To understand the importance of public and official perception of aquaculture To have the ability of adjusting the modules presented to the reality of Ukraine training strategy
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	1. Methodology of Scientific Research
New or updated	Updated
LOs of the module	1) Knowledge: The student will obtain overall knowledge about the basic structure of the final thesis/ scientific paper, publication ethics, scientific writing and presenting, processing a literature review of the current state of the art at home and abroad, as well as work with citation databases. 2) Skills: The student can modify general knowledge at the level of synthesis to solve specific problems in the final work. 3) Competences: The student of the course can elaborate individual chapters of the final thesis/ paper for the Bc./ MSc. Level of study in terms of technical and linguistic aspects and citations of bibliographic references.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	FORMAL ASPECTS OF PUBLISHING 1) Regulations at the level of academic institution 2) Publishing ethics 3) Intellectual property 4) Plagiarism THE BASIC STRUCTURE OF SCIENTIFIC PUBLICATION 1) Study and review of scientific literature 2) Electronic information sources 3) Scientometric tools for evaluation of the quality of scientific work 4) Standards and regulations 5) Registration of scientific publishing at the level of the Institution PRESENTATION OF SCIENTIFIC WORK 1) Basics of scientific writing 2) Forms of presentation
LOs of the training	At the end of this training, participants should: 1) know the basics of the theory and practice of scientific research in fish farming, as well as the basics of documentation, data processing, reporting, and writing scientific articles. 2) know the basics of research methods in ichthyology, fish farming and aquaculture
Delivery Mode and form of training	Instructor-led training
Duration:	Two weeks (10 working days) including 1 day visit Theory: 8 hours (4 days of module sessions) Practical and fieldwork: 8 hours (4 days working on the pre-defined subject - individual (trainer)assisted work of participants) Individual work: 10 hours - preparation for example class 1 day - discussion and evaluation of the classes
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	2. Technical equipment of aquaculture
New or updated	New
LOs of the module	1) to learn about facilities for growing aquaculture objects, 2) to learn about constructions and operation principles of mechanization and automation tools in industrial aquaculture, 3) to learn about water preparation technologies and purification of polluted water, 4) to form skills in selecting the necessary equipment and designing technological facilities complex for water purification, control and maintenance of the main physicochemical parameters of water.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	SUA
Topics of the training	THEORETICAL TOPICS I – POND MANAGEMENT (6 h) a) Water requirements for the Carp culture b) Ponds – history and characteristics c) Pond’s technical facilities II – TROUT CULTURE (6 h) a) Water requirements for the Trout culture b) Cultural systems c) Cultural facilities d) Feeders
LOs of the training	At the end of this training, participants should: – Gains knowledge about water quality requirements for both fish culture systems (cold- as well as warm-water systems). – Acquaints with facilities for both cultural systems (pond management and trout culture).
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	10 days (5 days/week, 2 weeks), 4 days of module sessions (total 21 h), 1 day for preparation of one class (on a pre-defined subject) at SUA. Theory: 12 hours Individual work: 20 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	3. Organization of business and financial activities of fishery enterprises
New or updated	Updated
LOs of the module	1) to study the basics of entrepreneurial activity in the fishing industry and the peculiarities of the creation and functioning of small enterprises and farms; 2) to research examples of best practices in the economic activity of enterprises in the field; 3) master algorithms for the creation and operation of small enterprises in the areas of breeding and growing aquaculture objects, industrial fishing, processing of fish and seafood; 4) to be able to develop a strategy and tactics for a small business, to carry out planning and forecasting activities based on economic calculations.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following chapters are not designed as a common plan of classes for students. The topics will be discussed with the participants (also teachers) to find and define the best ways of presenting them to future students, explaining how classes are organized and which details and teaching methods are more effective. References about bibliography and internet sources will be made. All teaching resources will be analyzed. THEORETICAL TOPICS Chapter 1. Theoretical Background (2h) 1.1. Understanding the business organization – a multidisciplinary approach 1.2. Decision making 1.3. The management role 1.4. Universality of management Chapter 2. Business Organization and environment (2h) 2. Integrative Managerial Issues 2.1. Managing in a Global Environment 2.1.1. The economic environment 2.1.2. The political/legal environment 2.1.3. The cultural environment 2.1.4. Technological environment 2.1.5. Global Management in Today's World Chapter 3. Planning (3h) 3.1. Foundations of Planning 3.1.1. Goals and Plans 3.1.2. Setting Goals and Developing Plans 3.1.3. Contemporary Issues in Planning 3.2. Strategic Management 3.2.1. The strategic management process 3.2.2. Corporate Strategies 3.2.3. Competitive Strategies 3.2.4. Current Strategic Management Issues

	Chapter 4. Organizing (2h) 4.1. Basic Organizational Design 4.1.1. Designing Organizational Structure 4.1.2. Traditional Organizational Design 4.2. Adaptive Organizational Design Chapter 5. Managing Human Resources (2h) 5.1. Employment (planning, for people, recruiting, staffing) 5.2. Development (training and personal development) 5.3. Compensation 5.4. Labor management 5.5. Support and international implications 3.3.1. Managing Teams Chapter 6. Leading (3h) 6.1. Understanding Individual Behavior 6.1.1. Attitudes and Job Performance 6.1.2. Personality 6.1.3. Perception 6.1.4. Learning³⁰ 6.2. Managers and Communication 6.2.2. Effective Interpersonal Communication 6.2.3. Organizational Communication 6.2.4. Organizational Communication Networks 6.3. Motivating Employees 6.3.1. Early Theories of Motivation 6.3.2. Contemporary Theories of Motivation 6.5. Managers as Leaders 6.4.1. Traditional theories of leadership 6.4.2. Contemporary theories of leadership Chapter 7 Controlling (2h) 7.1. The Control Process 7.2. Controlling for Organizational Performance 7.3. Tools for measuring Organizational Performance 7.4. Managing Operations Chapter 8 Introduction to business finance (2h) 8.1. Definition of business finance 8.2. Model of the interactions between the financial manager and the capital markets 8.3. Types of financing 8.4. Principles of finance 8.5. Funding rules Chapter 9 External and internal conditions for the development of business finance (3h) 9.1. Financial environment 9.1.1. Financial markets 9.1.2. Financial institutions 9.1.3. Financial instruments 9.2. Forms of business organizations 9.2.1. Sole proprietorships 9.2.2. Partnerships 9.2.3. Corporations
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	9.2.4. The relationship between the forms of business (enterprise structure) and business finance (capital structure) Chapter 10 Equity financing vs. debt financing (4h) 10.1. The cost of money and the cost of debt / Time value of money concept 10.2. Bonds and bond valuation 10.3. Common and preferred stocks 10.4. Bond and stock quotes Chapter 11 Capital investment appraisal methods (3h) 11.1. Methods that take into account the time value of money concept 11.1.1. Net present value method 11.1.2. Internal rate of return method 11.2. Methods that do not take into account the time value of money concept 11.2.1. Payback period method 11.2.2. Accounting rate of return method Chapter 12 Financial statements and their interpretation and analysis (4h) 12.1. Differences in the scope of the annual financial statements depending on the size of the company 12.1.1. Balance sheet 12.1.2. Income statement 12.1.3. Cash flow statement 12.1.4. Statement of change in equity 12.1.5. Notes to financial statements 12.2. Vertical and horizontal analysis 12.3. Financial ratios PRACTICAL CLASSES AND ACTIVITIES: Visits to the institutions on Dubrovnik-Neretva county such as: Croatian Trade Chamber in Dubrovnik-Neretva county, Dubrovnik Center for entrepreneurship and Croatian Craft Chamber in Dubrovnik-Neretva county and a commercial bank, where participants can discuss some financial issues with the bank manager.
LOs of the training	After this training period, participants are expected to: - define terms of management and organizations - explain what a manager is and how the role of a manager has changed - define the management functions and the management process what an organization is and how the concept of an organization has changed - explain the function of planning - interpret the steps in the decision making - compare decision conditions - describe the different decision-making styles - explain the function of organizing - define organizational structure and organizational design - describe the elements of organizational structure - recognize the different organization structures - explain the function of human resources - explain the function of leading - define the goals of organizational behavior - explain the function of controlling - define control - describe the control process

	- distinguish between the types of control - explain the scope of business finance - recognize the place and responsibilities of financial manager within the firm - describe principles and rules of business finance - recognize the main characteristics of the financial environment - recognize the differences between different forms of organization and their influence on business finances - define the main characteristics of bond financing - describe the rights of owners arising from different types of stocks - interpret bond and stock quotes - compare available methods for evaluating capital investments - choose the best investment options based on the results of the methods - explain the structure and objective of all mandatory financial statements - calculate and interpret the financial indicators derived from the reports. All these learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach (depending on previous knowledge of the participants about each area) and discussion of teaching methods and practical activities to support classes. At the end of the training, participants will prepare a complete class plan, as an example of what they will have to do in the future. This plan will be discussed and adjusted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	4. Prevention and treatment of fish diseases
New or updated	New
LOs of the module	1) to learn the theory and practice of therapeutic and preventive measures, which are necessary for successful fish farming processes and obtaining high-quality fish products, 2) to study the basics of general pathology, parasitology, and body defense mechanisms, 3) to know the nature of main fish diseases, 4) to know veterinary sanitary measures used in everyday work in aquaculture.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) - Significance of fish diseases in relation to aquaculture - Host/pathogen/environment interaction - Role of water quality in fish diseases - Literature - Internet and other teaching materials 2) PATHOPHYSIOLOGY OF FISH DISEASES (3 h) - Pathogens - Stress 3) SYSTEMATIC FISH PATHOLOGY (4 h) - Integumentary system - Musculoskeletal system - Respiratory system - Circulatory system - Haemopoietic tissue - Renal and excretory system - Digestive system - Nervous system - Reproductive system 4) DEFENCE MECHANISMS (3 h) - Non-specific defence mechanisms - Specific defence mechanisms in fish - Factors affecting the immune response 5) PARASITIC DISEASES (2 h) - Introduction - Protozoan parasitic fish disease - Metazoan parasitic fish disease 6) BACTERIAL DISEASES (2 h)

	7) VIRAL DISEASES (2 h) 8) FUNGAL DISEASES (1 h) 9) NON-INFECTIOUS DISEASES (2 h) - Nutritional pathology - Toxic components of diet - Water quality parameters 10) DIAGNOSIS OF FISH DISEASES (3 h) 11) FISH VACCINES (3 h) - Introduction - Vaccines - Methods for measuring efficacy, safety and protection - New trends in vaccination 12) HEALTH MANAGEMENT STRATEGIES (5 h) - Risk analysis for aquatic animal movement – Biosecurity plan - Quarantine and health certification Disease surveillance and reporting - Management practices strategies PRATICAL CLASSES AND ACTIVITIES - Methods of sampling fish for disease diagnosis - Live and post mortem examination - Collection and identification of parasites - Techniques in histology - Pathological changes in different organ systems associated with different pathogens - Methods of treatment - Visit to the local fish market
LOs of the training	At the end of this training, participants should: - Understand interaction host/pathogen/environment - Know to define the role of stress and host defence mechanism - Understand, predict and assess the impact of disease on farm operations - Know the principles of disease diagnosis. - Know microscopical, microbiological, histopathological and biochemical methods - Know how to develop health management plan All the learning outcomes are directed to (and focused on) the acquisition of teaching skills by the participants, as they are teachers interested in teaching skills, not students interested in acquisition of knowledge and development of practical abilities.
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach (depending on the participants' prior knowledge in each area) and discussion of teaching methods and practical activities to support the teaching. At the end of the training, participants will create a complete lesson plan as an example of what they will have to do in the future. This plan will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the 2 whole training at UNIDU Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant.

Title of the module	5. World fisheries. Protection and reproduction of hydrobiological resources
New or updated	Updated
LOs of the module	1) to learn about the World Ocean biological resources in fishing regions, the composition of catches, and the infrastructure of countries' fishing fleets, 2) to learn to identify problems and evaluate the prospects for the world fisheries and aquaculture development, evaluate the role and effectiveness of the state policies in the field, 3) to know the legal aspects and mechanisms of regulation of aquatic living resources extraction, operation of transport and fish processing vessels, terminals, etc. 4) to evaluate the fishing industry state in Ukraine and other countries, to consider the prospects for their development.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIDU
Topics of the training	(Total time: 32 h) NOTE: The following topics are not intended as a standard lecture for students. The topics will be debated with the participants (also teachers) to understand and decide on the best ways of presenting them to future students, explaining how classes are organized and which elements and teaching methods are most successful. Adaptation to regional needs is discussed and planned. References to literature, internet sources, auxiliary materials (images, infographics, photos, texts, slides, videos, etc.), laboratory equipment and experimental protocols are given. All teaching materials are analysed in detail. THEORETICAL TOPICS 1) INTRODUCTION (2 h) a) Global fisheries b) Global aquaculture c) Literature d) Internet and other teaching materials 2) FISHERIES PRODUCTION (4 h) a) Marine capture production b) Major producing countries c) Major species and genera d) FAO major fishing areas 3) AQUACULTURE PRODUCTION (4 h) a) World aquaculture production b) Major producers and production by region c) Mariculture and coastal aquaculture 4) FARMED AQUATIC SPECIES (2 h) a) Finfish in marine and coastal aquaculture b) Crustaceans c) Molluscs d) Other aquatic animals e) Algae 5) THE STATUS OF MARINE FISHERY RESOURCES (4 h) a) Status of resources b) Status and trends by major species c) Status and trends by fishing area

	6) THE FISHING INDUSTRY STATE IN UKRAINE (2 h) 7) FISHING FLEET (2 h) - Global fleet and its regional distribution - Size distribution of vessels and the importance of small boats 8) EMPLOYMENT IN FISHERIES AND AQUACULTURE (2 h) - Employment in the primary sector - Employment in post-harvest sector 9) PROCESSING OF FISHERIES AND AQUACULTURE PRODUCTION (2 h) - Fishmeal and fish oil - By-product utilization 10) TRADE OF FISHERIES AND AQUACULTURE PRODUCTS (2 h) - Exporting countries - Main trade commodities 11) BLUE TRANSFORMATION (2 h) - Why we need blue transformation - Objectives of blue transformation 12) IMPROVING FISHERIES MANAGEMENT (2 h) - Objectives and targets - Better governance and policy reform - Better management and production 13) FISHERIES AND AQUACULTURE ADAPTATIONS TO CLIMATE CHANGE (2 h) - Mainstreaming climate change into fisheries and aquaculture management - Developing and implementing transformative adaptation plans PRATICAL CLASSES AND ACTIVITIES - Visits to external entities (aquaria, mussel and oyster farm) - Videos about fisheries and aquaculture
LOs of the training	After this training period, the participants should: - be able to explain the global status of fisheries and aquaculture - know the most important fishery and aquaculture producers - be able to discuss the different types of fisheries - know the most important species in fisheries and aquaculture - discuss the need to improve fisheries management
Delivery Mode and form of training	The sessions are planned as a combination of theoretical approach and discussion of teaching methods. At the end of the training, participants will prepare a complete lesson plan, it will be discussed and adapted accordingly.
Duration:	10 days (5 days/week, 2 weeks), including 4 days of visits (around 30 h), 4 days of module sessions (total 32 h), 1 day for preparation of one class (on a pre-defined subject, including theory and practical support) and 1 day for discussion of the classes and evaluation of the whole training at UNIDU. Theory: 32 hours Practical and field work: 30 hours Individual work: 8 hours
Assessment Method	Preparation, presentation and discussion of an example class chosen and fully designed by each participant.

Title of the module	6. Population ecology
New or updated	Updated
LOs of the module	1) to know and understand contemporary issues of population ecology (systems of the organic world as a reflection of its historical development and evolution of living things from molecular genetic to biosphere level, population level organizations of life, modern environmental problems, and mechanisms adaptation of organisms to the habitat). 2) to use the acquired knowledge in planning research in the field of protection and use of natural resources. 3) to be able to characterize the main properties and signs of the population. 4) to be able to identify and measure the main factors of the environment for the forecast of survival rate, increase, and number of organisms.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h) - Selection of subjects to include in the PE module and its level of detail; examples of subjects are: definition of population; geographic dispersion; genetic variability; effects of population size; population density and growth; life histories and the structure of population; life tables and population growth; population growth models; regulation of population growth; species interactions and population growth. - Analysis and selection of methods/tools to present the different subjects to students. - Collection of information sources, formal and informal (books, scientific articles, internet) - Collection/creation of support materials - Development of protocols for practical classes
LOs of the training	The objective of this training is to provide the participants with knowledge/tools that allows them to: 1. Define the main subjects and content to include in the module in order to accomplish its LO, adapted to local reality. 2. Select the best methodologies to teach the subjects of the module, including theoretical presentations and practical assignments. 3. Prepare theoretical classes and practical activities that support them, focused on the students learning interests and needs.
Delivery Mode and form of training	Sessions will be based on discussions about contents, teaching methods, practical activities and teaching materials to support classes. During the training, participants will prepare a complete module plan, adapted to their local reality.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of an example class, chosen and fully designed by each participant. At last day session, participants will be asked for their opinions about the U.Porto training period as a whole.

Title of the module	7. Fish products sanitary control, standardization, and certification
New or updated	Updated
LOs of the module	1) to learn general rules and regulations regarding the assessment of the quality of fish, fish, and non-fish products; international standards in the field of fish farming; 2) to study laboratory methods of fish exploration, fish products, and non-fish products (physics-chemical, biochemical, microbiological, organoleptic); 3) be able to develop, organize, and carry out a comprehensive assessment of the quality of fish and fish products; conduct laboratory studies of fish, fish products, and non-fish products and give an expert opinion.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	THEORETICAL INSTRUCTION I- Food microbiology a) Microbiological assessment of food, surfaces and water - Sampling, preparation of the initial suspension, serial decimal dilutions, culturing techniques and interpretation of the results II) Clinical microbiology a) Overview of major fish diseases b) Diagnosis of bacterial infection in fish: - Examination, sampling and laboratory processing. III) Fish Sanitary control a) Notification of diseases b) Criteria for listing aquatic animal diseases c) Diseases listed by OIE d) Biosafety in aquaculture (infection control and equipment disinfection) IV) Antimicrobial resistance a) Priority pathogens b) Antimicrobial susceptibility testing methods and interpretation c) Antibiotic classes and function d) Antibiotic categorization by EMA e) Resistance mechanism of antibiotics V) Labeling, Authenticity, Safety and Inspection a) Food chain communication / Certification b) Traceability & Food Safety (including IFSfood) - perspective on fish processing units, equipment's, materials, products, workers, operations, environment and controls c) Label creation (EU markets) d) Fish processing & Packaging e) Visits and practical sessions PRACTICAL INSTRUCTION AND ACTIVITIES: - Laboratory techniques: microbiological evaluation of food, surfaces and water; antimicrobial susceptibilities assays, etc. - Visits to food business operators (a small industrial unit and to supermarket).
LOs of the training	After this training period, participants are expected to:

	- Gain proficiency in assessing the microbiological quality of food, surfaces, and water through proper sampling, suspension preparation, dilution, and culturing techniques; - Know major fish diseases, and learn the diagnostic process for bacterial infections in fish, covering examination, sampling, and laboratory processing; - Acquire knowledge on notifying diseases and implementing biosafety measures in aquaculture; - Comprehend the concept of antimicrobial resistance; - Develop skills in food chain communication, certification processes, traceability, and food safety; - Understand fish processing and packaging practices.
Delivery Mode and form of training	The training sessions will incorporate both theoretical and practical elements. Upon completion of the training, participants will formulate a comprehensive class plan, serving as an exemplar for their future classes.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Participants will prepare and present an example of formations activities. During the final session on the last day, participants will be invited to share their feedback regarding the overall U.Porto training period.

Title of the module	8. Ornamental aquaculture
New or updated	New
LOs of the module	1) to acquaint students with the biology and requirements for the maintenance conditions of the main ornamental aquaculture objects, 2) to develop skills in breeding ornamental fish, rearing young, feeding at all stages of development, treatment, and prevention of fish diseases, 3) to develop skills in caring for a decorative aquarium system, 4) to learn how to make calculations and design farms for breeding ornamental fish.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	UNIVERSITY OF PORTO / ICBAS LITTORAL STATION OF AGUDA ELA SEA LIFE Porto
Topics of the training	(Total time: 24 h/module) THEORETICAL TOPICS I - INTRODUCTION a) Role of marine stations and public aquaria in education and research b) Environmental education for all pedagogic levels and age groups II - AQUATIC ORGANISMS a) Main groups and representative species of the local aquatic fauna (salt and freshwater) b) General characterization of local species III - ANIMAL HUSBANDRY a) Capture and handling b) Quarantine c) Feeding d) Maintaining water quality

	IV. SEMI CLOSED CIRCULATION SYSTEMS a) Mechanical filtration b) Biological filtration c) Chemical filtration by Ozone d) Protein skimming e) Sterilization by UV light f) Refrigeration/heating. g) Aeration III. TROUBLE SHOOTING a) Water quality control b) Recognizing problems c) Solving problems by simple and complex means PRACTICAL CLASSES AND ACTIVITIES: - ELA's service area - SEA LIFE LSS room and technical areas Visits to external entities: - Distribution Logistic Center (ORNIEX)
LOs of the training	After the training period, the participant is expected to: - know the general local aquatic fauna (salt – and freshwater). - know the basics of animal husbandry. - know the main techniques of maintaining the quality of seawater and freshwater for exhibition and quarantine purposes. - prepare theoretical classes and practical activities that are focused on the local reality and regional and national resources, needs and preferences.
Delivery Mode and form of training	Sessions are planned as a combination of theoretical approach and discussion of teaching methods and practical activities to support classes. At the end of the training, the participant will prepare a complete class plan, as an example of what he will have to do in the future.
Duration:	24 h (6h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of a class, chosen and fully designed by the participant.

Title of the module	9. Water quality and fish health
New or updated	New
LOs of the module	1) to know the problems associated with water pollution and the general responses of fish to such stressors; 2) to learn how to analyze the causes of fish poisoning and/or mortality; 3) to learn the causes and effects of pollution on fish and general principles for preventing fish poisoning; 4) to know the influence of pollution in relation to viral, bacterial, and fungal diseases, and fish parasites.
New educational materials which planned to create	Syllabus, Description of the module, Methodical instructions for practical work, Current and final control tests
Information about the place and form of the training	
EU hosting university	U.PORTO
Topics of the training	(Total time: 24 h) 1. Introduction to the module of Water Quality and Fish Health (2 hours) a) Introduction of the teaching and support staff, as well as all venues and facilities that will be used during this module b) General introduction to the topics of water quality and fish health c) Presentation of the module programme and timetable, with expected theoretical and practical classes. d) Bibliography and other resources relevant to the module e) Discussion of the module with the participants to better understand their needs and expectations. 2. Water Quality Parameters (2 hours) a) How temperature fluctuations affect fish metabolism. b) The importance of salinity in fish health and disease occurrence. c) The role of pH in nutrient availability and fish health. d) Importance of dissolved oxygen for aerobic respiration in fish. e) Impact of nitrogen and phosphorus on water quality. f) Eutrophication and its consequences for fish and aquatic ecosystems. 3. Water Quality Monitoring and Management (2 hours) a) Setting up a comprehensive water quality monitoring program. b) Frequency and methods of data collection. c) Strategies for improvement water quality monitoring. d) Adjusting management practices based on monitoring results. e) Implementing corrective measures to address water quality issues. f) Practical demonstrations of water testing equipment and interpreting test results and their implications for fish health. 4. Regulatory Frameworks and Environmental Policies (2 hour) a) Overview of regulations. b) Understanding national and international regulations related to water quality, aquaculture and fisheries. c) Compliance and reporting. d) Navigating regulatory frameworks in the context of fish health. e) Reporting requirements and documentation for regulatory compliance. 5. Aquatic Ecosystems and Fish Biology (2 hours) a) Overview of aquatic environments. b) Freshwater, brackish and marine ecosystems c) The connection between aquatic environments and terrestrial ecosystems.

	d) Fish anatomy and physiology. e) Detailed study of fish body structures and functions. f) Physiological adaptations of fish to aquatic environments. 6. Aquaculture Practices and Water Quality (2 hours) a) Principles of sustainable aquaculture. b) Balancing production goals with environmental conservation. c) Impact of aquaculture on water quality. d) Strategies for minimizing negative impacts. e) Implementing “Best Management Practices” to ensure responsible aquaculture. f) Case studies of successful and unsuccessful aquaculture operations. 7. Aquatic Pollution and its Effects on Fish (2 hours) a) Chemical pollutants (pesticides, heavy metals, etc.). b) Biological pollutants (pathogens and parasites). c) Physical pollutants (sedimentation, habitat destruction). d) Point source and non-point source pollution. e) Urban, industrial, and agricultural sources of pollution. f) Identification and interpretation of bioindicators. g) Using aquatic organisms to assess the health of an ecosystem. 8. Water Circulation and Aeration (2 hours) a) Importance of water movement. b) The role of water circulation in nutrient distribution. c) Preventing stratification and maintaining uniform conditions. d) Aeration techniques. e) Introduction to different aeration methods (mechanical, diffused, etc.). f) Choosing the appropriate aeration system for specific conditions. 9. Fish Nutrition and Feeding Practices (2 hours) a) Nutritional requirements. b) Understanding the dietary needs of different fish species. c) Formulating balanced and sustainable fish diets. d) Feeding practices. e) Feeding frequency and portion control. f) Environmental considerations in feeding practices. 10. Fish Diseases and Health Management (6 hours) a) Identification of prevalent diseases in different aquaculture fish species (marine, brackish and freshwater) and possible implications for wildlife populations. b) Understanding the causes and symptoms of fish diseases. c) Best practices for disease prevention in aquaculture (environmental management, vaccines, probiotics, dietary supplementation) d) Treatment options and their potential impacts on the environment (medication, surgical intervention, antisepsis) e) Implementing biosecurity protocols in fish farms. f) Importance of quarantine and hygiene in preventing disease outbreaks.
LOs of the training	Upon completion of the Water Quality and Fish Health module, participants are expected to have acquired the following knowledge: • Have a comprehensive understanding of aquatic ecosystems, their dynamics, and the principles of fish biology.

	• Be able to recognize and interpret key water quality parameters, including temperature, salinity, pH, dissolved oxygen, and nutrient levels. • Identify different types of aquatic pollution and develop strategies for pollution prevention and management. • Comprehend the importance of water movement and aeration in maintaining optimal water conditions for fish health. • Understand the nutritional requirements of different fish species and implement effective feeding practices for optimal health and growth. • Identify common fish diseases, understand their causes, and implement effective disease prevention and treatment measures. • Familiarize themselves with relevant regulations and environmental policies related to water quality and fish health. • Learn sustainable aquaculture practices, including water quality management, disease prevention, and responsible production. • Develop skills in creating and implementing water quality monitoring plans and strategies for improving and maintaining water quality. • Apply acquired knowledge to real-world scenarios, making informed decisions about water quality, fish health, and sustainable aquaculture. • Evaluate and utilize various teaching resources, including bibliographic references, internet sources, support materials, and laboratory equipment. • Effectively communicate water quality and fish health concepts to diverse audiences, in particular students, as the participants are teachers themselves, as well as community members.
Delivery Mode and form of training	Session will be planned as blended learning, combining traditional classroom sessions with online resources, allowing for flexibility and accessibility. These will include in-person lectures, hands-on laboratory sessions, and virtual components. Additionally, practical and interactive demonstrations will be performed, where trainees will be able to apply theoretical knowledge in practical exercises, with hands-on experience using relevant equipment for water quality monitoring, fish health assessments, and aquaculture practices. During these sessions participants will be guided through the development and presentation of their final projects, with constructive feedback and support.
Duration:	24 h (6 h/day x 4 days)
Assessment Method	Preparation, presentation, and discussion of a mock class by the participants, preferably on the subjects (but not limited to) presented in this module.

ANNEX 1**AFISHE - Development of Aquaculture and Fisheries Education for Green Deal in Armenia and Ukraine: from education to ecology****RESERCHERS/TEACHERS LIST FOR THE TRAINING**

Name, Surname	Position, academic degree/title	Email	Module	Training place
Armenian National Agrarian University				
1. Arusyak Gharibyan	Lecturer, Chair of Social Sciences	ar.a.ghyan@gmail.com	Research methodology	SUA
2. Zarine Tarkhanyan	Assistant, Chair of Forestry and Agroecology	tarzara5@gmail.com	Biodiversity conservation	SUA
3. Artur Alaverdyan	Lecturer, Chair of Forestry and Agroecology	arthuralaverdyan1@gmail.com	Environmental and Water Management	U.PORTO
4. Hakob Khachatryan	Associate Professor, Chair of Data Science	hkhachatr@mail.ru	Biostatistics	SUA
5. Garegin Hambardzumyan	Associate Professor, Chair of Food Safety and Hygiene	garegin77@gmail.com	Food safety of aquatic animals	UNIDU
6. Gayane Marmaryan	Associate Professor, Chair of Bioscience and general Chemistry	gmarmaryan@gmail.com	Fish biochemistry and physiology	SUA
7. Arman Harutyunyan	Associate Professor, Head of Chair of Agribusiness Management and Politics	armanhar@list.ru	Management in fishery and aquaculture	SUA
8. Naira Aloyan	Associate Professor, Chair of Water and Soil Resources Management	nairaloyan@gmail.com	Basic Aquaculture Engineering	U.PORTO
9. Hasmik Gevorgyan	Lecturer, Chair of Agribusiness Management and Politics	gevgoghas@gmail.com	Entre. in fishery and aquaculture	UNIDU
International Scientific-Educational Center of NAS RA Scientific Center of Zoology and Hydroecology of NAS RA ISEC				
1. Oleg Shcherbakov	DVM, PhD, Researcher, Laboratory of Molecular Parasitology	oleg1vet@gmail.com	Ichthyopathology	UNIDU

2.	Hranush Melkonyan	Senior researcher, PhD, Associate Professor	hranushmelkonyan@gmail.com	Ecotoxicology	SUA
3.	Nelli Barseghyan	Senior scientific researcher Ph.D., Ecology	neli.barseghyan@yahoo.com	Aquaculture	SUA
SCZHE					
4.	Bardukh Gabrielyan	Head of Laboratory, Dr.of Biol. Sci. Professor	gabrielb@sci.am	General Ichthyology	UNIDU
5.	Vardan Asatryan	Lead researcher, PhD/Dr.	asatryanvardan@gmail.com	Fishery	SUA
6.	Armine Hayrapetyan	Senior scientific worker / PhD in Biology	armhayrapetyan309@gmail.com	Aquatic Animal Feeding and Nutrition	U.PORTO
7.	Lusine Hambaryan	Head of Hydroecology laboratory, PhD, Associate professor	lus-ham@yandex.ru	Biology of Cultured Algae	UNIDU
8.	Susanna Hakobyan	Head of laboratory of hydrobiology, PhD	susannahakob@gmail.com	General Hydrobiology	U.PORTO
9.	Gor Gevorgyan	Head of Laboratory, PhD	gor.gevorgyan@sczhe.sci.am	General Hydroecology	U.PORTO
Sumy National Agrarian University					
1.	Vechorka Victoriia	Dean, professor of the department, professor, doctor of science	vvvechorka@gmail.com	Breeding Technologies in Mariculture	UNIDU
2.	Kyselov Oleksandr	Associate professor of the department, candidate of sciences	kyselov_snau@ukr.net	Diversification of Shelfish Farming	UNIDU
3.	Mykhalko Oleksandr	Associate professor of the department, doctor of philosophy	snau.cz@ukr.net	Diversification of Fish Farming	UNIDU
4.	Yana Illiashenko	Phd student of the department of Technology and Food Safety	Yannulia0911@gmail.com	New Technologies in Mariculture	UNIDU
5.	Kovalenko Ihor	Vice rector for academic work, professor, doctor of science	kovalenko_977@ukr.net	Introduction to Ecology	UNIDU
6.	Kuchkova Tetiana	Assistant of the department, PhD student	kuchkova1992@ukr.net	Fisheries Technology and Evaluation of Fisheries Resources	UNIDU
7.	Tkachenko Viktoriia	Associate professor of the department, candidate of sciences	viktoriyatk@gmail.com	Entrepreneurship in Mariculture	UNIDU
8.	Bordunova Olga	Head of the department, professor, doctor of science	bordunova.olga59@gmail.com	Aquaculture processing technology	U.PORTO

9.	Petrenko Anna	Assistant of the department, PhD student	anyutapetrenko@gmail.com	Aquaculture processing technology	U.PORTO
10.	Shkurko Maryna	Associate professor of the department, candidate of sciences	m.shkurko@ukr.net	Animal Welfare in Aquaculture and Public Aquariums	U.PORTO
11.	Koshel Olena	Associate professor of the department, candidate of sciences	olena.koshel@snau.edu.ua	Food Nutrition and Technology	U.PORTO
12.	Rebenko Halyna	Associate professor of the department, candidate of sciences	rebenko.halina@gmail.com	Bioresources of the hydrosphere and their use	U.PORTO
13.	Olga Korg	Associate professor of the department, candidate of sciences	korg.olga@ukr.net	Aquaculture of artificial and natural reservoirs	U.PORTO

The National University of Water and Environmental Engineering

1.	Olha Biedunkova	Professor of the Department of Ecology, Technologies of Environmental Protection and Forestry, Doctor of Biological Sciences	o.o.biedunkova@nuwm.edu.ua	Methodology of scientific research	SUA
2.	Alina Petruk	Associate Professor of the Department of Water Bioresources, Candidate of Agricultural Sciences (Ph.D.), Associate Professor	a.m.petruk@nuwm.edu.ua	Methodology of scientific research	SUA
3.	Vasyl Korbutiak	Associate Professor of the Department of Land Management, Cadastre, Land Monitoring and Geoinformatics, Ph.D. in Technical Science	v.m.korbutiak@nuwm.edu.ua	Technical equipment of aquaculture	SUA
4.	Sergii Konotsev	Professor of the Department of Water Bioresources, Doctor of Technical Sciences, Associate Professor	s.v.konontsev@nuwm.edu.ua	Ornamental aquaculture	U.PORTO
5.	Yulia Hrokhovska	Professor of the Department of Water Bioresources, Doctor of Agricultural Sciences	y.r.grokhovska@nuwm.edu.ua	Water quality and fish health	U.PORTO
6.	Alla Kucheroва	Senior Lecturer of Agro chemistry, Soil Science and Farming Department, Head of International Projects Department	a.v.kucheroва@nuwm.edu.ua	Fish products sanitary control, standardization, and certification	U.PORTO

7.	Alla Pryshchepa	Director of Institute of Agroecology and Land Management, Doctor of Agricultural Sciences, Professor	a.m.pryshchepa@nuwm.edu.ua	World fisheries. Protection and reproduction of hydrobiological resources	UNIDU
8.	Tetiana Poltavchenko	Head of the department of Water Bioresources, Candidate of Veterinary Sciences (Ph.D.), Associate Professor	t.v.poltavchenko@nuwm.edu.ua	Prevention and treatment of fish diseases	UNIDU
9.	Tetiana Solodka	Associate-Professor at the Department of Agrochemistry, Soil Science and Agriculture, Candidate of Agricultural Sciences (Ph.D.), Associate Professor	t.m.solodka@nuwm.edu.ua	Prevention and treatment of fish diseases	UNIDU
10.	Vladyslav Solodkyy	Associate Professor of the Department of Enterprise Economics and International Business, Candidate of Economics (Ph.D.), Associate Professor; Head of the Department of International Cooperation and Migration Issues at the Center for International Cooperation and Education of the University	v.o.solodkyi@nuwm.edu.ua	Organization of business and financial activities of fishery enterprises	UNIDU
11.	Lyudmila Beztelesna	Professor of the Department of Management, Doctor of Economic Sciences, Professor	l.i.beztelesna@nuwm.edu.ua	Organization of business and financial activities of fishery enterprises	UNIDU
12.	Zinaida Budnik	Associate Professor of the Department of Ecology, Technologies of Environmental Protection and Forestry, Candidate of Agricultural Sciences (Ph.D.), Associate Professor	z.m.budnik@nuwm.edu.ua	Population ecology	U.PORTO
13.	Olha Varzhel	Senior lecturer of the Department of land management, cadastre, land monitoring and geoinformatics, PhD in "Environmental protection technologies"	o.v.varzhel@nuwm.edu.ua	Population ecology	U.PORTO