

Global change, marine resources and biodiversity

Advanced course

Work load

Contact hours: 40 hours

Independent study: 60 hours

Lecturers

Prof. Henrique Queiroga, University of Aveiro, Portugal

Prof. Steve Swearer, University of Melbourne, Australia

Prof. Ester Serrão, University of Algarve, Portugal

Dr. Fernando Lima, Research Centre in Biodiversity and Genetic Resources, Portugal

Science Cafés

Prof. Jesus Dubert, University of Aveiro

Prof. Ulisses Azeiteiro, University of Aveiro

Participant to be announced

Dr. Elena Ojea, University of Vigo

Dr. Isabel Teixeira, University of Aveiro

Dates

September 26 to October 1, 2019 (except Sunday, September 29)

Venue

University of Aveiro, with videoconference connection to the remaining Do*Mar *campi*.

Timetable and rooms (Portuguese time)

Morning sessions: 9h00-13h00, lectures and discussion, room to be announced

Afternoon sessions: 14h00-16h30, paper reading and discussion, room to be announced

Late afternoon sessions: 17h00-18h30, science café, room to be announced

Background and objectives

Most macroscopic marine organisms, from algae to fish, are sessile or sedentary organisms reproducing through propagules (spores, vegetative fragments, larvae) that spend minutes to months

in the plankton. The existence of a planktonic propagule in the life cycle of these organisms has two major consequences to the dynamics of the populations: i) many marine species form metapopulations and ii) small variations in the mortality factors during the dispersal phase originate large changes in supply to the adult habitat. Recorded and expected changes in ocean climate are increased temperatures, increased stratification, changes in oceanic currents, and acidification. These changes impact on the dispersal, growth, feeding and mortality of planktonic propagules, resulting in geographical shifts of the populational units. Understanding the factors that affect the dispersal of propagules, the mortality rates and factors to which they are subjected, the degree of connectivity between local populations, and the spatial organization of metapopulations is a challenging task, but one that is essential to understand the effects of global change and for an ecosystemic approach to the management of marine environment.

Course structure

The morning sessions are based on lectures reviewing the major recorded and expected changes in the ocean climate and addressing the ecological concepts and mechanisms underpinning the dispersal of marine propagules and the mortality factors that affect different phases of the life cycle. These lectures are followed by discussions of previously distributed papers, emphasising the basic dispersal and mortality processes and the patterns of change in the metapopulations of marine species. The research methodologies and the implications of the ecology of early life-history stages for the management of marine populations and ecosystems are also explicitly addressed. The afternoon sessions are allocated to reading of the suggested papers. The science cafés include short presentations of further case studies, followed by discussions.

Syllabus (provisional)

1. Climatic trends in the ocean and impacts on marine biodiversity (Queiroga)
A brief review of global trends and impacts, and a focus in the Iberian Peninsula
2. Regulation of marine populations and communities (Queiroga, Swearer)
Significance of a planktonic phase for the ecology of marine meta-populations
3. The patterns and processes in the horizontal dispersal of planktonic propagules (Queiroga)
Biophysical interactions
4. Measuring dispersal and population connectivity in marine organisms (Swearer, Serrão, Queiroga)
Methods: elemental markers, molecular markers, biophysical models
5. Climate change, dispersal pathways and range shifts (Lima, Serrão, Swearer)
Case studies, covering a diversity of taxa and geographical regions
6. Designation and management of Marine Protected Areas (Queiroga, Swearer)
How does knowledge on the dispersive phase inform implementation and management of MPA networks
7. Biological resources management (Lima, Ojea, Swearer)
How does knowledge on the dispersive phase inform management of exploited populations

Science Cafés

Modelling the future Iberic ocean, Prof. Jesus Dubert. September 26.

Climate-related changes in estuarine zooplankton, Prof. Ulisses Azeiteiro. September 27.

Topic to be announced. September 28.

Trophic webs of the future ocean, Dr. Isabel Teixeira. September 30.

Small scale fisheries and adaptation to climate change, Dr. Elena Ojea. October 1.

Suggested reading

1-2 papers per each chapter. List to be updated.

These papers will be distributed before the course.

Teachers CVs

Henrique Queiroga (Associate Professor, Departamento de Biologia & CESAM - Centro de Estudos do Ambiente e do Mar, University of Aveiro, henrique.queiroga@ua.pt)

Henrique is Professor of Marine and Estuarine Ecology and of Biological Oceanography. His main research interests are the interactions between behaviour of larval forms and physical forcing controlling the dispersal and recruitment of marine species and the integration of multiple tools (numeric biophysical models, genetic markers, elemental fingerprinting) to assess population connectivity. Henrique is also interested in the processes that regulate large scale biodiversity patterns, marine conservation, and marine ecosystem services. Henrique is a member of the Scientific Board of the National Strategy for Adaptation to Climate Change, and Director of the doctoral programmes on Marine Science, Technology and Management - Do*Mar. He coordinated the successful application of the Berlengas Archipelago to the Biosphere Reserves Network (UNESCO), and is a member of the Strategic Council of the Reserva Natural das Berlengas. Henrique has been Principal Investigator or team member of several national and international research projects on marine ecology and on marine ecosystem services. Editor of two books and author of > 90 papers in leading international journals in the area of Marine Biology. Research advisor of 22 M. Sc. students, 19 Ph. D. students and 7 post-doc researchers. Has been referee of several leading journals in the fields of zoology and marine ecology, and member of the organizing or scientific committees of 6 international conferences.

Prof. Steve Swearer (Full Professor, School of BioSciences, University of Melbourne) s.swearer@unimelb.edu.au

Stephen is Professor of marine biology at the University of Melbourne. He began his career as a larval fish biologist and his research in this field has focused on understanding how larval dispersal, settlement and recruitment influence population replenishment and connectivity in marine ecosystems and the ecological and environmental factors that influence these processes. In 2015, he became Director of the National Centre for Coasts and Climate. Since then, his research has taken a broader focus into developing solutions for addressing the impacts of overabundant species, habitat

loss and climate change in marine and coastal ecosystems in partnership with government and industry.

Prof. Ester Serrão (Associate Professor, Faculty of Sciences and Technology, CCMAR – Centro de Ciências do Mar, University of Algarve, eserrao@ualg.pt)

Ester coordinates the team BEE (Biogeography, Ecology and Evolution) at CCMAR, researching how marine populations persist, disperse and evolve as species ranges shift, in response to habitat and climatic changes. She published > 220 indexed scientific papers and coordinated >10 large national and international research projects. She develops conservation and marine habitat restoration projects and societal outreach, which received international prizes. These include diverse actions such as a Pew Marine Fellow award for conservation of genetic biodiversity of marine forests around the world, habitat restoration at the Marine Protected Areas of the Arrábida Natural Park (Portugal) and scientific advisory to the Natural Park of Banc d'Arguin (Mauritania). She contributes to training students (18 PhD, 46 MSc, 21 BSc) and young researchers (18 postdocs), taught many undergraduate and graduate courses and initiated and coordinated international graduate study programs at the University of Algarve.

Dr. Fernando Lima (Assistant Researcher, CIBIO- Research Centre on Biodiversity and Genetic Resources, fplima@gmail.com)

Fernando's main research interest is the study of marine biodiversity and biogeography, with particular emphasis on the processes governing species distributions. Most of my recent works focus on the study of alterations in species distributions and their relation with climate change. I like multidisciplinary approaches, and my current projects combine aspects from experimental ecology, behavior analysis, physiology, climatology, electronics, and modelling.