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DAILY VARIATIONS OF SUMMER PHYTOPLANKTON IN THE DARDANELLES

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Abstract

Average temperature, salinity, pH, DO, TDS, TSS, $NO^{-}{}_{2}$+$NO^{-}{}_{3}$, $PO^{-3}{}_{4}$, $SiO_4$and chlorophyll-a were found to be 25.0 °C, 23.3 ppt, 8.42, 9.26 mg $L^{-}1$, 23.9 g L^{-1}, 36.1 mg L^{-1}, 1.90 μM, 0.24 μM,3.61 μM and 1.70 μg L^{-1}, respectively. Average N:P and S:P rates were calculated as values of 12.5 and 25.0, respectively. Total phytoplankton density and bio-volume varied between $2.86x10^5$-$1.5x10^7$ cell L^{-1} and $5.98x10^8$-$8.81x10^{10}$ $\mu m^3 L^{-1}$, respectively.

Keywords : Dardanelles, Phytoplankton, Eutrophication, Hydrography.

The Dardanelles is located between the Aegean Sea and the Sea of Marmara and has a 50 m mean depth. This study was carried out to determine the diurnal distributions of phytoplankton density, bio-volume and chlorophyll-a in relation to nutrients and CTD in surface waters of the Dardanelles (Fig. 1) in the summer period of 03 July 2002 and 04 August 2002. It was collected 99 surface (0.5m) samples for nutrient, chlorophyll-a and phytoplankton.

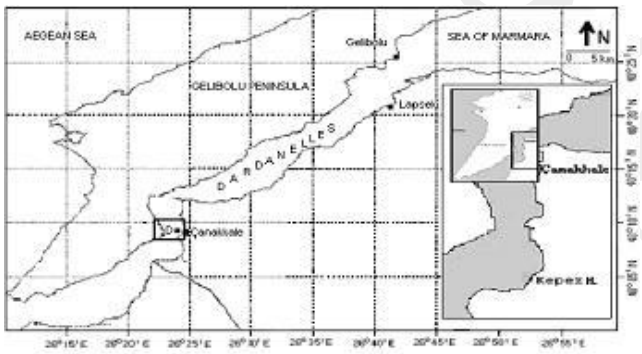


Fig. 1. Dardanelles and sampling station (D)

CTD parameters, nutrient and chlorophyll-a were measured by using YSI 556 MPS, Technicon Model Two Channel Autoanalizor and Jasco V-530 UV/VIS spectrophotometer, respectively [1]. For enumeration of the phytoplankton species, Uterhmöhl Sedimentation Chambers, Neubauer and Sedgwick-Rafter counting slides were used in combination according to the dimensions of the organisms. The phytoplankton was identified under phase-contrast microscopy to the taxonomic level of species.

Temperature, salinity, pH, DO, TDS, TSS, $NO^{-}{}_{2}$+$NO^{-}{}_{3}$, $PO^{-3}{}_{4}$, $SiO_4$and chlorophyll-a were varied between 22.5-26.5 (mean 25.0, SD 0.97 °C), 22.7-23.7 ppt (mean 23.3, SD 0.23 ppt), 8.31-8.49 (mean 8.42, SD 0.04), 8.46-10.1 mg L^{-1} (mean 9.26, SD 0.48 mg L^{-1}), 23.4-24.3 g L^{-1} (23.9; SD 0.21 g L^{-1}), 16.8-76.0 mg L^{-1}(36.1; SD 10.7 mg L^{-1}), 0.04-11.8 μM (mean 1.90; SD 2.15 μM), 0.02-0.97 μM (mean 0.24; SD 0.20 μM),0.64-8.50 μM (mean 3.61; SD 2.15 μM) and 0.21-5.62 μg L^{-1}(mean 1.70; SD 0.76 μM), respectively. N:P and S:P rates were also varied between 0.44-142.8 (mean 12.5, SD 19.5) and mean 3.82-125.5 (25.0, SD 22.3), respectively. Diurnal variations of bio-physicochemical parameters in time interval between 08:00 and 19:00 were generally much higher than daily variations in period of 03 July and 04 August due to two counter flows system and domestic inputs of Çanakkale city.

On the other hand, the negative correlation between SiO_4 and diatom cell density (r=-0.295) was more significant than between SiO_4 and diatom bio-volume (r=-0.134). These correlations showed that utilization of $SiO_4$by diatoms was more connected with diatom cell density than with diatom cell volume. This study showed that the relationship between chlorophyll-a and Bacillariophyceae (r=0.570) was more important than the relationship between chlorophyll-a and Dinophyceae (r=0.176) and between chlorophyll-a and other taxonomic groups (r=-0.145). These relationships between chlorophyll-a and major taxonomic groups of phytoplankton showed that chlorophyll-a was highly controlled by Bacillariophyceae species than those of Dinophyceae and other taxonomic groups. In fact, very important relationship between Bacillariophyceae and total phytoplankton (r=0.702) also accurate important contribution of Bacillariophyceae to total phytoplankton.

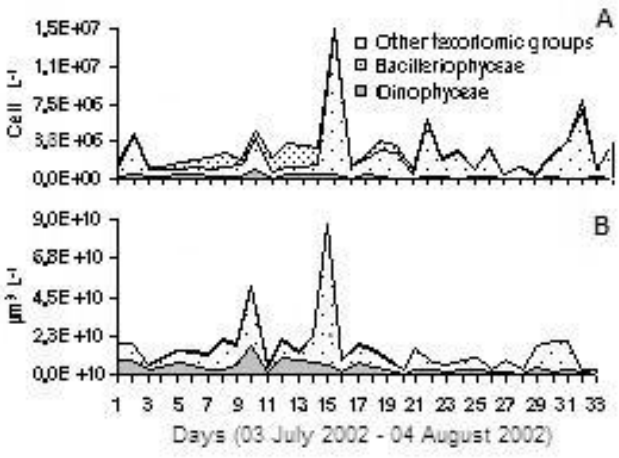


Fig. 2. Daily variations in density (A) and bio-volume (B) of different phytoplankton groups in the Dardanelles in the period of 03 July 2002 and 04 August 2002

Total phytoplankton density and bio-volume varied between $2.86x10^5$-$1.5x10^7$ cell L^{-1} and $5.98x10^8$-$8.81x10^{10}$ $\mu m^3 L^{-1}$, respectively (Fig. 2). Due to Black Sea surface waters, rational contribution of Bacillariophyceae (66.5%) to total phytoplankton bio-volume was higher than contribution of Dinophyceae (31.0%). It has been showed that there are 8-10 population growth slopes by different species such as dinoflagellates *Prorocentrum compressum* (Bailey) Abé and *Prorocentrum micans* Ehrenberg , diatoms *Pseudonitzschia pungens* (Grunow *ex.* P.T. Cleve) Hasle, *Pseudosolenia calcar-avis* Schultze, *Rhizosolenia fragilissima* Bergon and a globally significant coccolitophore *Emiliania huxleyi* (Lohmann) Hay & Möller at different times and different densities in the Dardanelles. These species were also responsible for algal blooms in different times during the sampling period. In view of both cell density and bio-volume, although diatoms (Bacillariophyceae) showed some algal blooms in summer period, dinoflagellates (Dinophyceae) showed more regular and stabile fluctuations in the summer sampling period especially in bio-volume profile (Fig. 2). Phytoplankton community structure was observed to be controlled by these species in the summer period in the Dardanelles as shown like in the Black Sea ecosystems.

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