FORMER STUDENTS' OPINION ABOUT THE PROGRAMME

- *"Thanks to the Master I have come into contact with the world of research and had the opportunity to work with the best aquaculture professionals in Spain and in the world. Furthermore, it has been a fabulous personal experience for me to work in an international context."*

  Mouna Abaab. Environmental Assessemet & Management (EAM). Tunisia.

- *"My time at the Master has opened doors for me in the aquaculture world through my contact with lecturers of international standing and thanks to a wide variety of subjects. The master's in marine culture has been the foundation upon which I have built my career as a researcher, as it gave me my first opportunity to carry out research."*

  David Domínguez Montesdeoca, Doctor-Researcher, GIA-ULPGC, Spain.

- *"Attending the course on marine culture of the ULPGC-CIHEAM-IAMZ has meant a radical change in my life. Professionally it has enabled me to work with marine fish larvae, which I am passionate about, and to become acquainted with the highest levels of world marine aquaculture. Personally, I have met some very interesting people and have had the good fortune to work closely with colleagues that have become my best friends and that will be with me for the rest of my life."*

  Mauricio Moreno Alva. Hatchery Manager, Ocean Baja Labs. Baja California, Mexico.

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

  Ricardo Zerolo, Director of Production CUPIMAR, Cadiz, Spain.

SCIENTIFIC COMMITTEE

- **Dr. B. BASURCO**
  Mediterranean Agronomic Institute of Zaragoza, CIHEAM, Spain.
- **Dra. M.T. DINIS**
  University of El Algarve, Faro, Portugal.
- **Dr. A.F.M. EL-SAYED**
  United Arab Emirates University.
- **Dra. M.S. IZQUIERDO**
  University of Las Palmas de Gran Canaria, Spain.
- **Dr. S. KAUSHIK**
  INRA, St. Pée-Sur-Nivelle, France.
- **Dr. A. TACON**
  Aquatic Farms Ltd, Hawaii, USA
- **Dra. C. M. HERNÁNDEZ-CRUZ**
  University of Las Palmas de Gran Canaria, Spain.

SOME LECTURERS OF FORMER EDITIONS

- Acosta Arbelo, Félix (ULPGC, Las Palmas de G.C., Spain)
- Afonso, Juan Manuel (ULPGC, Las Palmas de G.C., Spain)
- Basurco, Bernardo (CIHEAM-IAMZ, Zaragoza, Spain)
- Barja, Juan Luis (Universidad de Santiago Compostela, Spain)
- Courtois de Vicoise, Gercende (ULPGC, Las Palmas de G.C., Spain)
- Domezain Fau, Alberto (Caviar de Riofrío S.L., Granada, Spain)
- El-Sayed, Abdel (United Arab Emirates University, Egypt)
- Felip Edo, Alicia (CSIC, Castellón, Spain)
- Fernández Martín, Jesús (INIA)
- Fernández Vaquero, Agustín (BIOMAR, Spain)
- García García, José (IMIDA, Murcia, Spain)
- Gijón Preciado, Daniel (Skretting, Spain)
- Ginés, Rafael (ULPGC, Las Palmas de G.C., Spain)
- Gómez Cabrera, Serafin (Universidad de Murcia, Spain)
- Gómez Peris, Ana (CSIC, Castellón, Spain)
- Gómez Pinchetti, Juan Luis (ULPGC, Las Palmas de G.C., Spain)
- Guerrero Asorey, Luis (IRTA, Gerona, Spain)
- Guerra Calado, Ricardo (Universidad de Aveiro, Portugal
- Haro, Enrique (TINAMENOR, Santander, Spain)
- Haroun, Ricardo (ULPGC, Las Palmas de G.C., Spain)
- Hernández-Cruz, Carmen Mª (ULPGC, Las Palmas de G.C., Spain)
- Hernández Ferrer, Mariano (ULL, La Laguna, Tenerife, Spain)
- Hernández Guerra, Juan (ULPGC, Las Palmas de G.C., Spain)
- Hontoria Danes, Francisco (CSIC, Castellón, Spain)
- Hyun, Suk Shin (ULPGC, Las Palmas de G.C., Spain)
- Izquierdo, Marisol (ULPGC, Las Palmas de G.C., Spain)
- Kjorsvik, Elin (Universidad de Trondheim, Norway)
- Machado Campaña, Manuel (IFAPA, Cádiz, Spain)
- Masuda, Reiji (Kyoto University FRS, Japan)
- Millamena, Oseni (SEAFDEC AQD, Philippines)
- Molina, Lucia (ULPGC, Las Palmas de G.C., Spain)
- Molina Alcalá, Antonio (Universidad de Córdoba, Spain)
- Montero Vitores, Daniel (ULPGC, Las Palmas de G.C., Spain)
- Moyano López, Francisco J. (Universidad de Almería, Spain)
- Neira, Roberto (Universidad de Chile)
- Padrón Robaina, Victor (ULPGC, Las Palmas de G.C., Spain)
- Pall, Harry (Universidad de Rostock, Germany)
- Papandroulakis, Nikos (Institute of Marine Biology of Crete, Greece)
- Robaina Robaina, Lidia (ULPGC, Las Palmas de G.C., Spain)
- Roo Filgueira, Javier (ACIISI, Las Palmas de G.C., España)
- Rosenlund, Grethe (Skretting-NUTRECO, Norway)
- Simard, Francois (Musée Océanographique, Monaco)
- Socorro, Juan (ULPGC, Las Palmas de G.C., Spain)
- Tacon, Albert (Aquatic Farms Ltd, Hawaii, EE.UU.)
- Thongrod, Supis (HK, Bangkok, Tailandia)
- Toro, Miguel A. (INIA, Madrid, Spain)
- Tort Bardolet, Lluis (Universidad Autónoma de Barcelona, Spain)
- Vergara, José Manuel (ULPGC, Las Palmas de G.C., Spain)
- Zamorano Serrano, Mª Jesús (ULPGC, Las Palmas de G.C., Spain)

Grupo de Investigación en Acuicultura

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA · CIHEAM · Parque Científico Tecnológico · ECOAQUA www.ecoaqua.eu

University Master in Marine Aquaculture

October 2020 - June 2022

Las Palmas de Gran Canaria, Spain

Grupo de Investigación en Acuicultura

UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA · CIHEAM · Parque Científico Tecnológico · ECOAQUA www.ecoaqua.eu

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 decapod crustaceans. 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 Machrobrachium culture. Catfish culture. Tilapia culture. Carp culture. Salmonid culture. Sturgeon culture. Turbot culture. Seabass and seabream 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 food production that has experienced most growth in recent decades. It is now 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 2016 world aquaculture production reached 112 million metric tons (algae included), surpassing capture fishery production by 18.2 million metric tons. In fact, more than half of the aquatic products for human consumption come from aquaculture, and, in the case of species such as salmon, carp and oysters, this figure reaches up to 90%, 70% in mussels and 25% in prawns or shrimp. Europe is the third largest producing region 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, it is the fifth producer of shellfish worldwide and a major producer of turbot, seabream, seabass, trout and new species such meagre and sole.

This development requires a continued demand of specialized professionals in the various fields of this activity, which the University Master in Marine Aquaculture (former **International Master in Aquaculture**) has been building up for over 20 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 two 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 focus.

The Master is coordinated by the **Aquaculture Research Group (GIA)** (www.grupoinvestigacionacuicultura.org) of the **University of Las Palmas de Gran Canaria (ULPGC)**. This group with more than thirty years of experience in research and teaching in aquaculture, has facilities with approximately 2,500 m2 devoted to comprehensive cultivation of algae, shellfish, crustaceans and marine fish and 500 m2 of laboratories in nutrition, histology, genetics, reproduction, pathology and a workshop to prepare fish feed and pellets. Having led more than 130 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. 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 30 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 species worldwide, with special emphasis on the Mediterranean.

The completion of the **Master thesis** shall, in addition, provide a formative period of introduction to research. This Master opens the door for later registration, if desired, in the PhD programme in Sustainable Aquaculture and Marine Ecosystems, offered by the GIA that holds the Quality Award 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)**, 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 renowned guest professors belonging to research institutions and teaching, to administration and private entities in several countries.

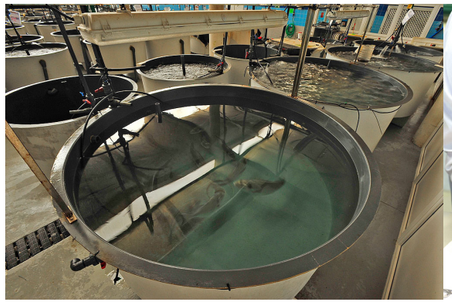
The agenda of the International Master in Aquaculture has two parts. The first (60 ECTS) provides an intense basic training in all fields of aquaculture through theoretical and practical classes in the first year of the programme to take place from October 2020 to June 2021.

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 2022, 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 Specialization 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 Master 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, field visits and laboratory techniques. These activities are supplemented by seminars and open discussions. The course will be taught at the Scientific and Technological Park 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 20 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 2020 for those participants who require it.

PRE-REGISTRATION AND FEES

Applications for pre-admission and registration can be made at http://www.ulpgcparati.es/; and for any additional information please contact:

Prof. Félix A. Acosta Arbelo
Universidad de Las Palmas de Gran Canaria
Autovía Bañaderos a Las Palmas nº 80, km 6,5
Las Palmas de Gran Canaria. Spain.
E-mail: felix.acosta@ulpgc.es

The first application for the pre-admission period starts 5 February and ends 15 March 2020. Afterwards, selected candidates will be asked to register at http://www.ulpgcparati.es/ prior to the deadline determined by the ULPGC. The application should be accompanied by a 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.

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 25 euros 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.

In **https://www.ulpgc.es/becas**, one can also find several calls for scholarships for postgraduate studies.

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. Scholarships will be awarded according to academic merit, and preference will be given to candidates from developing countries. The application for these scholarships must be made before 4 May 2020 through the following address:

http://www.admission.iamz.ciheam.org/es/

The Carolina Foundation (FC) will award a scholarship 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-Conakry, Sierra Leone, 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 organization.

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 organizers 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.