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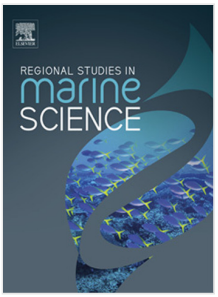


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# Effects of Organic Pollution on Environmental Conditions and the Phytoplankton Community in the Central Lebanese Coastal Waters with Special Attention to Toxic Algae

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**Abstract**

Organic pollution is a major global environmental issue for coastal ecosystems. In order to assess the effects of this pollution, environmental parameters and phytoplankton community were monitored during a two-year period (from April 2010 till March 2012) in the central coast of Lebanon in the Levantine Sub-basin. Data were collected for temperature, salinity, nutrients, chlorophyll-*a* and phytoplankton community. Temperature followed its normal seasonal and annual cycles, usually noted in the Lebanese coastal waters, whereas salinity varied spatially and temporally presenting sometimes low values due to continental inputs (19.07 - 39.6). Significant fluctuations of nutrients ($N\text{-}NO_2$= 0.004-4.28 $\mu ML^{-1}$ ; $N\text{-}NO_3$= 0.25-39.15 $\mu ML^{-1}$ ; $P\text{-}PO_4$= 0.014-5.77 $\mu ML^{-1}$), Chl-*a* concentrations (0.03-8.9 $mg/m^3$) and density of total phytoplanktonic cells (40 383-22.$10^6$ cells/L) were observed between the sites and through the years ($P < 0.05$). Environmental conditions were largely influenced by continental inputs. A perturbation of the natural phytoplanktonic succession and an occurrence of toxic or potentially harmful algae were noticed in the polluted sites, reflecting the influence of wastewater effluents on the coastal seawater equilibrium and thus on the Lebanese marine biodiversity. The overall study provides a good outline on the prevailing condition of few coastal areas which could facilitate the management of their pollution sources.

**Keywords**: Organic pollution, phytoplankton community, toxic algae, coastal water quality, Lebanon, Mediterranean Sea.

## 1. Introduction

Lebanon, like many Mediterranean countries, witnesses an increasing rate of population growth with more than 5.85 million residents in 2015 (World Bank, 2016 ; UNdata, 2016 ; World Factbook, 2016). Around 70% of the Lebanese population lives on the narrow coastline that hosts an increasing rate of urbanization [an estimated annual rate of around 3.18% between 2010 and 2015 in the entire country (World Factbook, 2016)], industries, businesses, touristic projects and other activities causing environmental pressures and quality deterioration of the coastal lands and waters. Moreover, Lebanon's coast receives nearly 65% of the total sewage via at least 53 major sewage outfalls spread along the Lebanese coastline (CDR/LACECO, 2000 ;