

ADVANCED COURSE 2024

GLOBAL CHANGE IN TRANSITIONAL ENVIRONMENTS



UNIVERSITY OF AVEIRO, JULY 15-19

Department of Biology (dbio), Department of Chemistry (dqua) &
Laboratory Central of Analysis (lca)

ORGANIZED BY ROSA FREITAS & EDUARDA PEREIRA

ADVANCED COURSE OVERVIEW

Climate change research is a current, relevant and fundamental theme in the context of the challenges that the Anthropocene poses to us, the target of special attention in the "2030 Agenda for Sustainable Development", in particular with regard to objective 13 - Climate Action, adoption of urgent measures to combat climate change and its impacts, and objective 14 - Protect marine life, which identifies the need to conserve and sustainably use oceans, seas and marine resources for sustainable development. In 2019 the Intergovernmental Panel on Climate Change (IPCC) published the Special Report on Climate Change, Oceans and Cryosphere. This document is enlightening in relation to the changes already undergoing by the oceans and cryosphere, alerting in particular to a warmer, more acidic and less productive ocean (along with the increase in the average sea level and the increase in the frequency and intensity of extreme coastal events), with well-identified consequences in coastal systems. In this context, the UN also launched the Decade of Ocean Science for Sustainable Development (2021-2030). During this period, it is envisaged the creation of scientific knowledge about the factors that are currently changing the structure and physical, chemical and biological functioning of oceans, seas and coastal areas, such as: acidification, disturbances caused by heat waves, progressive warming of waters and the presence of pollutants. For the above, the theme of this advance course, focusing on aquatic transition systems, is current and contributes substantially to what is expected in terms of training and human resources for the Decade of Ocean Science for Sustainable Development. The impacts caused by global changes in aquatic systems are mainly relevant in transition environments given their location, between terrestrial and oceanic environments, and characteristics such as low depth, reduced hydrodynamism, high content in organic matter, constant exposure to salinity variations and changes in the chemical composition of water resulting from these environmental changes. Although subject to these constant variations, aquatic transition systems have high biodiversity, housing species of high economic interest. This factor combined with its location, which facilitates, inter alia, the transport of goods and enhances the increase in the population around these regions, inevitably results in exposure to a high diversity of substances, many of them with toxic potential still unknown, especially considering predicted scenarios of climate change. Therefore, it is easy to realize that the teaching of themes related to the impacts of climate change and pollution in transition environments is relevant, with the advantage of integrating knowledge from various sciences, such as physics, chemistry, geochemistry, biology, ecology, toxicology and climatology. This interdisciplinarity will certainly be a reason for attracting students with different backgrounds.

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GLOBAL CHANGE IN TRANSITIONAL ENVIRONMENTS | 2024

DAY 1

Monday, July 15

09:00 **WELCOME**

Rosa Freitas & Eduarda Pereira | University of Aveiro, PT

09:15 **THE SCIENCE AND MANAGEMENT OF ESTUARIES TO COPE WITH INTERNAL AND EXTERNAL PRESSURES FOR THE BENEFIT OF NATURE AND SOCIETY**

Mike Elliott | University of Hull, UK

11:00 **CHALLENGES IN ENVIRONMENTAL TOXICOLOGY: FROM MOLECULAR RESPONSES TO ECOLOGICAL RISK ASSESSMENT**

Miren P. Cajaraville | University of the Basque Country, SP

12:30 **LUNCH BREAK**

14:15 **PRACTICAL ACTIVITY: Histopathological assessment of bivalve's main tissues**

Miren P. Cajaraville | University of the Basque Country, SP

DAY 2

Tuesday, July 16

09:15 **ENERGY METABOLISM IN MARINE ORGANISMS AND ITS ROLE IN RESPONSES TO STRESSORS**

Inna Sokolova | University of Rostock, DE

11:00 **ZERO POLLUTION STRATEGY: TOWARDS AN EFFECT-BASED RISK ASSESSMENT OF EMERGING CONTAMINANTS**

Alessandro Nardi | Polytechnic University of Marche, IT

12:30 **LUNCH BREAK**

14:30 PRACTICAL ACTIVITY: Hemolymph withdrawal and in vitro studies with bivalve hemocytes

Alessandro Nardi | Polytechnic University of Marche, IT

Miren P. Cajarville | University of the Basque Country, SP

DAY 3

Wednesday, July 17

09:15 IMPACTO DAS ALTERAÇÕES GLOBAIS NA HIDRODINÂMICA DE SISTEMA DE TRANSIÇÃO: O CASO DA RIA DE AVEIRO

João M. Dias | University of Aveiro, PT

11:30 ECOTOXICOLOGICAL EFFECTS OF PHARMACEUTICAL DRUGS: OCCURRENCE, FATE, AND TOXICOLOGICAL CONCERNS IN ENVIRONMENTALLY EXPOSED BIOTA

Bruno Nunes | University of Aveiro, PT

12:30 LUNCH BREAK

14:00 PRACTICAL ACTIVITY: Sampling and Conservation of Liquid and Solid Samples. Representativeness of Sampling Procedures in Coastal Systems

Eduarda Pereira & Daneila Tavares | University of Aveiro, PT

DAY 4

Thursday July 18

09:15 HAZARD ASSESSMENT OF NANOMATERIALS IN MARINE AND ESTUARINE WATERS: TOOLS AND APPROACHES

Susana Loureiro | University of Aveiro, PT

11:00 SAFEGUARDING THE WILD: ASSESSING ENVIRONMENTAL IMPACT OF VETERINARY PHARMACEUTICALS

Lucia De Marchi | University of Pisa, IT

12:30 LUNCH BREAK

14:00 PRACTICAL ACTIVITY: Treatment and analysis of liquid and solid samples

Eduarda Pereira & Daniela Tavares | University of Aveiro, PT

DAY 5

Friday July 19

09:15 PLASTICS IN THE ENVIRONMENT: A NEW BOOMERANG TALE?

Miguel Oliveira | University of Aveiro, PT

11:00 PRACTICAL ACTIVITY: Biochemical alterations in marine invertebrates exposed to different stressors: hands on

Lucia De Marchi | University of Pisa, IT

Rosa Freitas | University of Aveiro, PT

13:00 LUNCH BREAK

15:00 Take-home messages

COURSE INFO

Type of course: Theoretical/Practical (6 ECTS)

On-site: 15-19 july

On-line: 22-26 july

Venue: University of Aveiro, Department of Biology & Department of Chemistry

Coordinators: Rosa Freitas, CESAM & Department of Biology, University of Aveiro; Eduarda Pereira, REQUIMTE & Department of Chemistry, University of Aveiro

Applications deadline: 30th May 2024

Registration fee: free

Registration by email: rosafreitas@ua.pt

ORGANIZERS



MARIA EDUARDA PEREIRA

University of Aveiro, Portugal

Maria Eduarda Pereira completed her PhD in Chemistry in 1997 and her Bachelor's degree in Ceramic and Glass Engineering in 1984 from the University of Aveiro. She is an Associate Professor in the Department of Chemistry at the University of Aveiro. Since June 2012, she has been the Coordinator of the Central Analysis Laboratory at the University of Aveiro. Since May 2018, she has been the Director of the Bachelor's degree in Chemistry and also a Member of the Scientific Committee of the Master's degree in Marine and Atmospheric Sciences. She is the author or co-author of approximately 400 articles in scientific international journals. She has 19 book chapters and 5 books. She holds 5 registered patents. She has organized 45 events. She has supervised or co-supervised about 30 doctoral theses, 79 master's dissertations, and 120 undergraduate final projects. Currently, she is involved in 7 projects. Her scientific interests are focused on the responses of aquatic organisms to environmental exposure to metals and the relationship between contamination and biological responses, bioaccumulation, and biomagnification of metals along estuarine food chains; water remediation; removal of classical contaminants such as Hg; recovery of elements of high economic/strategic value through innovative technologies, focusing on live macroalgae, biosorbents, and nanomaterials.



ROSA FREITAS

University of Aveiro, Portugal

Rosa Freitas is an Auxiliary Professor with habilitation at the Department of Biology, University of Aveiro (Dbio-UA). In the last 5 years, she has devoted my research to the toxicity of emergent contaminants of concern (CECs), including pharmaceuticals and personal care products, nanoparticles and more recently technological critical elements, always considering different CC scenarios. As a consequence of my research over the years, I have published so far more than 260 papers, with more than 7000 citations (H-index 47, i10-index-176, scholar.google.com). Throughout her career, I presented more than 100 oral communications and 80 posters at national/international conferences. She already supervised/co-supervised 6 post-docs, 23 PhD and 27 MSc theses defended, more than 68 under-graduation students, and 16 ERASMUS students. At Dbio-UA, I have been teaching since 2010. She has also been committed to attracting funding to UA, including scientific projects that allowed me to create an international network with different countries (e.g., Spain, France, Italy, China, Mexico, Argentina, Chile, and Brazil). Besides the projects in progress, during the last 5 years, Rosa Freitas was the PI at the UA of 1 EU, 1 Portugal-China and 2 national projects; member of 1 international and 6 national projects.

INVITED SPEAKERS



ALESSANDRO NARDI

Polytechnic University of Marche, Italy

Alessandro Nardi is currently Researcher at the Department of Life and Environmental Sciences of Polytechnic University of Marche and at the Italian National Biodiversity Future Center. His research activity is focused on the study of biological effects of emerging contaminants (e.g. microplastics, pesticides, abuse substances and pharmaceuticals) and their mode of action in non-target marine organisms, under current and climate change scenarios. His approach relies on field studies, laboratory investigations of molecular to physiological traits in biological models, and the use of weight- and effect-based criteria for risk assessment.



BRUNO NUNES

Universidade de Aveiro, Portugal

Bruno Nunes (BN) is a BSc in Pharmaceutical Sciences by the Faculty of Pharmacy (1999), and holds a PhD in Biomedical Sciences (2005) from the Institute of Biomedical Sciences of Abel Salazar, both institutions from the University of Porto. BN also holds a title of Habilitation in Biology (2020), by the University of Aveiro. BN holds expertise in several areas related to the occurrence, fate and adverse effects of pharmaceutical drugs in the wild, with dozens of indexed, international and peer reviewed publications in the area. BN has been involved as Principal Researcher in national and international projects with this scope, and is the supervisor of dozens of graduate and undergraduate students, in both national and foreign universities. The main activities of BN have been related to the development, validation and implementation of novel biomarker-based analytical procedures to study the adverse effects of pharmaceutical drugs in the wild, especially in the aquatic compartment.



INNA SOKOLOVA

University of Rostock, Germany

Dr. Sokolova is an expert in environmental physiology and toxicology of marine organisms. She is studies adaptations of marine organisms to environmental stressors and the effects of environmental change (both natural and anthropogenic) on marine populations.



JOÃO MIGUEL DIAS

University of Aveiro, Portugal

Pis a Full Professor at the UA and is the Director of the Physics Department (UA-CESAM). He founded and leads the Estuarine and Coastal Modeling Division, and is the Scientific Vice-Coordinator CESAM. With over 30 years of expertise, he is specialized in numerical modelling of physical processes in coastal areas, notably contributing to understanding the hydrodynamics of the Ria de Aveiro and other estuaries. He has led numerous national and international research projects. With over 220 articles (h-index 33), he has supervised numerous post-doctoral researchers and doctoral and master's students.



LUCIA DE MARCHI

University of Pisa, Italy

Lucia De Marchi is an Auxiliary Researcher with Scientific Habilitation at the Associate Professor level in the Veterinary Pharmacology and Toxicology sector at the Department of Veterinary Sciences, University of Pisa, Italy. She specializes in evaluating the toxic effects of drugs used in veterinary science with a One Health approach. Her primary interests lie in conducting research in fields and laboratories, employing various marine and terrestrial vertebrates and invertebrates as model species, as well as utilizing different scientific approaches and laboratory techniques.



MIGUEL OLIVEIRA

Universidade de Aveiro, Portugal

Miguel Oliveira is currently a Researcher at the Centre for Environmental and Marine Studies and at the Department of Biology of Aveiro University. Among his lines of research are the evaluation of effects of emerging contaminants (e.g., micro(nano)plastics, nanoparticles and pharmaceuticals) in aquatic organisms and cell lines, with more than 2500 citations. Some of his papers in the area of microplastics are among the most cited of respective journal. He has been involved in the organization of several sessions in international conferences and post-graduation courses.



MIKE ELLIOTT

University of Hull, United kingdom

Mike is the Director of International Estuarine & Coastal Specialists (IECS) Ltd and also the Emeritus Professor of Estuarine and Coastal Sciences at the University of Hull, UK. He was Director of the former Institute of Estuarine & Coastal Studies (IECS) at the university from 1996-2017. He is a marine biologist with a wide experience and interests and his teaching, research, advisory and consultancy includes estuarine and marine ecology, policy, governance and management. Mike has published widely, co-authoring/co-editing 21 books/proceedings and >350 scientific publications. He has advised on many environmental matters for academia, industry, government and statutory bodies worldwide. Mike is a past-President of the international Estuarine & Coastal Sciences Association (ECSA) and is now Vice-Chair of Future Earth Coasts and a Co-Editor-in-Chief of the international journal Estuarine, Coastal & Shelf Science; he currently is or has had Adjunct Professor and Research positions at Murdoch University (Perth), Klaipeda University (Lithuania), the University of Palermo (Italy), Xiamen University (China) and the South African Institute for Aquatic Biodiversity. He was awarded Laureate of the Honorary Winberg Medal 2014 of the Russian Hydrobiological Academic Society, and was awarded Lifetime Achievement Award of ECSA, September 2022. He is also a member of many national and international committees linking marine science to policy.



MIREN P. CAJARAVILLE

University of the Basque Country, Spain

Miren P. Cajaraville is Professor of Cell Biology since 2002 and has more than 30 years experience in Environmental Toxicology. Her research focuses on development and application of cellular and molecular biomarkers of pollution and AOPs in aquatic sentinel and model organisms to understand mechanisms of action of pollutants (particularly oil hydrocarbons, endocrine disruptors, nanomaterials and micro and nanoplastics) and also on the use of alternative in vitro and in vivo approaches for environmental and human risk assessment. Particularly interested in omics and histopathological responses. Director of consolidated research group "Cell Biology in Environmental Toxicology" 2001-2021 and head of the research line Toxicology of nanomaterials, micro and nanoplastics and other emerging pollutants. Founding member of the Marine Station of Plentzia PiE (2012). Expert for the EC JRC CAS project on nanoplastics. Currently PI of projects MIKRONANOPLAS, PLASFITO, FIERA and the AquEus LTC Laboratory for Transborder Cooperation. Coordinator of PhD programme in Environmental Contamination and Toxicology ECT since 2012 and lecturer at Erasmus Mundus masters ECT+; MER+ and IMBRSea. Has supervised 17 Licenciature Thesis, 4 End of Degree Projects, 22 Master Thesis and 17 PhD Thesis of which 13 were European or International Thesis. Basque Government and Ikerbasque Advanced Award (2021). According to WoS (January 2024) has 203 publications, cited 7.751 times; mean cites per publication: 38.18; h-index: 51. World's top 2% scientist according to Ranking of the World Scientists (October 2023 update).



SUSANA LOUREIRO

Universidade de Aveiro, Portugal

Susana Loureiro is an Associated Professor with Habilitation at the University of Aveiro, Department of Biology (Portugal) and her research is focused on tools and approaches in ecotoxicology. In the last 15 years she has worked mainly on chemical mixtures and toxicity predictions, nanoecotoxicology and linking ecotoxicological tools to ecosystem functioning. She has published more than 220 papers and has a H-index=41.