# Modeling the Future of Ocean Ecosystems in a Changing Climate

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## Introduction

- Global pelagic ecosystems are complex and highly heterogeneous.
- It is crucial to understand how they will respond to future climate change.
- Models project biomass decline and spatial shifts, but the underlying trophic processes and their impact on trophic dynamics remain uncertain.

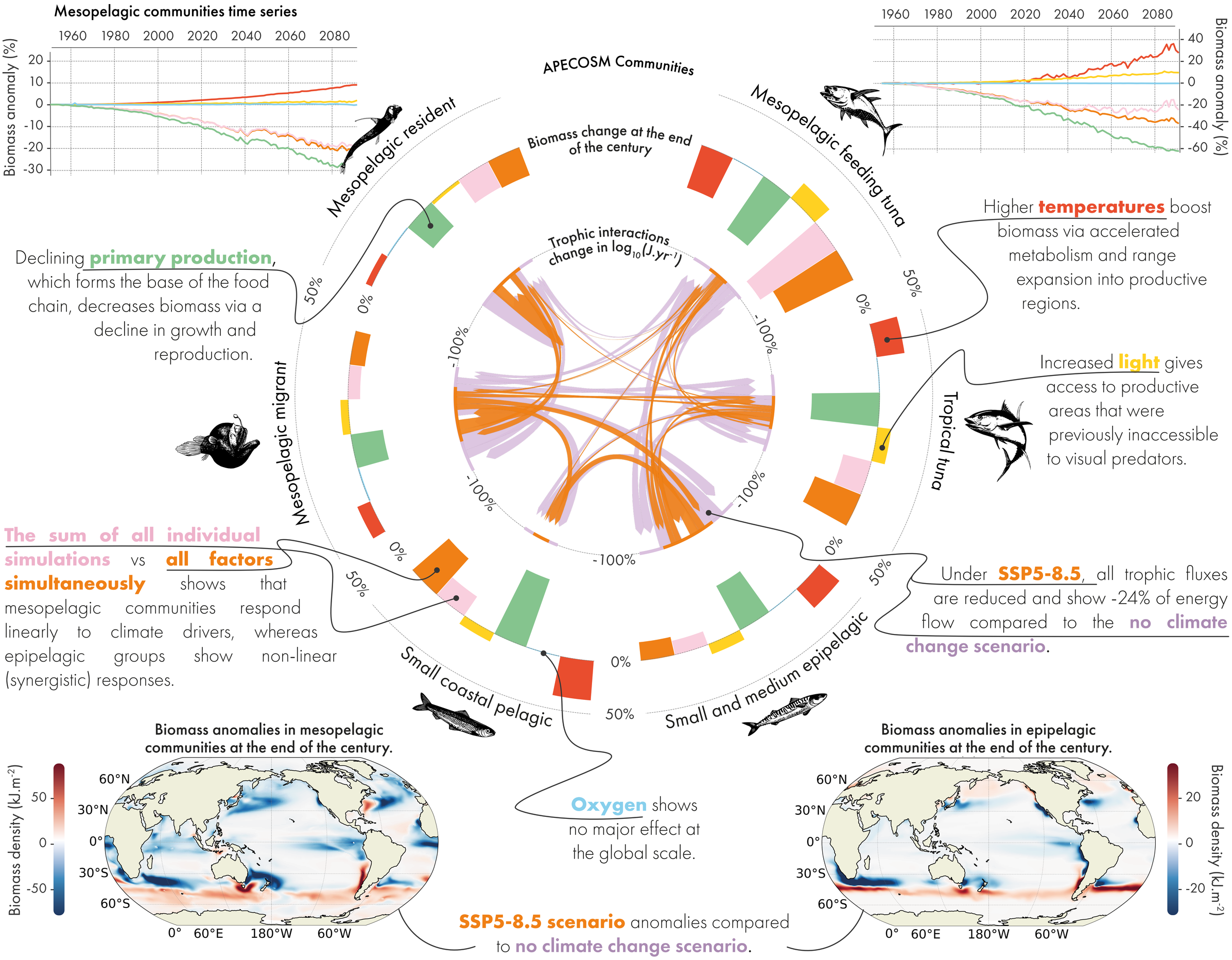
KEY QUESTIONS

- How will climate change rehape pelagic ecosystems?
- What are the respective roles of the different climate drivers affecting pelagic biomass and their interactions?
- How will climate change affect the structure of ecosystems and their trophic functions?

## Methods

- We use APECOSM, a model that simulates high trophic level pelagic communities from 0 to1,000 m (Dalaut et al., 2025).
- We compare a control simulation without climate change with an SSP5-8.5 simulation in which all drivers are varied simultaneously, as well as simulations in which only one driver is varied at a time.
- We assess the changes of global biomasses, spatial distributions, and trophic functions.

## Results




## Discussion

- **Primary production is the main driver** of biomass decrease by limiting the food base of the entire food web.
- **Warming effect** is complex and varies in direction and magnitude, impacting communities and regions in different ways.
- We are currently investigating the **processes underlying the synergistic interaction** highlighted for epipelagic communities.
- Our mechanistic analysis opens the **way for an improved understanding** of pelagic ecosystem responses to climate change.

**Reference :** Dalaut et al., Which processes structure global pelagic ecosystems and control their trophic functioning? Insights from the mechanistic model APECOSM,Progress in Oceanography, 2025, https://doi.org/10.1016/j.pocean.2025.103480.

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