



CLIMATIC EVENTS CONTROL THE INVASIVE DINOFLAGELLATE *Ceratium furcoides* IN SOUTHERN BRAZIL

Ruan Dutra da Silva¹, Luciane Oliveira Crossetti², Luana Moraes da Rosa¹, Luciana de Souza Cardoso³, Lucia Ribeiro Rodrigues¹

¹ Programa de Pós-Graduação em Recursos Hídricos e Saneamento Ambiental da Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Rio Grande do Sul, Brasil

² Programa de Pós-Graduação em Ecologia da Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Rio Grande do Sul, Brasil

³ Programa de Pós-Graduação em Botânica da Universidade Federal do Rio Grande do Sul (UFRGS), Porto Alegre, Rio Grande do Sul, Brasil

E-mail: ruan.dsilva@yahoo.com.br

Abstract:

Climate change acts as a major catalyst for biological invasions, altering ecosystems and enabling highly adaptable invasive species to expand into new areas. *Ceratium furcoides*, a dinoflagellate, exhibits invasive behavior in South American aquatic ecosystems and benefits from climate shifts, blooming and dispersing in response to changes in climate conditions. This study monitored 151 southern Brazilian municipalities between 2012 and 2022 to understand how *C. furcoides* behaves during different climatic events. Environmental data were obtained from INMET (Instituto Nacional de Meteorologia) and TerraClimate, while physical and chemical data and *C. furcoides* abundance data were provided by CORSAN (Companhia Riograndense de Saneamento). The datasets were grouped according to specific climatic events (La Niña, El Niño, Neutral) as defined by NOAA (National Oceanic and Atmospheric Administration). Principal component analysis (PCA), environmental principal component analysis (PCA-env) and descriptive analysis were performed to describe the different climate events, and random forest models (RF) were used to evaluate the changing importance of the predictors in different years and climate events. The results emphasized the importance of organic matter and temperature for species development in most years and events. Besides these variables, the species was related to vapor pressure (VAP), solar radiation and the Palmer drought index in La Niña, alkalinity and dissolved oxygen in El Niño, and nitrite, total phosphorus and wind speed in neutral events. Additionally, PCA analysis showed clear segregation between the climatic events, while PCA-env revealed that *C. furcoides* tended to follow extreme climate conditions. This is consistent with the descriptive analysis, which showed higher abundances in these instances. These findings corroborate previous studies, reinforcing the importance of mixotrophy and temperature to species development and highlighting that climatic events influence *C. furcoides*' behavior.

Palavras-chave: *Biological invasions; ENSO; climate change*