SPATIAL DISTRIBUTION OF THE CILIATE COMMUNITY IN THE GULF OF TUNIS (TUNISIA, EASTERN MEDITERRANEAN SEA)

I. Hannachi [1], Z. Drira [1], W. Guermazi [1]*, J. Elloumi [1], M. Belhassen [2], A. Bouaïn [1], L. Aleya [3] and H. Ayadi [1]

[1] Institut National des Sciences et Technologie de la Mer. 2025 Salammbô Tunis, Tunisie

[2] Université de Franche-Comté, Laboratoire de Chrono-Environnement, UMR CNRS 6249, 1, Place Leclerc, 25030 Besançon cedex, France

[3] Université de Sfax, Faculté des sciences. Département des sciences de la vie, UR05ES05, Biodiversité et Ecosystèmes Aquatiques, Sfax, 3000 , Tunisie - wassim016@yahoo.fr

Abstract

The spatial distribution of ciliates was studied in the Gulf of Tunis (NE Tunisia) in August 2006. 17 species belonging to 3 groups were identified. Spirotrichea was the dominant group in the inner (92%) and the outer (94%) shelf. The ciliate density decreased from the coast (mean ± s.d = 108.33 ± 80.10 cells l^{-1}) to the open sea (mean ± s.d = 56.25 ± 47.87 cells l^{-1}) areas. In terms of a vertical occurrence, the ciliate community showed a decrease from the surface to the bottom.

Keywords: Coastal Waters, Open Sea, Deep Waters, Surface Waters, Plankton

Introduction

Studies on marine protozoans have been carried out in the Mediterranean for many years, and their importance in the trophic organization and community structure of pelagic ecosystems has been emphasized [1]. However, studies addressing the distribution of ciliate assemblages in the Gulf of Tunis (NE Tunisia) are totally missing. Therefore, it seems very interesting to study the protozoa community in this area. The present study gives, for the first time, the structure and the spatial distribution of the ciliate community in the Gulf of Tunis.

Material and methods

Sampling was performed in 4 coast-to-offshore stations during a cruise on board the R/V Hannibal in August 2006. Samples were taken at 3 depths (surface, middle of water column and bottom) for stations <100 m deep and at 5 depths (surface, -10 m, -20 m, thermocline and bottom) for stations >100 m deep. In each station, profiles of temperature, salinity, dissolved oxygen and water density were collected with a CTD: SBE 9 equipped with a 12 Niskin bottle rosette sampler. Samples for nutrients were stored at -20°C before analysis with a BRAN and LUE BBE type 3 analyzer. Sub-samples (1L) for ciliates were fixed with acid Lugol solution (2% final concentration) and stored in the dark at low temperature (4°C) until analysis. The different species were quantified with an inverted microscope using 20 ml Utermöhl chambers. The entire surface of the chamber was examined at 40 x magnification.

Results and discussions

Water column profiles showing the range of physico-chemical in the different stations of the two gulfs are summarized in Table 1. During this study, a strong thermocline was detected at the mean depth of 30 m. No significant difference ($P>0.05$) was detected between the coast and the open sea area, in terms of physico-chemical parameters (Table 1).

Tab. 1. Min, max and Mean ± S.D. of physico-chemical parameters in the Gulf of Tunis

	Min	Max	Mean ± s.d
Physical parameters			
Temperature (°C)	13.58	27.34	18.19 ± 5.16
Salinity (p.s.u)	37.17	38.68	37.77 ± 0.44
Sigma-t (Kg m^{-3})	24.46	29.06	27.24 ± 1.63
Dissolved oxygen (mg l^{-1})	4.48	5.74	5.29 ± 0.47
Chemical parameters			
$N\text{-}NO_3^-$ (µmol l^{-1})	0.1	1.21	0.66 ± 0.35
$N\text{-}NO_2^-$ (µmol l^{-1})	0.02	0.63	0.25 ± 0.15
$N\text{-}NH_4^+$ (µmol l^{-1})	0.04	0.99	0.45 ± 0.36
$Si(OH)_4$ (µmol l^{-1})	0.02	1.23	0.32 ± 0.4
$P\text{-}PO_4^{3-}$ (µmol l^{-1})	0.01	0.87	0.28 ± 0.24
T-N (µmol l^{-1})	5.61	10.56	7.18 ± 1.16
T-P (µmol l^{-1})	0.32	1.95	1.02 ± 0.33
N/P ratio	0.92	84.29	14.63 ± 20.98

The N/P ratio (mean ± s.d = 14.63 ± 20.98) was lower than the Redfield ratio (16) suggesting a potential N limitation. During this summer study, 17 different species belonging to 3 groups: Spirotrichea, Oligohymenophorea and Colpodea were identified. In the coastal and the open sea stations, Spirotrichea dominated the ciliate community with 92% and 94%, respectively. In fact, this group was the most abundant in the Gulf of Gabes [1]. Although tintinnids were characterized by a small contribution to the ciliates community [2], in this present study, they contributed 40% of the total ciliates. Among this class, Choreotrichia contributed 80%. The loricates ciliates constitute an important group in the Choreotrichia (91%) and in the total of the ciliates community (40%). The protozoa community marked a decrease from the inshore (mean ± s.d = 108.3 ± 80.1 cells l^{-1}) to the offshore (56.2 ± 47.9 cells l^{-1}). In terms of the vertical distribution, ciliate density showed a maximum in the middle of the water column (150 ± 141.42 cells l^{-1}). However, in stations where the bottom was above 100m, ciliate density showed a decrease from the upper (125 ± 35.35 cells l^{-1}) to the deeper (75 ± 106.1 cells l^{-1}) layer (Fig. 1).

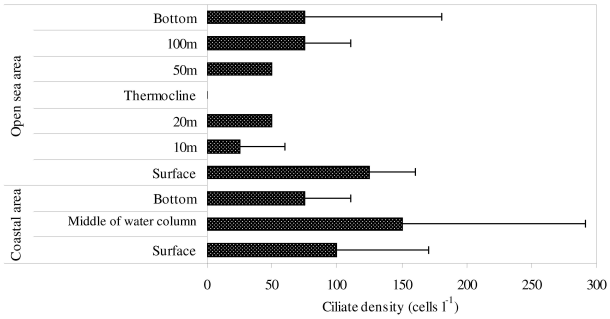

Fig. 1. Vertical distribution of ciliate density in both inshore and offshore stations

This differed from the gulf of Gabes, where ciliate density increased from the surface to the bottom [1]. However, no significant correlation ($P>0.05$) was detected between the physico-chemical parameters and the spatial distribution of the ciliate community.

References

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