

## FORMER STUDENTS' OPINION ABOUT THE PROGRAMME

- *"The Course was a nice experience which allowed me to know the world of international co-operation and to get enough experience for my present work in projects for aquaculture development in Africa".*

Giorgia Monti, AFGRP Project officer, Institute of Aquaculture, University of Stirling, Scotland.

- *"Professionally speaking, to attend this Course gave to me the opportunity to get my first job, even before finishing it, at a Center for Applied Research in Aquaculture. It also provided me with the required knowledge to start up my professional career and start getting experience. From a personal point of view, I knew many and very good friends which I still enjoy".*

Juana Durán Chica, Laboratory of Marine and Aquaculture Research, Andratx Port, Mallorca.

- *"The Master Degree allowed me to introduce myself to the world of aquaculture at the international level, to work with top experts and build a brilliant scientific career, allowing my access to the best labs in the world; also has been an enriching personal experience, as I have worked and made friends with people from around the world".*

Rachid Ganga. Grupo de Investigación en Acuicultura, ULPGC & ICCM. Las Palmas de Gran Canaria, Spain.

- *"Thanks to the Master Course I have been able to work in the culture of sole, which it is what I always wanted".*

Ricardo Zerolo, Center for Research and Training in Fisheries and Aquaculture "El Toruño", Cádiz, Spain.

## SCIENTIFIC COMMITTEE

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Mediterranean Agronomic Institute of Zaragoza, CIHEAM, Spain.
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- **Dr. A.F.M. EL-SAYED**  
United Arab Emirates University.
- **Dr. H. FERNÁNDEZ-PALACIOS**  
Canarian Institute of Marine Sciences, Telde, Spain.
- **Dra. M.S. IZQUIERDO**  
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- **Dr. A. TACON**  
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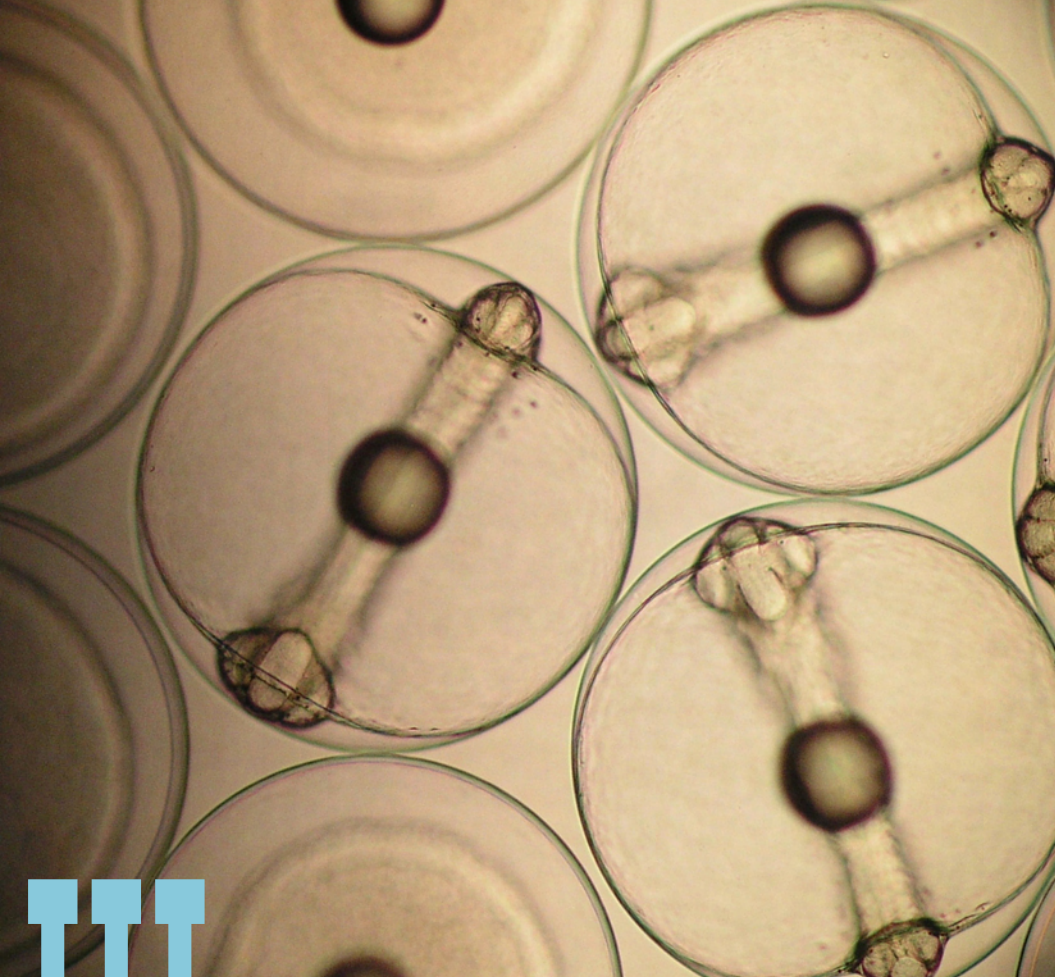
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# UNIVERSITY MASTER in MARINE AQUACULTURE

October 2012 - June 2014



Las Palmas de Gran Canaria  
Spain

Grupo de Investigación en Acuicultura

## PROGRAMME OF THE POSTGRADUATE SPECIALISATION COURSE

### I. INTRODUCTION TO AQUACULTURE (1 ECTS)

Relevance of Aquaculture. Current status of the various production categories. Aquaculture evolution in geographic regions.

### II. NUTRITION (12 ECTS)

Physiology of nutrition. Nutritional requirements and dietary ingredients: lipids, proteins, carbohydrates, vitamins and minerals, nutritional Energy.

### III. HEALTH MANAGEMENT (12 ECTS)

Animal welfare in aquaculture. General and specific anatomic pathology in fish cultured. Immunology. Major viral diseases. Major bacterial diseases. Parasitic diseases caused by fungi. Non-infectious diseases. Prevention and treatment of diseases.

### IV. REPRODUCTION (4 ECTS)

Physiology and control of reproduction in Shellfish and crustaceans. Physiological regulation mechanisms of reproduction in Teleosts. Induced reproduction in bivalve molluscs and crustaceans decapod. Induced reproduction in Teleosts. Broodstock management in fish. Design of facilities. Food and nutritional requirements of broodstock.

### V. GENETIC IMPROVEMENT (6 ECTS)

Population genetics. Quantitative genetics. Biotechnology. Improvement in aquaculture. Genetic improvement in fish. Microsatellite techniques applied to marine cultivation.

### VI. FACILITIES (3 ECTS)

Pipe water systems. Pumping systems. Aeration and oxygenation systems. Hatchery design, nurseries and on-growing facilities.

### VII. ECONOMICS AND MANAGEMENT (3 ECTS)

Financial-economic assessment of projects. Design and project development. Feasibility studies. Marketing and commercialization. Management of research projects.

### VIII. TECHNICAL HATCHERY PRODUCTION (8 ECTS)

Auxiliary cultures. Compared production techniques. Larval development histology. Mesocosmos technology. Algae culture. Recent advances in larval feeding. Hatchery techniques.

### IX. ON-GROWING TECHNIQUES (5 ECTS)

On-growing in extensive systems. On-growing in intensive on-land systems. On-growing in intensive sea farming systems. Pellets in aquaculture: nutritive value and fish colour. Overall fish fillet quality. On-growing techniques.

### X. DIFFERENT SPECIES CULTURE TECHNIQUES (3 ECTS)

Macroalgae Culture. Mussel culture. Oyster culture. Clam and cockle culture. Scallop culture. Peneids and Macrobrachium culture. Catfish culture. Tilapia culture. Carp culture. Salmonid culture. Halibut culture. Turbot culture. Sea bass and sea bream culture. New species culture. Alternative culture systems. Fish Aquaria.

### XI. ENVIRONMENT (3 ECTS)

Aquaculture and the environment. Biodiversity associated with marine aquaculture. Sustainability of marine aquaculture. Conduct Codes. Aquaculture as a tool for preserving endangered species.

### XII. INTRODUCTION TO RESEARCH (30 ECTS)

Complementary Courses. Project planning, processing, interpretation and presentation of data. Optical histology techniques. Electron microscopy techniques. Fish physiology.

### XIII. MASTER THESIS (30 ECTS)

## PRESENTATION

Aquaculture constitutes the production of food that has most grown over the past 30 years and currently is a consolidated activity able to supply the growing demand for fish products, as opposed to the stagnation of catches by fisheries from the late 80s. In 2009 world production of Aquaculture reached 73 million metric tons. Thus, one of each three aquatic products destined for human consumption, and up to 90% in species such as salmon, carp and oysters, 70% in mussels and 25% in prawns or shrimp come from aquaculture. Europe is the third largest geographic region producer after Asia, being specialized in the culture of shellfish and fish from both marine and continental waters. Spain is the second largest producer in Europe, close to France and behind Norway, is the fifth producer of shellfish worldwide and a major producer of trout, turbot, sea bream and sea bass.

This development requires a continued demand of specialized professionals in the various fields of this activity, that the University Master in Marine Aquaculture (before International Master in Aquaculture) has been building up for more than 15 years. The Master offers an international programme on the principles of Aquaculture, the cultivation techniques of the most representative species and the different areas of study that support this activity: Nutrition, Pathology, Genetics, Reproduction, Engineering, Economics and the Environment, joining the efforts of three organizing institutions with extensive experience in this field. With more than 50 specialist lecturers in Aquaculture, from various countries and students from the five continents, the Masters is an intense personal and professional experience with a strong international character.

The Master is coordinated by the Aquaculture Research Group (GIA) ([www.grupoinvestigacionacuicultura.org](http://www.grupoinvestigacionacuicultura.org)) of the University of Las Palmas de Gran Canaria (ULPGC) and the Canary Institute of Marine Science (ICCM) of the Canary Islands Government. This group with more than twenty years of experience in research and teaching in Aquaculture, has facilities with approximately 2,500 m<sup>2</sup> devoted to comprehensive cultivation of algae, shellfish, crustaceans and marine fish and 500 m<sup>2</sup> of laboratories in Nutrition, Histology, Genetics, Reproduction, Pathology and a Workshop to prepare feeds, pellets for the fish. Having led more than 80 research projects in Aquaculture in collaboration with more than 30 groups from various countries and advised more than 30 companies of the sector through collaboration agreements, the experience of teaching and research of this group, their international relations and business and the adequacy of its facilities guarantee the quality for the proposed programme.

The participation of the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM) in the organization of this Master highlights its international nature. The CIHEAM aims to develop agricultural cooperation among countries in the Mediterranean region through post-graduate training and the promotion of cooperative research, and through its Mediterranean Agronomic Institute of Zaragoza (IAMZ) has organized for over 15 years many courses, seminars and workshops on various technical aspects and socio-economics of aquaculture in the Mediterranean.



## OBJECTIVES

Provide a specialization in Aquaculture through:

- An updated content of the most innovative scientific and technological bases that support the development of aquaculture.
- Particular attention to the techniques of commercial production of the most relevant world wide species, with special emphasis on the Mediterranean species.

The completion of the Master thesis shall, in addition, provide a formative period of introduction to research. Thus, the Master opens the door for later registration, if desired, in the Ph.D. programme in Aquaculture, by the GIA and that has kept Mention Quality of the Spanish Ministry of Education and Science since 2004.



## ORGANIZATION

The Master programme is jointly organized by the University of Las Palmas de Gran Canaria (ULPGC), through the Faculty of Marine Sciences, the Canary Institute of Marine Science (ICCM) of the Government of the Canary Islands, and the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), through the Mediterranean Agronomic Institute of Zaragoza (IAMZ).

The programme will be taught by highly skilled teachers of their host institutions and by guest professors of reknown prestige belonging to research institutions and teaching, to administration and private entities in several countries.

The agenda of the International Master in Aquaculture has two parts. The first (60 ECTS) provides an intense basic training in all fields of aquaculture through theoretical and practical classes in the first year of the programme to take place from 15th October 2012 to 30 June, 2013.

The second part (60 ECTS) will allow specialization in any of these areas through the implementation of a research project and the Master's thesis in any of the institutions or collaborating companies belonging to the supervisor. This training period is an introduction to applied research in aquaculture to be completed before May 2014, for subsequent public defence.

## CERTIFICATES

At the end of the first part of the Master, the participants who have passed the tests of knowledge established and have obtained 60 ECTS, receive the title of Postgraduate Specialisation Diploma awarded by the CIHEAM.

Participants who passed the first part of the Master with a grade of 7 or more out of a maximum of 10 may opt, once an experimental protocol has been presented and accepted, to the Master Degree. The official Spanish degree will be awarded by ULPGC, and CIHEAM will award its Master of Science Degree.

## ACADEMIC ORGANIZATION

The first part, the Postgraduate Specialization Course, will include lectures, practical work and field visits and laboratory techniques. These activities are supplemented by seminars and open discussions. The course will be taught at the ICCM, and require full time participation. The total duration of the course will be 600 teaching hours.

The research project and the thesis required for obtaining the title of university Master, will take place in the second part, upon admission of the candidate and approval of a work protocol submitted under the supervision of the thesis director. This should be by a PhD with proven expertise. The thesis may take place at the headquarters of their host institutions or research centres and companies belonging to the teachers who collaborate in the programme. Interested candidates may apply to conduct thesis research at centres in their home countries.

## ADMISSION

The course is designed for a maximum of 24 participants who must meet the following criteria:

- A) Higher university degree or equivalent, related to the theme of the course.
- B) Knowledge of Spanish, which will be the working language of the course.

Most of the documentation will be in this language. Since some of the conferences and part of the teaching materials will be in English, knowledge of this language will also be valued in the selection of candidates.

The CIHEAM will organize an intensive Spanish course in Zaragoza between July and September 2012 for those participants who require it.

## PRE-REGISTRATION AND FEES

Applications for pre-admission and additional information should be addressed to:

Prof. Carmen M<sup>a</sup> Hernández-Cruz  
ICCM, Apdo. 56, 35200 Telde  
Gran Canaria, Spain.  
E-mail: [chernandez@dbio.ulpgc.es](mailto:chernandez@dbio.ulpgc.es)  
Fax: +(34) 928-132908

The deadline for the submission of applications is 4 May 2012. The request should be accompanied by detailed curriculum vitae, together with supporting documentation of qualifications and / or studies, work experience and language skills. It shall also state the reasons for the interest in the course. Once informed of their pre-admission the selected candidates must register and enrol through the Universidad de Las Palmas de Gran Canaria during the dates that will be informed,

[https://www.ulpgc.es/index.php?pagina=posgrados\\_oficiales&ver=inicio](https://www.ulpgc.es/index.php?pagina=posgrados_oficiales&ver=inicio)

The provisional acceptance will be communicated as soon as possible. This will become final upon the payment of the registration fees.

Registration fees will be set by the Government of the Canary Islands (approximately 30 per credit). These fees cover the documentation of the course, attending lectures, seminars and practicals, and the costs of study tours and visits. They will not cover travel costs, lodging and food.

It is compulsory for participants to have medical insurance valid for Spain. Proof of insurance cover must be given at the beginning of the Master. For participants under 27 years of age, insurance is included in the registration fees.

## SCHOLARSHIPS

Various public and private agencies may grant scholarships to participate in the programme. These scholarships may cover all or part of the registration fees.

Other specific grants for official master courses can be also found in <http://www.educacion.gob.es/horizontales/servicios/becas-ayudas-subsuenciones/para-estudiar/master.html>,

Candidates from CIHEAM member countries (Albania, Algeria, Egypt, France, Greece, Italy, Lebanon, Malta, Morocco, Portugal, Spain, Tunisia and Turkey) may apply for scholarships covering registration fees, and for scholarships covering the cost of travel and full board accommodation. The applications must be addressed before 4 May 2012 to the Director of the Programme, completing the application form. Scholarships will be awarded according to academic merit.

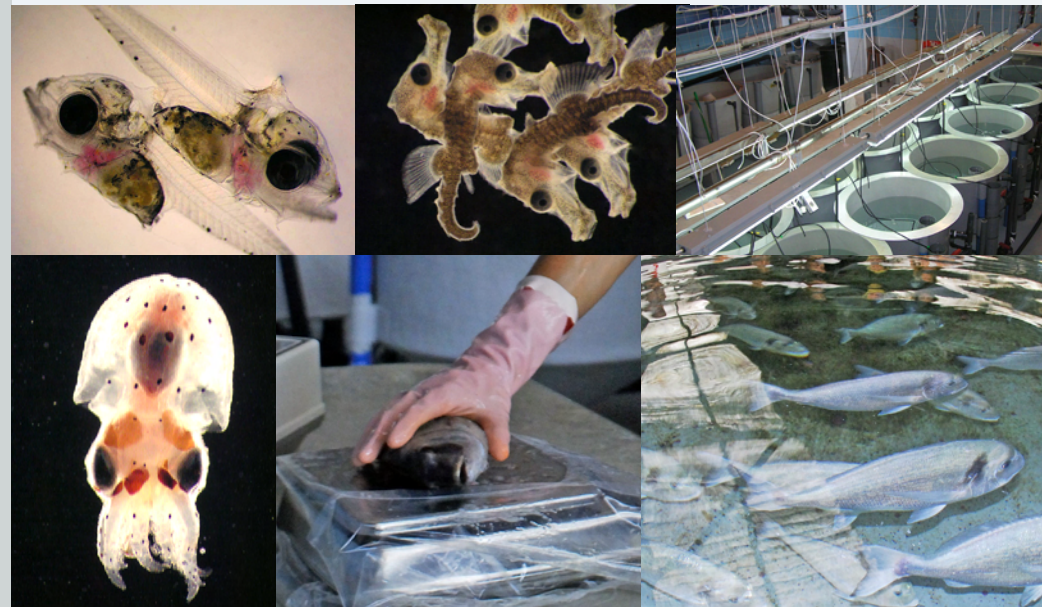
The Carolina Foundation (FC) will award two scholarships to candidates from the Latin American Community of Nations, except Spain. Information about these scholarships is available on the Web site of the FC: <http://www.fundacioncarolina.es>

Candidates from West African Countries (Senegal, Mauritania, Ghana, Gambia, Ivory Coast, Cape Verde, Guinea Conackry, Sierra Leona, Guinea Bissau and Liberia) may apply for a registration fee grant sponsored by the Canary Islands Government (Viceconsejería de Acción Exterior y Relaciones Institucionales), that must be requested through the Master organisation.

Non-Spanish candidates can also apply for scholarships to the Spanish Agency for International Development Cooperation (AECID). Scholarship information may be consulted at [www.becasmae.com](http://www.becasmae.com) (applications may also be sent through this website), or by contacting the nearest Embassy of Spain or Consulate in the corresponding countries.

Candidates from other countries who require financial support should apply directly to other national or international institutions such as FAO, European Commission, World Bank, etc.

For the second part of the Master, students conducting their research project in a Spanish province outside Las Palmas may opt for aid through the Student mobility programme (Modalidad B) of the Spanish Ministry of Education.



## ACCOMMODATION (LODGING)

The organisers will help participants find accommodation in hotels, apartments or university halls of residence during the course. However booking and related expenses will be paid by the participants.