

## CFA1.6 Course Title: Biological invasions in marine ecosystems

**Modality: Advance Training Course**

**Dates:**

May 2019

**Duration:**

Lectures: 20h

**Location:** DOMAR Videoconference room TORRE-CACTI Building, Campus As Lagoas-Marcosende, University de Vigo

**Academic coordinators:**

Name	Institution	e-mail
Celia Olabarria	Universidade de Vigo	colabarria@uvigo.es

**Lecturers:**

Name	Institution	e-mail
Francisco Arenas Parra	CIIMAR, Porto	farenas@ciimar.up.pt
Brezo Martínez-Díaz-Caneja	Universidad Rey Juan Carlos, Madrid	brezo.martinez@urjc.es

**General description:**

Biological invasions occur when a species enters and spreads into areas beyond its natural range of distribution. Every single day thousands of marine species are transported by human activities around the world far away from their native range to new areas where they become non-indigenous species (NIS). However, whether this introduced species will be successful in its new host habitat is a dynamic, very complex process entailing several transitional stages. When successful, invasions may be among the greatest threats to global biodiversity.

Coastal marine systems are among the most invaded systems on the planet and invasive species can have dramatic effects on the structure and functioning of invaded ecosystems. Yet, marine invasions are much less well studied than invasions in terrestrial and freshwater communities.

Here, we review the characteristics of biological invasions in marine communities from the points of view of both the invasive species and the host communities. Thus in the course, we will examine how new species arrive at our seashores, what makes a good invader, which communities are more susceptible to invasion, and the impacts of some of the most successful invaders in our coastal habitats.

Lectures and practical sessions will cover the technical aspects needed to develop Species Distribution Models in marine coastal environments. Students will be trained in the basics of statistical modelling and guided through the phases: compilation of biotic information and

environmental rasters, making informed decisions on parameter settings and selecting the best methods for developing distribution models, developing predictions, and incorporating results in scientific manuscripts and technical reports. The course includes theoretical lectures and hands-on exercises using predominantly case studies of marine macroalgae. Students are encouraged to bring their own datasets.

**Contents:**

1. Biological invasions: Historical review of species invasions research.
2. Vectors and pathways of introduction of marine invaders.
3. Invasion: what makes a good invader.
4. Biological resistance to invasions: the other side of invasions.
5. How to manage marine invasions: Prevention, control and eradication.
6. Anthropocene: Global stressors and Biological invasions.
7. Ecological and economic impacts: from individuals to ecosystems, from structure to functioning.
8. Bases of Statistical Modelling. Species Distribution Models (SDMs) as Multiple Logistic Regressions.
9. Definition of correlative SDMs. Desired properties. Modeling phases and decisions, the cookbook.
10. Modeling methods. Projections and predictions. Validation and accuracy.
11. The special case of modeling invasive species. Which niche are we modelling?. Equilibrium assumption.
12. Applications. How to write an article/oral presentation using SDMs. Students work on own projects/presentations.

**Teaching methodologies:**

The course will use a variety of methodologies, including lecture/presentations, practical sessions with computer simulations, and group discussions and exercises. Participant will be given some reference reading material some weeks before the course.

It is recommended that students have basic knowledge of GIS

**Evaluation system:**

Each participant will be assessed throughout the course for the completion of the course objectives. A final practical exercise with a brief presentation of congress type will also evaluate students individually.

**Brief CV of the lecturers:**

**Dr Francisco Arenas**

He is currently a Researcher at the Aquatic Ecology and Evolution Group (AEE) of CIIMAR – Interdisciplinary Centre of Marine and Environmental Research. He graduated as a biologist (speciality Botany) at Oviedo University (Spain) and completed the Master degree in 1993 as marine ecologist. From 1996 to 1999 he completed his PhD degree in Biology, funded by the EU

project EUROCK, at Oviedo University (Spain). In 2001 he was awarded with a Postdoctoral grant and moved the Marine Biological Association of the UK (England). In 2005 he was hired at the Interdisciplinary Centre of Marine and Environmental Research CIIMAR, Porto Portugal as researcher. Through all his professional career, he has developed his research expertise as a marine ecologist with interests in ecology of marine invasions, impacts of climate change on marine systems, and the importance of biodiversity in the functioning of coastal ecosystems. Dr Arenas has published more than sixty articles in scientific journals and four book chapters. He has supervised 4 successful PhD Theses and many Msc Theses. He was PI of two national funded projects and participated as researcher in several national and international projects. He has lectured in several Master Programs in Portugal & Spain and participate in the Unesco funded OceanTeacher program.

### **Dr Brezo Martínez**

She is a marine ecologist with a particular research interest in the environmental drivers of species distribution based at Rey Juan Carlos University, in Madrid. My background focuses ecology of rocky shores, and ecophysiology and mariculture of foundation macroalgae (MSc & PhD). She is interested in ecophysiological and demographic responses of species at their contracting distributional edges. She developed several correlative species distribution models (SDM) aimed at predicting distributional shifts at macroecological scales resulting from Climate Change. She is currently working on how assessing the projections of SDMs with physiological thresholds observed in stress experiments using seaweed and corals as model species. She has coordinated a team of 12 universities and research institutions in a project founded by the Ministry of Environment evaluating the conservation state of the kelp and canopy-forming macroalge to be included in the national red list of endangered species. She has also lead several articles alarming to the media and society on the catastrophic decline of foundation seaweed in southern Europe. This activity has resulted in 30 SCI articles, one book and 1 contribution in a book chapter, and 6 dissemination articles. She has supervised 10 graduated dissertations on biogeography and physiology of algae and corals at their distributional edges, 5 master dissertations on coral ecology and restoration, and 1 defended PhD thesis in algal ecology and mariculture. She has participated in 11 competitive research projects including 3 European (4 as PI). She was visiting researcher at University of California Irvine in 2016, Universidad Federal de Santa Catarina (Brazil) in 2012 & 2013, University of Western Austrasia in 2010 and 2012, and Universidade do Porto (2007, 2008 & 2009).