Marine Ecological Modelling Global Climate Change

Course Overview

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Scope

Interactions and potential **impacts of global climate changes on different levels of marine biodiversity**.

Hands-on oriented, with a strong **component on biodiversity and climate data acquisition, management and visualisation, as well as on ecological modelling** using state of the art mechanistic and correlative approaches.

Goals

Get to know the foundations of **ecological niche theory**;

Develop skills on **marine macroecology**, **climate data acquisition**, **management** and **visualisation**;

Develop skills on **mechanistic and correlative ecological modelling**;

Understand the strengths of niche modelling and the develop skills for proper **model transferability across space and time**;

Week 1-5

S01. Course overview

S02. Principles of Geographic Information Systems

S03. Ecological niches and geographic distributions

S04. Biological and environmental data for macroecology

S05. Climate oscillations and distributional shifts of marine biodiversity

S06. Principles of Ecological Niche Modelling

S07. Potential applications of Ecological Niche Modelling

S08. Model fitting and transferability in space and time

Week 6

Individual research study addressing a topic in the context of ecological modelling and global climate change.

[**Presentations discussing study possibilities** 5 + 10 minutes]

Week 6-8

S09. The diversity of algorithms of Ecological Niche Modelling

S10. Evaluating predictive performance and setting decision thresholds

S11. Bringing realism to Ecological Niche Modelling

S12. Improving transferability of Ecological Niche Modelling

S13. Dissemination of results under the Open Science framework

Week 9-10

Individual study addressing a topic in the context of ecological modelling and global climate change.

[**Final Presentations** 10 + 10 minutes]

Evaluation

Each student needs to write an **individual** report (**research study**) addressing the interactions OR impact of global climate changes (past OR future) in one of the different levels of biodiversity. This can be:

. identifying the main environmental drivers shaping distributions;

. predicting present distributional ranges;

. projecting future range shifts;

. predicting marine invasion processes, etc.

Formulate a relevant research ecological question

>> what will be the consequences of future climate to *Zostera noltii*?

Students must formulate an hypothesis, based on the general theories presented in the lectures or from literature

>> increasing emissions of greenhouse gases will produce more severe range shifts to *Zostera noltii*.

Build a conceptual model to address the question in their system

>> model the ecological niche of *Zostera noltii* and predict its distribution for the present and for future climate conditions.

Read literature in a systematic, quantitative way, to collect, assess the evidence for the different components of their model and hypotheses, and formulate conclusions and recommendations

Evaluation

Individual research study

[Apr 12] Presentation / Discussion : 5 + 10 min (10% grade)

[May 11] Presentation : 10 + 5 min (20% grade)

[Jun 15] Report (15pp without references, paper format; 60% grade)

[Jun 15] Documented R markdown script as supplementary information of the final report (10% grade)

Mid-term Exam

[May 03] Multiple choice + up to 4 essay questions, 90 min; > 9.5

** **Final grade = (Exam x 0.25) + (Individual research x 0.75)**

Classes

Theory [up to 50m] >> Break >> Hands-on [50m] >> Break >> Hands-on

Resources

https://github.com/jorgeassis

Sessions (PPTs), Data, Scrips, challengeSolutions, codeRecipes and literature.md (Interesting and mandatory reads per session)

Relevant questions

[book a meeting] jmassis@ualg.pt