ICES CM 2019/J:129

ICES Annual Science Conference (ASC) 2019

Factors controlling toxic microalgae in open marine waters:

challenges for pioneering offshore bivalve aquaculture in the Basque Country (southeastern Bay of Biscay)

Marta Revilla[1], José A. Fernandes[1], Luis Ferrer[1], Almudena Fontán[1], Aitor Laza-Martínez[2], J. Germán Rodríguez[1], Yolanda Sagarminaga[1] & Oihana Solaun[1]

[1]AZTI, Marine Research Division

[2]University of the Basque Country, Plant Biology and Ecology Department

mrevilla@azti.es

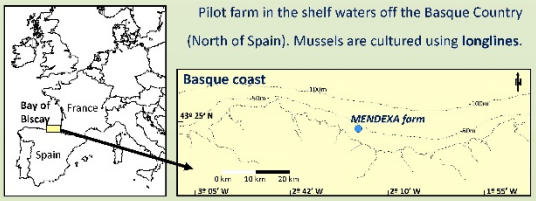
INTRODUCTION

Marine phytoplankton, as primary producers, contribute to the sustenance of bivalve aquaculture. However, some species can synthetize **potent toxins**, which are ingested by filter-feeding organisms and pose a threat to human health.

Aquaculture has traditionally developed in coastal embayments and there, the responses of toxic phytoplankton species to the environment have been thoroughly studied. However, less is known about the dynamics of these species in **open marine waters**, where their variability can be highly influenced by **oceanic and meteorological processes**.

Our research tries to understand how **physical dispersal** and **bottom-up factors** (e.g., nutrients and light availability) control toxic microalgae, with the final aim of predicting toxic events in new bivalve-farms that are being settled offshore.

STUDY AREA

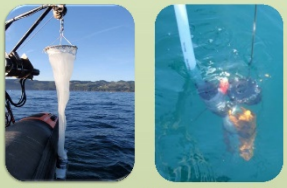


Pilot farm in the shelf waters off the Basque Country (North of Spain). Mussels are cultured using **longlines**.

MONITORING: Methodology and Findings

About 80 campaigns conducted since 2014 at the pilot farm ("Mendexa"):

Hydrography: CTD for vertical profiles (salinity, temperature, oxygen, etc.), Niskin bottle for water samples (nutrients), and Secchi disc.



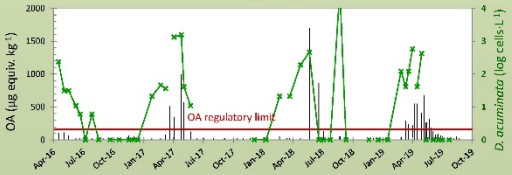
Phytoplankton sampling: net (20 µm opening size) and hose (Lindahl method).

Analyses of the **regulated toxins (EU)** in **mussel flesh**: domoic acid, saxitoxin and derivatives (STXs), okadaic acid (OA), dinophysistoxins, pectenotoxins, azaspiracids and yessotoxins.

Closure events and potential producer species:

STXs (Paralytic Shellfish Poisoning toxins) > the regulatory limit in autumn 2018.

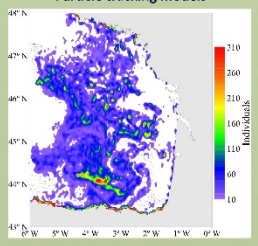
OA (Diarrheic Shellfish Poisoning toxin) > the regulatory limit in every spring during the peaks of *Dinophysis acuminata*.



CURRENT RESEARCH

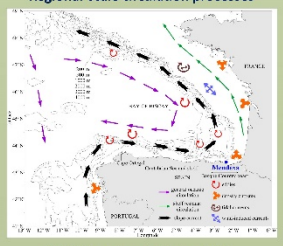
Data on phytoplankton abundance, toxin concentrations, satellite-derived chlorophyll "a", meteorological (e.g., wind, rainfall, solar radiation), physical and chemical variables.

Particle tracking models



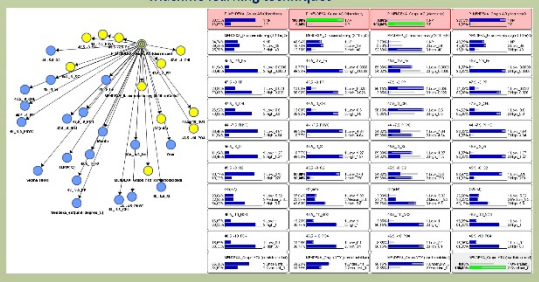
SOFT (Sediment, Oil spill and Fish Tracking model) applied to track the dispersal of phytoplankton.

Regional-scale circulation processes



Modified from Ferrer & Caballero (2011) J. Mar. Syst. 87: 133-144.

Machine learning techniques



Funding

This research was supported by the Basque Government through several projects (OSTREA, LIKUMU, SIMMA, MUSSELS and MALOTSI and by the European Union through the project PRIMROSE (INTERREG Atlantic Area Programme, grant agreement no. LAPA_182/2016).

Factors controlling toxic microalgae in open marine waters: challenges for pioneering offshore bivalve aquaculture in the Basque Country (southeastern Bay of Biscay)

Authors: M. Revilla [1], J. A. Fernandes [1], L. Ferrer [1], A. Fontán [1], A. Laza-Martínez [2], J. G. Rodríguez [1], Y. Sagarminaga [1], O. Solaun [1]

Abstract

Marine phytoplankton, as primary producers, contribute to the sustenance of bivalve aquaculture. However, some phytoplankton species can synthetize potent toxins, which are ingested by filter-feeding organisms and pose a threat to human health. In temperate areas, phytoplankton abundance and composition show large spatio-temporal fluctuations that involve seasonal cycles, species succession and sporadic blooms. This variability is controlled by both top-down factors (e.g., grazing) and bottom-up factors (e.g., nutrients and light availability), being all of them ultimately driven by oceanic and meteorological processes and anthropogenic influence. It is known that the responses to the environment differ among toxic phytoplankton taxa, even within the same genus. However, the ecology of toxic phytoplankton species has been little studied in open marine waters compared to coastal embayments where aquaculture has been traditionally developed. Here we address how physical dispersal and bottom-up factors control toxic microalgae in shelf waters off the Basque Country (southeastern Bay of Biscay), with the final aim of predicting toxic events. In these waters, a recent development of bivalve aquaculture has led to monitor phytoplankton, toxins and hydrographic variables since 2014. Our results show that a broad array of toxins can affect mussels growing on longlines offshore. Associations between toxins and potential producer species are studied, such as paralytic shellfish poisoning toxins and the dinoflagellate *Alexandrium ostenfeldii*. In order to assess the influence of both local and regional processes, meteorological and hydrographic variables together with satellite chlorophyll “a” data are used. Also, particle tracking models and machine learning techniques are considered.

Keywords:
aquaculture, offshore, shellfish, phytoplankton, toxins

Contact author:
Marta Revilla. AZTI, Marine Research Division, Herrera Kaia - Portualdea z/g. E-20110 Pasaia – GIPUZKOA (Spain). mrevilla@azti.es

[1] AZTI, Marine Research Division, Pasaia, Spain

[2] University of the Basque Country, Plant Biology and Ecology Department, Leioa, Spain