Course title: New trends in aquaculture biotechnology research

Modality: CFA- Advance Training Course

Orientation:

- ☐ Ocean Observation and Global Change
- X Sustainable use of Marine Resources
- ☐ Integral Management of the Sea
- ☐ Technological progress. Engineering and Business Management

Dates:
April 17-21, 2023

Timetable:

	April 17	April 18	April 19	April 20	April 21
09:00-11:00	Ignacio Fernández	José Fernando López	Manuel Gesto	Javier Dubert	Carlos Pereira
11:00-13:00	Juan Antonio Martos	Manuel Yúfera	Sandra Souto	Miguel Balado	Diego Robledo

Duration:
1 week

Location:
Do*Mar virtual teaching system

Language:
English

Academic coordinators:

Name	Institution	e-mail
José Luis Soengas	Universidade de Vigo	jsoengas@uvigo.es
Carlos Pereira Dopazo	Universidade de Santiago	carlos.pereira@usc.es

Lecturers:

Name	Institution	e-mail
Ignacio Fernández Monzón	IEO-Vigo-CSIC	ignacio.fernandez@ieo.csic.es
Juan Antonio Martos Sitcha	Universidad de Cádiz	juanantonio.sitcha@uca.es
José Fernando López Olmeda	Universidad de Murcia	jflopez@um.es
Manuel Yúfera Ginés	ICMAN-CSIC	manuel.yufera@icman.csic.es
Manuel Gesto Rodríguez	DTU-Dinamarca	mges@aqua.dtu.dk
Sandra Souto Pereira	IA-USC	sandra.souto@usc.es
Javier Dubert Pérez	IA-USC	javier.dubert@usc.es
Miguel Balado Dacosta	IA-USC	miguel.balado@usc.es
Carlos Pereira Dopazo	IA-USC	Carlos.pereira@usc.es
Diego Robledo Sánchez	USC	diego.robledo@roslin.ed.ac.uk

General description:
The course describes ongoing research lines in aquaculture to provide students a general view of the present research in this field

Contents: 10 different lectures (2h each) given by recognized experts in specific research fields within aquaculture

1	Ignacio Fernández Monzón	Molecular and cellular approaches to unveil biological functions and requirements of essential micronutrients in fish species
2	Juan Antonio Martos Sitcha	Use of nutraceutical compounds isolated from micro- and macroalgae for feeding in aquaculture
3	José Fernando López Olmeda	Biological rhythms in fish and their applications for the improvement of aquaculture
4	Manuel Yúfera Ginés	Development and physiology of fish larvae
5	Manuel Gesto Rodríguez	Fish welfare in aquaculture: What the water can tell
6	Sandra Souto Pereira	Current overview on vaccine development for the prevention of fish viral pathogens
7	Javier Dubert Pérez	New insights about bacterial diseases in bivalves: using omics to develop biotechnological tools in aquaculture
8	Miguel Balado Dacosta	Use of siderophore systems as therapeutic targets to mitigate the occurrence of infection diseases caused by Gram-negative bacteria in aquaculture
9	Carlos Pereira Dopazo	Viral diagnosis: techniques of the future
10	Diego Robledo Sánchez	Integration of genetic and genomic technologies to improve resistance to diseases in aquaculture

Teaching methodologies:
Lectures

Evaluation system:
Test exam

Brief CV of the lecturers:

Ignacio Fernández Monzón
He is a researcher at Instituto Español de Oceanografía (IEO-CSIC), Spain. He has a bachelor degree in Marine Sciences (University of Vigo, Spain), and a Master and PhD in Aquaculture (University of Barcelona, Spain). He was post-doctoral researcher at the Centre of Marine Sciences (CCMAR, Portugal) and Contratado Ramón y Cajal at Instituto Tecnológico Agrario de Castilla y León (ITACyL). His research studies are focused on determining the nutritional requirements of fat-soluble vitamins, and the molecular pathways governing larval development. Recently, he is mainly interested in i) the identification, validation and implementation of integrative biomarkers of fish physiological condition, ii) the establishment of predictive and diagnosis descriptors of fish quality, and iii) defining new strategies to adapt fish farming to climate change; applying a multidisciplinary approach (in vitro and in vivo tools, transcriptomics, biochemistry, histology and immunohistochemistry). Currently, he coauthored 50 publications, edited one book and participated in 18 national (4 as a PI) and 2

EU funded research projects, and 14 contracts (6 as PI) with private companies

Juan Antonio Martos Sitchá

He is Researcher and Associate Professor at the Department of Biology at the Faculty of Marine and Environmental Sciences (UCA). Dr. Martos-Sitcha develops his research line in growth physiology and endocrinology for the design and validation of molecular markers, mainly in marine fish using different approaches both conventional and based on omic techniques for their application in aquaculture after situations of different nutritional requirements and environmental variations. He leads several Autonomic (e.g. SUPLALGAE), Spanish (e.g. IRSAF, PLANASER) and International (e.g. SERIBLUE, IGNITION) Research Projects, as well as several contracts with private companies . He published 74 peer-reviewed articles, 36 book chapters with ISBN, 1 patent deposit and more than 140 communications in national and international conferences. At the training level, he is/has been Co-Advisor of a total of 5 Doctoral Theses, as well as 18 Master's Theses, 20 Bachelor's/Grade's Theses. (Scopus h-index = 23) ORCID: 0000-0002-0151-7250

José Fernando López Olmeda

I am currently a researcher at the Department of Physiology at the University of Murcia. I got my PhD in 2009 in the same institution. Later, I performed a 2-year postdoc at the Karlsruhe Institute of Technology (Germany) and come back to the University of Murcia in 2013. My main line of research is focused on the study of biological rhythms in fish in many physiological processes such as metabolism, the stress response, growth and reproduction. Besides the basic interests, an important part of my research has been applied to the improvement of culture of several fish species such as the European sea bass, gilthead seabream, Senegalese sole and Nile tilapia

Manuel Yúfera

Prof. Yúfera graduated in Biological Sciences at the University of Seville in 1977 and received his PhD in 1982. He joined the CSIC staff in 1986. He has 44 years of experience in aquaculture research. He has participated in 50 national and international research projects, leading a large part of them. His line of interest has focused on the biology, ontogeny and feeding of larvae, as well as the digestive physiology of fish in general. He has been deputy director of ICMAN and head of the livestock and aquaculture area of the R+D Plan of the State Research Agency of the government of Spain.

Manuel Gesto

My research career has focused in different aspects of the physiology of aquatic organisms, mainly related to the physiological responses against environmental insults in the form of chemical and physical stressors. Early research helped to understand the effects of pollutants on stress and reproduction in aquatic fauna. My research has also focused on fish stress physiology and has contributed to clarify the role of the fish brain in determining the ability of fish to cope with stress/environmental challenges. My most recent research is in the context of welfare in aquaculture, assessing how intrinsic (e.g. personality) and extrinsic factors (e.g. environmental complexity), affect the ability of fish to tolerate stress associated to life in captivity. I have coauthored 54 peer-reviewed journal articles (24 as first author) in SJR journals and 3 peer reviewed book chapters. I have acted as reviewer (>115 rev) for >20 SJR journals.

Sandra Souto Pereira

She is a researcher at Universidade de Santiago de Compostela (USC), Spain. She has a bachelor degree in Biology (University of Santiago de Compostela, Spain), and a PhD in Aquaculture (University of Santiago de Compostela, Spain) with the special mention of Extraordinary PhD Award at USC. She was post-doctoral researcher at the National Research Institute for Agriculture, Food and the Environment (INRAE, France) and Posdoutoral at Instituto de Acuicultura (USC). She has extensive experience using the reverse genetics technique, which allows her to recover recombinant viruses from different species of fish viruses, such as Nervous necrosis virus (NNV) and Spring viraemia of carp virus (SVCV), all of them of great impact in aquaculture. She is lecturer of the subject "Vaccines and biotechnological applications of viruses" for the Biotechnology degree at the USC. Her scientific career has been focused on the study of virulence factors and pathology of several virus that are major concerns in southern European aquaculture. She coauthored 19 publications, one patent and participated in national and EU funded research projects. She is currently involved in two projects for the development of vaccines for the protection of fish against NNV using different approaches

Javier Dubert Sánchez

After completing my PhD at USC with honors, I was working as postdoc (2016-2018) in some of the most outstanding laboratories on Vibrio ecology, pathogenesis and evolution, namely under supervision of Frédérique Le Roux in France (Roscoff Marine Station; CNRS & Sorbonne University) and Prof. Martin F. Polz at MIT (US), gaining a valuable expertise in genomics, molecular biology and genetic engineering. On July'18, I came back to the group "Pathology in Aquaculture" (GIPA-1213) at USC, leading with the Professor Juan L. Barja the line of research about the infectious diseases in marine bivalves with interest in aquaculture. My research interests include the use of multidisciplinary approaches based on microbiology, genomics, immunology and host's disease resistance to study the relationship between pathogenic Vibrio spp. and bivalves and using all this information to develop novel biotechnological tools to prevent and to manage bacterial diseases in aquaculture. I have experience as a junior group leader in supervising PhD, graduate and undergraduate students and four projects as PI funded by the Ministry of Science and Innovation or Xunta de Galicia, among others. Examples of ongoing and past research projects in my laboratory include the investigation of the host-pathogen interactions and the discovery of new pathogenic species with significance for bivalve aquaculture such as V. europaeus, V. ostreicida or V. bivalvicida. I am also exploring the mechanisms of bacterial pathogenesis of those species to understand how they grow and proliferate, modulate the expression of the virulence genes, evade the host immune system, and ultimately cause disease.

Miguel Balado Dacosta

Graduated in Biology from the University of Vigo (year 2002); and joined the Marine Genetic Resources Laboratory (REXENMAR) at the University of Vigo, where he obtained a degree in Biology (2003) by defending the thesis entitled "Application of microsatellite markers in the genetic management of European hake, Merluccius merluccius". He joined the Ictiopathology Unit of Institute of Aquaculture (University of Santiago de Compostela) in 2004. He obtained a PhD degree in Biology by defending the doctoral work titled "Characterization of a new assimilation system of iron by siderophores in Vibrio anguillarum". The PhD work obtained the

Extraordinary Doctorate Award from the Faculty of Biology (period 2008-2009) and the award for the best PhD work of SEM's Aquatic Microbiology Group. In these 18 years of a fulfilling research career, he participated in 43 scientific publications published in international journals and was director of 3 PhD tesis. His scientific activity focuses on the study and molecular characterization of virulence factors in relevant fish and mollusc pathogenic bacteria for Spanish aquaculture. Among his research interests are the study of iron uptake systems, secretion of extracellular toxins and dissemination of virulence factors by mobile DNA elements. Some results successfully obtained allowed the development/ implementation of new therapeutic targets; e g. "Trojan Horse" strategy by utilization of A. salmonicida siderophore receptors as a gateway for new antimicrobials or use of the siderophore receptors to obtain vaccines. Currently, he is IP of a @AgEInves funded research projects focused in irp-HPI genomic island evolution and temperature-dependent regulation of virulence factors in Vibrio

Carlos Pereira Dopazo

Carlos P. Dopazo has more than 30 years of experience in Fish Virology. He is director of the IA-USC since 2015, and coordinator of the Galician Interuniv. Master of Aquaculture since 2008. He created and was coordinator (2002-2008) of ReGABA (Gal. Aquacult. Biotechnol. Network), and coordinator of the International Network of Viruses of Lower Vertebrates (2010-2018). He has been involved in research and innovation to introduce new technologies in fish virus diagnosis, and is considered an expert in that field, actively collaborating with the EU Reference Laboratory for Aquatic diseases in the development and validation of new procedures for oficial diagnosis. Among the around 100 papers, a large number are devoted to develop molecular viral diagnosis procedures in aquaculture. He has published a large number of reports on screening of aquatic viruses in the ocean and coastal waters, and has demonstrated that presence of viruses in certain areas can be predicted with more that 5 years in advance when the Galician sole farms were notified, in 2005, that VNNV was reaching North from Atlantic Andalucia, through the Portuguese cost. He has been invited to lecture on topics on viral epidemiology by the Spanish Microbiology Soc. (2015, Logroño), the Sp Aquaculture Soc. (2019, Murcia), the National Aquatic Forum (O Grove, 2020), the Iberoamerican Forum of Marine Resources (FIRMA-2021, in an online lecture to hundreds of attendees all around Iberoamerica and Spain), the Sp Virology Society (2022, Málaga). His interaction with aquaculture companies is intense, making them have a great confidence in his capacity to solve their problems. Therefore, he is frequently called upon to act as consultant, for diagnostic and other services. This interaction makes him have a large knowledge on the Sector needs, what has helped the groups to move into research on vaccines development in 2 consecutive projects of the Plan Nacional de I+D+i. This year, we have obtained a EU project (Cure4Aqua) in the call Horizon CLC-2022, with the main objective to develop a VNNV vaccine based in mRNA, a new breakthrough in fish virus vaccine research.
Since 2018, he is part of the European Marine Board, and has been appointed as a representative in the EMB-Comit Navigating the Future.
Finally, he has been for long time involved in diffusion transference. Summarizing with the most recent: Forum of entrepreneurs and trainers in aquaculture, Gijón, 2019; "What is Innovation in Aquaculture", Cluster Acuiplus, Santiago, 2019, and at II University-Business, Fisheries, aquaculture and Climate Change (Bayona, 2021), he was invited to give a talk on "Keys to effective university-business interaction: research and transfer.

Diego Robledo Sánchez

Diego Robledo is a group leader at the Roslin Institute (University of Edinburgh). The main interest of his research group is to understand infectious processes in aquatic animals, and especially differences in disease resistance between individuals, populations or species, applying this knowledge to improve the resistance to diseases of aquaculture stocks. To do so, his research group employs a broad range of genetic and genomic approaches, including the development of new genome assemblies and genotyping arrays, genome-wide association and genomic selection approaches, (single-cell) transcriptomic and epigenomic technologies, and genome editing using CRISPR-Cas systems. This ample repertoire allows tackling research questions from different angles. Their ongoing lines of research can be summarised in 1) Understanding the biology underlying differential resistance to infectious diseases; 2) Improving the efficacy and efficiency of selective breeding via the use of genomic selection, imputation and functional information; and 3) increasing disease resistance via the use of in vitro and in vivo CRISPR-Cas9 genome editing

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