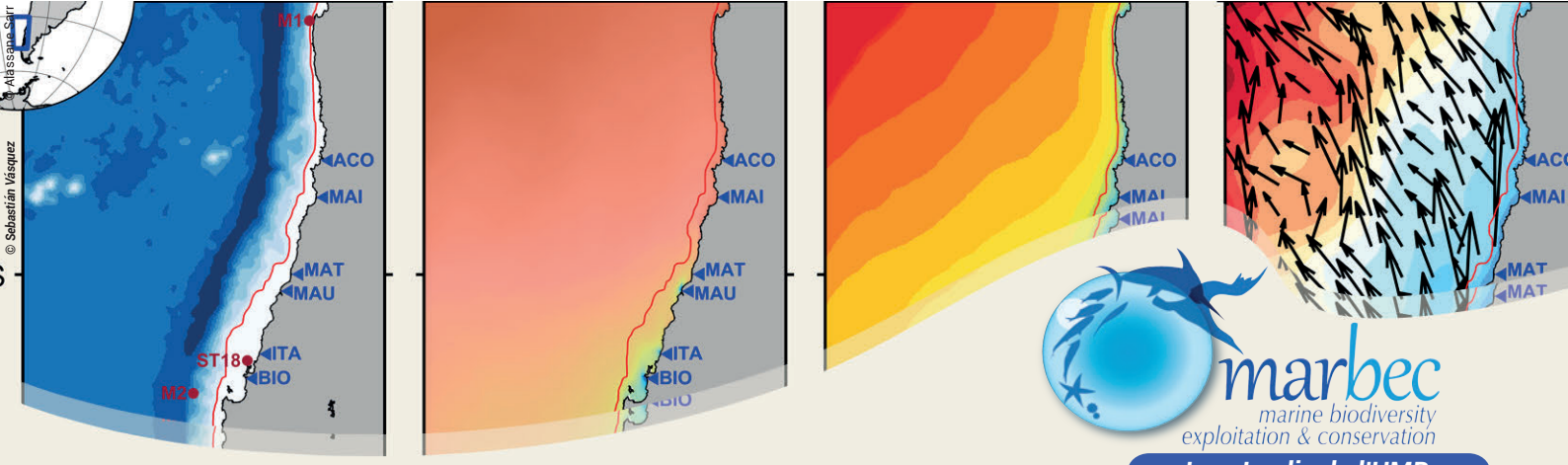

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Les Jeudis de l'UMR

JEUDI 13 FÉVRIER 2025 / 11h30 **Sebastián VÁSQUEZ**, Chercheur Université de Concepción, Concepción Chili

Modelling the population responses of the anchovy (*Engraulis ringens*) to environmental variability in the southern Humboldt ecosystem from an Individual-Based Approach

Small pelagic fish, such as sardines and anchovies (or anchovetas, anchoitas), dominate marine fish biomass in eastern boundary upwelling systems, playing a key role in energy transfer to upper trophic levels and supporting important fisheries. The population characteristics of these species—such as abundance, size composition, and spatial distribution—evolve rapidly in response to climate-driven changes in bottom-up forcing. In central-southern Chile, the anchovy (*Engraulis ringens*) inhabits a river-influenced seasonal upwelling system, exhibiting biomass fluctuations linked to interannual recruitment variability.

Although previous studies have explored the environmental drivers of anchovy recruitment in southern Humboldt ecosystem, key knowledge gaps remain regarding the underlying mechanisms, including: i) the relationship between interannual recruitment variability and environmentally driven coastal retention of early stages; ii) the influence of spatiotemporal heterogeneity in temperature and food availability on individual growth and subsequent recruitment; and iii) the effects of environmental variability on adult anchovy behavior and its impact on spatial population structure.

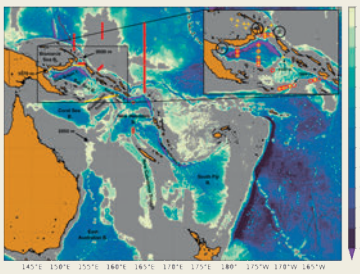
This study addresses these questions using an individual-based modeling approach. First, we describe the implementation and validation of a high-resolution 3D coastal circulation model for the central-southern Chilean coastal zone. Then, we present results from biophysical simulations using Ichthyop, which investigate the primary factors driving interannual variability in egg and larval dispersal and survival, with an emphasis on variability associated with the El Niño-Southern Oscillation (ENSO) from 1994 to 2023. Simulation results highlight the importance of the southern anchovy spawning zone (38°–40°S), where lower wind stress, a broader continental shelf, and freshwater discharge from rivers enhance coastal retention and limit offshore advection. We demonstrate that larval dispersal pathways vary significantly between years, closely following ENSO-driven changes in wind-driven transport. During El Niño events, larval survival probability increases due to reduced offshore transport, associated with a shorter and weaker upwelling season. Conversely, during La Niña, larval survival probability decreases due to stronger alongshore winds and intensified offshore transport, linked to a longer and more intense upwelling season. We discuss the ENSO modulation of offshore transport in central-southern Chile and its implications for anchovy recruitment.

Furthermore, we examine the synergistic effects of temperature and food availability in the context of regional biogeochemical model implementation and the integration of Dynamic Energy Budget (DEB) theory into the existing biophysical modeling framework (Ichthyop-DEB). Finally, we outline the development of a full life-cycle model for anchovy in the southern Humboldt system, highlighting its implications for understanding the species' spatial dynamics and improving fishery assessments.

> accès zoom

https://umontpellier-fr.zoom.us/j/96426860643
ID de réunion : 964 2686 0643

> prochainement



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Jeudi 27 février 2025 à 11h30 : Alexandre Ganachaud, IRD, LEGOS
« Transdisciplinarité et océanographie en Océanie »

@ contacts

elisa.sniecinski@ifremer.fr
emy.cottrant@ifremer.fr
frederic.bertucci@ird.fr
hugues.rosselle@ifremer.fr
johann.mourier@umontpellier.fr
melina.grouazel@ifremer.fr
paul.tixier@ird.fr
samuel.dijoux@ifremer.fr
sarah.nahon@inrae.fr
youssef.yacine@ifremer.fr

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