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EMILIANIA HUXLEYI BLOOM IN WINTER PERIOD IN THE DARDANELLES, TURKEY

Muhammet Türkoglu [1]*
[1] Yes - mturkoglu@comu.edu.tr

Abstract

Following a strong summer bloom of *Emiliania huxleyi* (Lohmann) Hay & Mohler, 1967 in June and July 2003, a winter bloom was observed for the first time between late December 2003 and early January 2004 in the Dardanelles and the results were appreciated along with hydrography. *E. huxleyi* was the dominant species and represented about 90.0% of the phytoplankton assemblage. The bloom started flourishing after the diatom and dinoflagellate blooms under nitrogen depleted and moderate light, temperature and salinity conditions.

Keywords: Dardanelles, Blooms, Coccolithophores, Hydrography

The Dardanelles is a part of the Turkish Strait System and located between the Aegean Sea and the Sea of Marmara and has two flow system reverse to one another [1]. The data in this study is a part of the data collected during cruises in the period of January 2002 and January 2004, in the framework of a National project of TUBITAK, Turkey [1]. CTD parameters, nutrient and chlorophyll-a were also measured by using YSI 6600 MPS, Autoanalizor and spectrophotometer, respectively [2]. Except for the polar ones, *E. huxleyi* is one of the most abundant coccolithophores occurring globally in the oceans in early summer periods. In summer, high surface irradiance, shallow stratification with a mixed layer depth of about 10-20 m, anomalies in salinity and temperature, low phosphate and silicate concentrations compose favorable conditions for *E. huxleyi* bloom in the marine systems [3]. However, following a strong summer bloom of coccolithophore in June and July 2003 [3], a winter bloom was observed for the first time between late December 2003 and early January 2004 in the Dardanelles (Fig. 1).

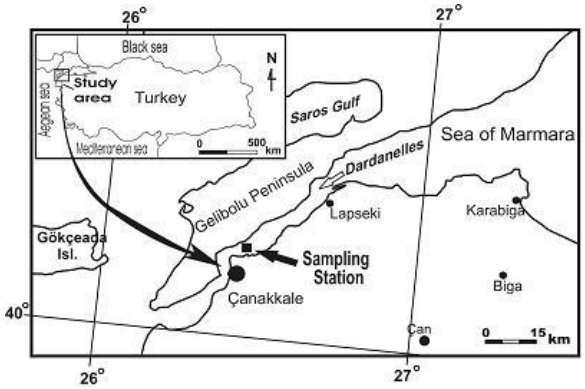


Fig. 1. Map of the Dardanelles and sampling station

While *E. huxleyi* revealed small population density (1.60 x 10^4 cells L^{-1}) in early December 2003, the bloom started in middle December 2003 (7.86 x 10^6 cells L^{-1}) and then peaked in early January 2004 (5.03 x 10^7 cells L^{-1}) in the superficial layer. The peak dramatically decreased in late January 2004 (7.50 x 10^6 cells L^{-1}) (Fig. 2A). *E. huxleyi* was the dominant species and represented about 90.0% of the phytoplankton assemblage. The bloom started flourishing after the diatom and dinoflagellate blooms (Figs. 2B, C) under nitrogen depleted and moderate light, temperature and salinity conditions. Water temperature (10.31±1.14 ^oC) and salinity values (27.05±0.88 ppt) were usually stabile. Surface chlorophyll-a concentrations ranged from 1.23 to 2.32 µg L^{-1} (1.94±0.43 µg L^{-1}) during the bloom (Fig. 2E). Vertical profiles of inorganic nutrients showed that the concentrations in the upper layer were lower (0.26±0.14 µM for NO^-_2+NO^-_3, 0.06±0.01 µM for PO^{-3}_4 and 2.51±1.16 µM for SiO_4 than those in the lower layer (0.42±0.24 µM for NO^-_2+NO^-_3, 0.07±0.02 µM for PO^{-3}_4 and 2.80±0.84 µM for SiO_4) due to *E. huxleyi* blooms in the surface waters during the winter bloom conditions. Although SiO_4 concentration was calculated as mean value of 2.80±0.84 µM, the surface concentration was lower than 2.00 µM in the first period of the *E. huxleyi* bloom, due to its excessive utilization by diatoms just before the *E. huxleyi* bloom (Figs. 2A, C). Ratios of N:P (min-max: 2.00-7.33; mean:4.12±2.12,) Si:N (min-max: 3.08-17.33; mean: 9.79±4.32) and Si:P (min-max: 24.00-58.50; mean: 40.35±16.25) of the bloom period were lower than those of the non bloom periods. The strong bloom potential of *E.huxleyi* in winter period in addition to the summer period [3] has revealed that the Dardanelles is under the hyper-eutrophication due to the fact that it is a part of the Turkish Strait System affected by the Black Sea.

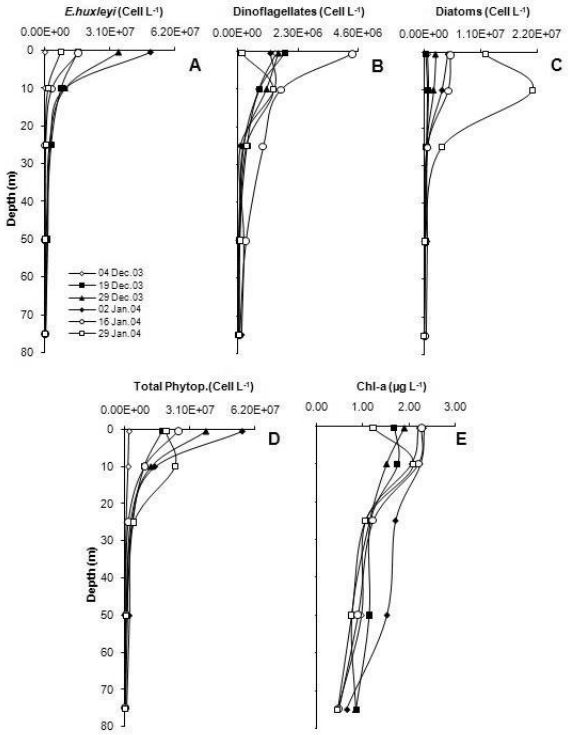


Fig. 2. The vertical profiles of E. huxleyi (A), dinoflagellates (B), diatoms (C), total phytoplankton (D), and chlorophyll-a (E) in winter in the Dardanelles

Acknowledgements : This study is funded by TUBITAK Project # 101Y081. This study has also been accepted as more detailed research article in "Hydrology Research (Formerly Nordic Hydrology)". Please look at the journal for more detailed information and discussion.

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