

Advances in the early warning of species causing Diarrhetic Shellfish Poisoning: *D. acuminata* modelling

Authors: A. Silva, A. Sobrinho-Gonçalves, T. Rosa, B. Mota

Abstract

The dinoflagellate genus *Dinophysis* is a major problem for the shellfish industry worldwide as a producer of diarrhetic shellfish toxins which blooms are triggered by multiple correlated variables. A monitoring programme must be able to identify *Dinophysis* bloom formation and its environmental drivers, to anticipate a risk and timely communicate the information. We propose fitting a model of *D. acuminata* distribution, with high predictive quality, as a tool for early warning and for data-base decision making. The goal is to reduce the economic impact/losses for the industry by timely promoting mitigating actions and preventing long harvest bans. This study uses a 11-year time series (2008-2018) of *Dinophysis acuminata* and environmental variables from the Atlantic coast of Portugal (W Iberia). The in situ concentration of cells were obtained weekly (25 sampling stations) in the context of the National Monitoring Program of Shellfish Molluscs, held by IPMA. The geo-physical variables (27) were obtained from multiple sources -Meteorological stations, Earth Observing satellites and atmospheric re-analysis- and different temporal composites were evaluated to determine which environmental variable are most associated with *Dinophysis* concentrations. Six variables were identified as predictors (SST, upwelling, mix layer depth, PAR, wave height and precipitation). Based on the AIC, a Poisson Generalized Linear Mixed Model provided the best fit, with 95% confidence in modelling and predicting *D. acuminata* proliferations when a set of conditions are gathered, before warning reference levels are reached (200 cells/L-1). The analysis was performed in R (R Foundation for Statistical Computing) and algorithms will be available.

Keywords:

Dinophysis, GLMM, early-warning, HABs, upwelling systems

Contact author:

Alexandra D. Silva, IPMA, I.P – Instituto Português do Mar e da Atmosfera,
amsilva@ipma.pt