

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. Projet Officer- Marine WWF North Africa, Tunisia.

"The master has opened up job opportunities for me in the field of research and private industry where I am working today. The excellent study programme has enabled me to establish links and work with the best international professionals in the sector. All this has been made possible thanks to an exceptional team of prestigious lecturers capable of transmitting their knowledge and professional experience. This has also given me the opportunity to meet people from other countries and cultures that have enriched my experience and with whom I have shared unforgettable moments."

Antonino La Barbera. Aquanaria, Spain.

"Attending the course on marine culture of the **ULPGC-ICCM** 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.

"The Master gave me the opportunity to conduct research in fish nutrition and health, not only from a fundamental but also from an applied approach. It enabled me to establish collaborations with international research institutions, external companies and experts to promote projects addressed to contribute with innovative solutions to the aquaculture industry responsible and sustainable development."

Silvia Torrecillas. IRTA La Ràpita, Spain.

The master's degree in marine Aquaculture was an essential step in the development of my training, with a very complete syllabus and many hours of practical work, in direct contact with animals, aquaculture production systems and laboratories. The master's degree gave me a strong push to choose a research career.

Antonio Serradell. PhD student ULPGC., Spain.

Studying the Master in Marine Aquaculture has allowed me to experiment and enter the world of aquaculture research, and in addition to training, I have had the opportunity to acquire valuable professional experience. By studying it, you not only learn about various areas of aquaculture, but also the master's teaching team has exceptional human and scientific quality.

Antonio Gómez Mercader. Project Technician (Researcher). Spain.

SCIENTIFIC COMMITTEE

• **Dr. B. BASURCO**
CIHEAM Zaragoza, Spain.

• **Dr. M. T. DINIS**
University of El Algarve, Faro, Portugal.

• **Dr. A.F.M. EL-SAYED**
United Arab Emirates University.

• **Dr. DANIEL MONTERO**
University of Las Palmas de Gran Canaria. Spain.

• **Dra. M.S. IZQUIERDO**
University of Las Palmas de Gran Canaria. Spain.

• **Dr. S. KAUSHIK**
INRA, St. Péé-Sur-Nivelle, France.

• **Dr. A. TACON**
Aquatic Farms Ltd, Hawaii, USA.

• **Dr. F. ACOSTA**
University of Las Palmas de Gran Canaria. Spain.

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 Zaragoza, Spain)
- Barja, Juan Luis (Universidad de Santiago Compostela, Spain)
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- Calado, Ricardo (Universidade de Aveiro, Portugal)
- Carrillo Estévez, Manuel (CSIC, Castellón, Spain)
- Castilho, Rita (University Of Algarve, Faro, Portugal)
- Cavari, Benzion (I.O.L.R., Haifa, Israel)
- Conijeski, Daniel (National Center for Mariculture, Israel)
- Dinis, M^a Teresa (University of Algarve, Faro, Portugal)
- De Blas Giral, Ignacio (Universidad de Zaragoza, Spain)
- Ellis, Tony (SOAEFD, Aberdeen, Escocia, UK)
- El-Sayed, Abdel (United Arab Emirates University, Egypt)
- Fernández Martín, Jesús (INIA)
- Fdez-Palacios, Hipólito (ULPGC, Las Palmas de G.C., Spain)
- Fdez-Palacios, J.Enrique (ICC, Telde, Spain)
- Fernandez Aldana, Juan M. (APROMAR, Spain)
- Fernández Vaquero, Agustín (BIOMAR, Spain)
- Flores Aguilar, Roberto A. (Universidad de los Lagos, Chile)
- García García, José (IMIDA, Murcia, Spain)
- Gasca-Leyva, Eucario (CINVESTAV, México)
- Gijón, Herminia (ULL, La Laguna, Tenerife, Spain)
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- López-Fanjul, Carlos (Universidad Complutense, Madrid, Spain)
- Martínez Palacios, Carlos (INIRENA, México)
- Masuda, Reiji (Kyoto University FRS, Japan)
- Millamena, Oseni (SEAFDEC AQD, Philippines)
- Molina, Lucia (ICCM, Telde, Spain)
- Molina Alcalá, Antonio (Universidad de Córdoba, Spain)
- Montero, Daniel (ULPGC, Las Palmas de G.C., Spain)
- Mozes, Noam (National Center for Mariculture, Israel)
- Moyano López, Francisco J. (Universidad de Almería, Spain)
- Neira, Roberto (Universidad de Chile)
- Ojeda, Juan José (ADSA, Las Palmas de G.C., Spain)
- Padilla Castillo, Daniel (ULPGC, Las Palmas de G.C., Spain)
- Padrón Robaina, Victor (ULPGC, Las Palmas de G.C., Spain)
- Padrós Bover, Francisco (Universidad de Barcelona, Spain)
- Papandroulakis, Nikos (Institute of Marine Biology of Crete, Greece)
- Pereira Dopazo, Carlos (Universidad de Santiago de Compostela, Spain)
- Pottinger, Tom (IFE, Windemere, UK)
- Real, Fernando (ULPGC, Las Palmas de G.C., Spain)
- Robaina, Lidia (ULPGC, Las Palmas de G.C., Spain)
- Roo Filgueira, Javier (ACIISI, Las Palmas de G.C., España)
- Rosenlund, Grethe (Skretting-NUTRECO, Norway)
- Rotllant, Josep (Universidat Autònoma de Barcelona, Spain)
- Santaella, Eladio (IEO, Madrid., Spain)
- Simard, Francois (Musée Océanographique, Monaco)
- Socorro, Juan (ICCM, Telde, Spain)
- Tacon, Albert (Aquatic Farms Ltd, Hawaii, EE.UU.)
- Thongrod, Supis (HK, Bangkok, Tailandia)
- Toro, Miguel A. (INIA, Madrid, Spain)
- Tort Bardolet, Lluís (Universidat Autònoma de Barcelona, Spain)
- Vergara, Jose Manuel (ULPGC, Las Palmas de G.C., Spain)
- Zamorano Serrano, M^a Jesús (ULPGC, Las Palmas de G.C., Spain)
- Zanuy Doste, Silvia (CSIC, Castellón, Spain)
- Zapata, Agustín (Universidad Complutense de Madrid, Spain)



University Master in Marine Aquaculture

October 2024 - June 2026

Las Palmas de Gran Canaria, Spain



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 2021 world production of Aquaculture reached 116 million metric tons (algae included). Thus, almost 50% of the 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, which the University Master in Marine Aquaculture (former **International Master in Aquaculture**) has been building up for over 25 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) of the **University of Las Palmas de Gran Canaria (ULPGC)**. This group with over 30 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 feeds, pellets for the fish. Having led more than 120 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 (CIHEAM Zaragoza) has organized for over 25 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**, and the **International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM)**, through the **Mediterranean Agronomic Institute of Zaragoza (CIHEAM Zaragoza)**.

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 2022 to June 2023.

The second year (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 June 2024, 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 **Post-graduate Specialisation Diploma** awarded by the CIHEAM.

Participants who passed the first part of the Master with a grade of 7 or more out of 10 may opt, after acceptance of the Master's Thesis proposal, to obtain the University Master's Degree in Marine Aquaculture. **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 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:

- Higher university degree or equivalent, related to the theme of the course.
- 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 online between July and September 2024 for those participants who require it.

PRE-REGISTRATION AND FEES

The pre-registration periods for applications for the 2024-2026 will be available at the link <https://www.ulpgc.es/masteres-administracion/inicio>

Interested candidates will have several pre-registration periods for university master's degrees. The first one corresponds to an early pre-registration (from February 1 to March 15) the second one corresponds to the ordinary admission phase (normally in June), and the third corresponds to the extraordinary phase (normally from September 1 to 15) only for those master's degrees in which places have been left over from the ordinary admission phase.

Afterwards, selected candidates will be informed to fill the ULPGC forms in the period designed by the University. 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.

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 16 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.

For further information please contact Professor Felix Acosta Arbelo (felix.acosta@ulpgc.es).



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 convocations 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 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 28 April 2024 through the following address:

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

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**. Students may also apply to Erasmus+ programme for traineeship mobility grants to other European countries.

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.

