SEA-EU Module description

Module offers for the SEA-EU 'Virtual Modules'

General Information

Module/Course Name	**Modelling the distribution of biodiversity under global change**	
Module/Course Code	BIO5039	
Field of Education	Generic programmes and qualifications	☐
	Education	☐
	Arts and humanities	☐
	Social sciences, journalism and information	☐
	Business, administration and law	☐
	Natural sciences, mathematics and statistics	☒
	Information and Communication Technologies	☐
	Engineering, manufacturing and construction	☐
	Agriculture, forestry, fisheries and veterinary	☐
	Health and welfare	☐
	Services	☐
Study programme	-	
Number of ECTS and total student workload	7.5 ECTS and 188 hrs (with 1 ECTS = 25-30 hrs at NORD)	
Contact hours and Independent study hours	38 hours (direct contact time) + 150 hours main assignments and independent study time	
Typology of contact hours	Lectures, and TP sessions.	
Academic Year	2025-2026	
Semester / Specific period	2nd	
Teaching Language	English	
Delivery mode	Online	
Responsible Lecturer	Name: Jorge Manuel Ferreira de Assis E-Mail: jorgemfa@gmail.com	
Other lecturers	No	

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Learning outcomes	**Knowledge:** • Has advanced knowledge of biodiversity modeling, with theoretical expertise in how environmental and climate changes impact biodiversity. • Can understand and communicate current theories on macroscale environmental conditions and their effects on biodiversity, including how biodiversity responds to changing environments. **Skills:** • Can extract, manage and visualize marine biodiversity and bioclimatic data, and in applying niche theory to develop mechanistic and correlative bioclimatic models. • Can assess bioclimatic models' strengths, limitations and transferability across space and time. • Can use methods to integrating physiological data into hybrid models, predicting invasive processes, and analyzing ecological niche overlap to infer drivers of niche evolution is essential. **General Competencies:** • Can judge the implications of research methods and understand how biodiversity will respond to environmental changes. • Can effectively communicate and defend results through publications and reports. • Can articulate findings on biodiversity distribution and evolutionary impacts to diverse audiences. • Can communicate the impacts of global climate change on marine biodiversity, ensuring methodological rigor and good practices for parameterization and evaluation.
Course contents	The course will provide students training in the scope of macroecology and bioclimatic modelling to infer and discuss the interactions and potential impacts of global climate changes (past, ongoing and future) on the different levels of marine biodiversity (i.e., from genes to ecosystems). It is mostly hands-on oriented, with a strong component on biodiversity and climatic data acquisition, management and visualization (e.g., the new Shared Socioeconomic Pathway scenarios of climate change), as well as on ecological and species distribution modelling using state of the art algorithms (e.g., machine learning). Students will be motivated to bring their own datasets. The course is organized in three parts.

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	• Part 1 consists of lectures and hands-on oriented coding in R computing language. • Part 2 consists of a written assignment that is an individual research study addressing (1) the interactions between, or (2) the impacts of, global climate changes on marine biodiversity. • Part 3 consists of an oral plenary presentation based on the individual assignment.
Prerequisites and/or recommended academic background	Students must be fluent in English and have fundamental / elementary knowledge on marine ecology and statistics. Students should have fundamental / elementary knowledge on R computing language (although not mandatory).
Assessment	Written assignment and oral presentation.
Main bibliography	Assis, J., Fernández Bejarano, S. J., Leclercq, F., Vanhoorne, B., Schepers, L., Gouvêa, L., Fragkopoulou, E., Tyberghein L., Serrão, E. A., Verbruggen, H., & de Clerck, O. (2024). Bio-ORACLE v3.0: Pushing marine data layers to the CMIP6 Earth System Models of climate change research. Global Ecology and Biogeography, 33, e13813. Assis, J., Fragkopoulou, E., Gouvêa, L., Araújo, M. B., & Serrão, E. A. (2024). Kelp forest diversity under projected end-of-century climate change. Diversity and Distributions, 33, e13837. https://doi.org/10.1111/ddi.13837 Assis, J., Serrão, E. A., Fragkopoulou, E., Legrand, T., Gouvêa, L., & Araújo, M. B. (2024). Misconception of model transferability precludes estimates of seagrass community reorganization in a changing climate. Nature Plants. https://doi.org/10.1038/s41477-024-01735-7 Colaço Martins, L., Gomes-Pereira, J. N., Dionísio, G., & Assis, J. (2024). Unravelling environmental drivers and patterns of Portuguese man o' war (Physalia physalis) blooms in two ocean regions: North Atlantic and the Southeast Pacific. Marine Pollution Bulletin, 209, 117278. https://doi.org/10.1016/j.marpolbul.2024.117278 Gouvêa, L., Fragkopoulou, E., B. Araújo, M., Serrão, E. A., & Assis, J. (2024). Seagrass Biodiversity Under the Latest-Generation Scenarios of Projected Climate Change. Journal of Biogeography. https://doi.org/10.1111/jbi.15021 Gouvêa, L. P., Krause-Jensen, D., Duarte, C. M., & Assis, J. (2025). Projected impacts of future climate change on the aboveground biomass of seagrasses at global scale. Science of The Total Environment, 966, 178680. https://doi.org/10.1016/j.scitotenv.2025.178680

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	Zhang, Z., Zhou, J., García Molinos, J., Mammola, S., Bede-Fazekas, Á., Feng, X., Kitazawa, D., Assis, J., Qiu, T., & Lin, Q. (2024). Incorporating physiological knowledge into correlative species distribution models minimizes bias introduced by the choice of calibration area. Marine Life Science & Technology. https://doi.org/10.1007/s42995-024-00226-0 Yates, K. L., Bouchet, P. J., Caley, M. J., Mengersen, K., Sequeira, A. M. M., Cheung, W. W. L., … & Sequeira, A. M. (2018). Outstanding challenges in the transferability of ecological models. Trends in Ecology & Evolution, 33(10), 790-802. https://doi.org/10.1016/j.tree.2018.08.001 Assis, J., Serrão, E. A., Claro, B., Perrin, C., Pearson, G. A., & Coelho, N. C. (2018). Climate-driven range shifts explain the distribution of extant genetic diversity in marine forests. Global Ecology and Biogeography, 27(3), 429-439. https://doi.org/10.1111/geb.12709 Guisan, A., & Thuiller, W. (2005). Predicting species distribution: offering more than simple habitat models. Ecology Letters, 8(9), 993-1009. https://doi.org/10.1111/j.1461-0248.2005.00792.x

Organisational Information

Maximum number of SEA-EU participants
16
Learning Management System
GitHub
Course schedule (date and time)
5 classes between Mon, 4th to Fri, 8th May 2026: Monday 4th: 8:00 – 14:00 Tuesday 5th: 8:00 – 16:00 Wednesday 6th: 8:00 – 16:00 Thursday 7th: 8:00 – 16:00 Friday 8th: 8:00 – 16:00
Application deadline
22nd Feb 2026

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