J. Mater. Environ. Sci. 2 (S1) (2011) 560-663 *Elghrib et al.*
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Influence of Mesologic Parameters On The Phytoplankton Distribution along of Transects Localized Between Cape Cantin And Dakhla

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Abstract
The marine phytoplankton was studied in january and july 2002 in four transects: 32°30'N, 29°N, 24°30'N and 24°N. Water samples were collected at four depths (surface, 10m, 30m and 50m).The total microalgal density shows that the southern area is more productive than the northern. The maximum of density is recorded at -30m depth in winter and -10m in summer in all transects. The analysis of the spatiotemporal variation of the physicochemical parameters shows an activity of upwelling during summer in whole transects, while in winter no marked gradient of physicochemical parameters was detected, except in Dakhla (24°N), where a cold filament was observed. Generally, the upwelling activity, the presence of filaments and the morphology of the coast determine largely the spatiotemporal variability of phytoplankton in the studied areas.

Key words: *Phytoplankton, Upwelling, Mesologic parameters, Moroccan Atlantic Coast*

Introduction
The marine phytoplankton occupies an essential trophic position in the ecosystems and constitutes, therefore, a major element of its functioning. Any variation of this basic compartment entails modifications of the whole trophic network. The important fluctuations of distribution, composition and abundance of the algal populations are governed by physical, chemical and biological factors characterizing the environment [1]. In fact, the aim of the present work is to establish the spatiotemporal variability of phytoplankton populations in relationship with the physicochemical parameters.

Material and Methods
The phytoplankton sampling was carried out at 15 stations (Figure 1). Water samples are collected from four depths (0, 10, 30 and 50m) by Niskin bottles connected to a CTD. Phytoplankton samples were analyzed according to Utermohl sedimentation method [2]. Account and identification of phytoplankton were performed using an inverted microscope. The results of densities are expressed in number of cells per litter ($cell.l^{-1}$). Temperature and salinity were also recorded simultaneously and concentration of phosphate (PO_4^{3}) was measured using a spectrophotometer.

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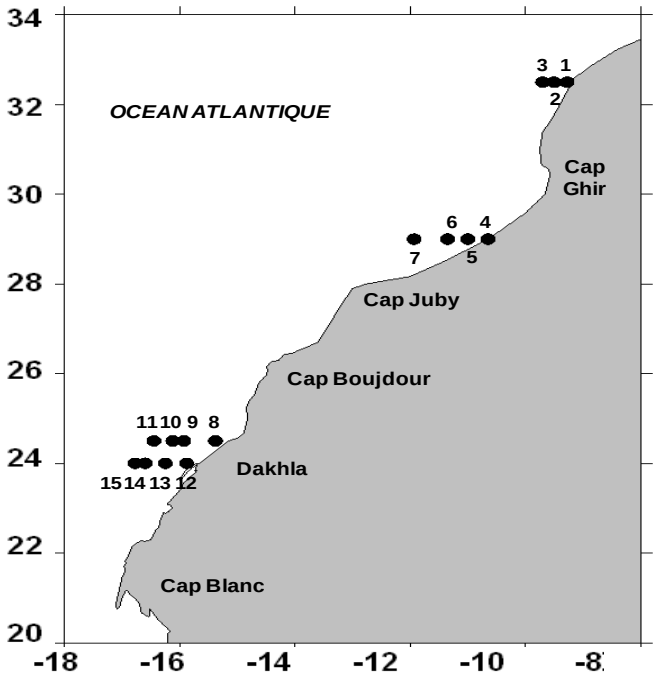
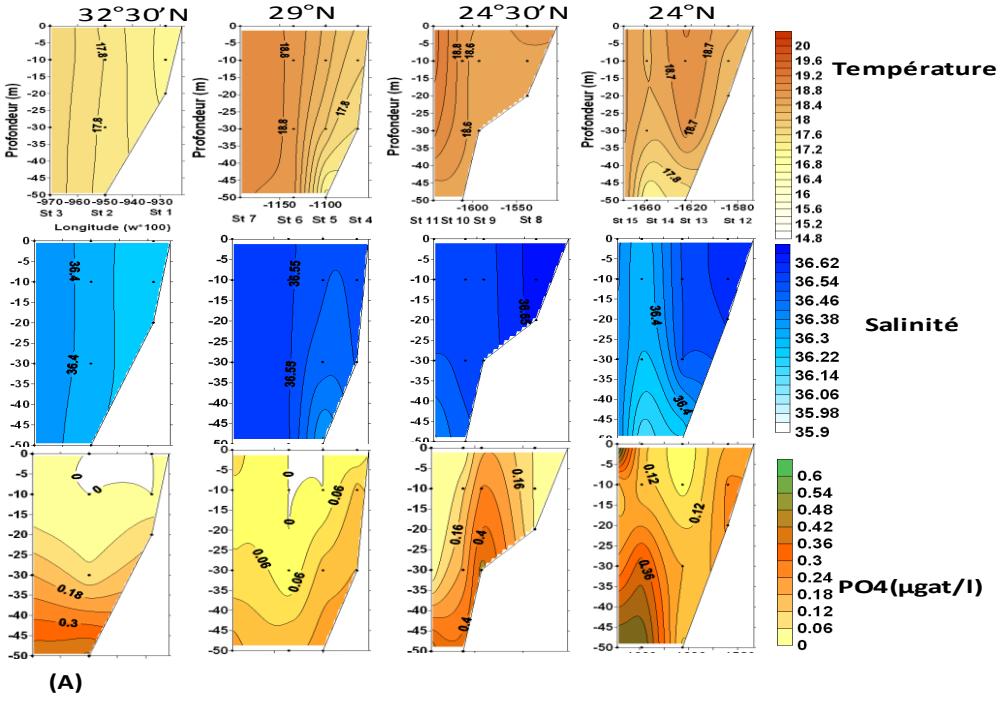


Figure 1: Location of the sampling stations

Results

Distribution Of The Physicochemical Parameters

In summer, strong vertical and horizontal gradients characterized the distribution of temperature, salinity and phosphate concentration along the four transects (Figure 2b). In winter, no marked gradients of the physicochemical parameters were observed. Except at 24°N, where a variation of different parameters was observed between coast and offshore (Figure 2A).



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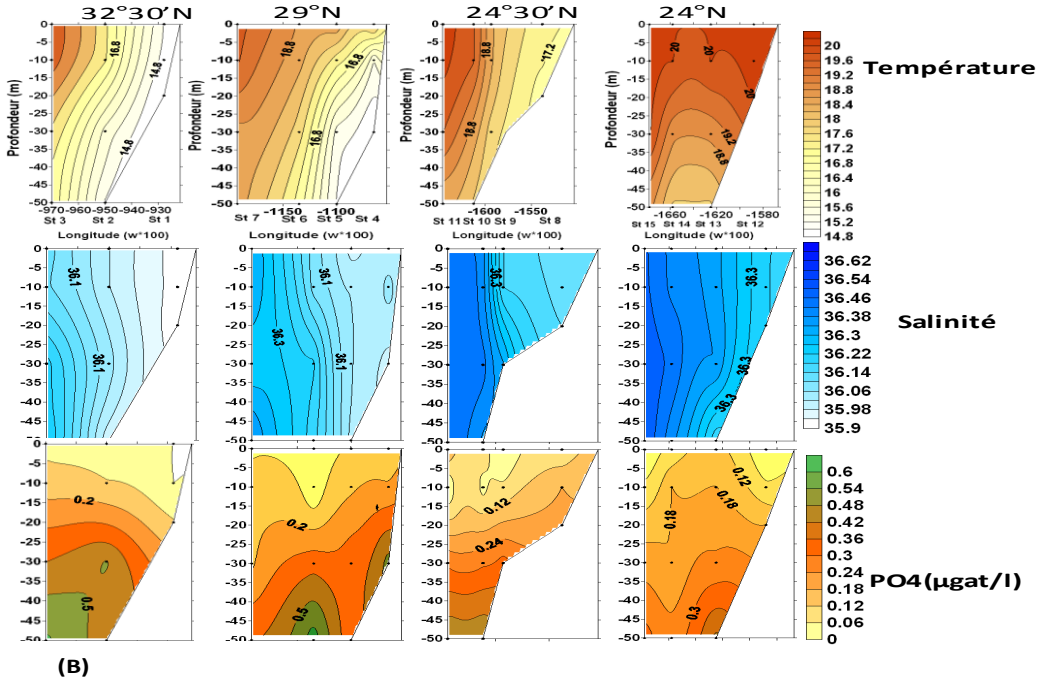

Figure 2: Distribution of the physicochemical parameters: (A) in winter and (B) in summer

Distribution Of Phytoplankton Densities

The spatiotemporal variability of phytoplankton shows the high densities in summer than in winter and in the southern than in the northern transects. In winter, the maximal algal densities are recorded in -30m of depth in all the transects. In the South, the values exceed generally 20000 cell.l-1, with a maximum of 68600 cell.l-1 registered in the open see at 24°N. In the North, the values ranged generally between 700 and 10000 cell.l^{-1}. The highest density is met in the coast at 29°N (68000 cell.l^{-1}) (figure 3a).In summer, the maxima of densities are coastal, noted in -10m at transects 29, 24°30 and 24°N. In the south, the values vary between 900 and 165500 cell.l^{-1}, while in the north, the algal densities do not exceed 43000 cell.l^{-1} The highest density registered at 29°N (254100 cell.l-1) is due to an exceptional proliferation of *Pseudonitzschia delicatissima* (figure 3b).

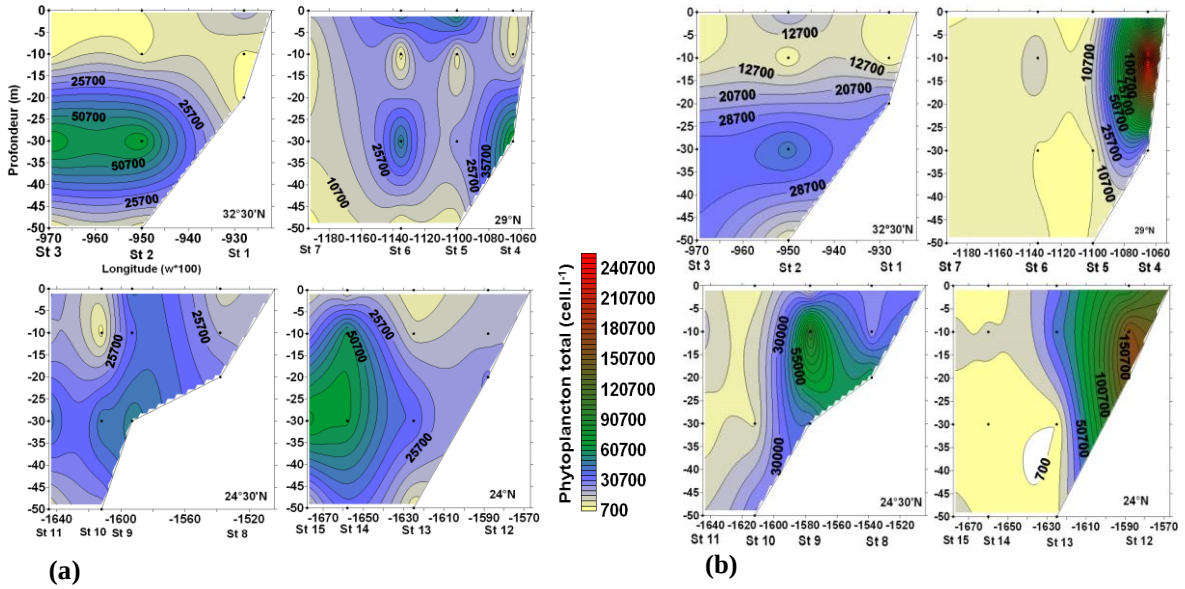

Figure 3: Vertical variability of total phytoplankton density (cell.l^{-1}): (a) in winter and (b) in summer

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Discussion and Conclusion

The total phytoplankton density studied in different transects along the Moroccan Atlantic coast shows that the southern transects were more productive than the northern transects. Indeed, in the South, the maximal densities reached 100125 cell.l-1 and 85275 cell.l-1 respectively in 24°N and in 24°30'N, while in the North, they were 60000 cell.l-1 in 32°30'N and 84650 cell.l-1 in 29°N. This is explained by the quasi-permanent presence of the upwelling activity in the south, while in the north, the upwelling is seasonal and occurs only in summer [3]. The phytoplanktonic density was more important in summer than in winter, due to a high upwelling intensity during the warm season. Furthermore, the maximum algal concentrations are generally registered in the coastal areas during both seasons.

The localization of the maximal algal densities in the sub-superficial waters could be explained by the photoinhibition phenomenon or by the admixture of the water column caused by the upwelling, the phytoplankton is consequently, acclimatized to an illumination more moderate than that of the surface [5]. Also, in some regions, mainly in 29°N, deep waters do not attain the surface, what allows an availability of nutrients in the deeper levels. Therefore, the upwelling activity determines largely the qualitative and quantitative spatiotemporal variability of the algal population of the studied ecosystems. Also, the morphology of the coast and the bathymetry allow to certain regions to be privileged zones of retention, in particular the both transects 29°N and 24°N characterized by the trapping of nutrients favorable to the strong coastal phytoplanctonic proliferations [4].

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