DISTRIBUTION OF HETEROTROPHIC MARINE BACTERIA IN THE ROMANIAN AREA OF THE BLACK SEA

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Abstract

During 2000 annual distribution of heterotrophic marine bacteria and seasonal characteristics were investigated in the water of the Romanian Black Sea coast. The heterotrophic marine bacteria density (CFU on agar plates) ranged from 5.4 x 10^2 to 2.8 x 10^5 CFU ml^{-1} with a maximum value in summer. As for the distribution of the physiological groups of bacteria (proteolytic, lipolytic, amylolytic), amylolytic bacteria were 80% of total heterotrophic marine bacteria during the investigation period.

Keywords : bacteria, coastal waters, Black Sea

Introduction

Microorganisms, especially bacteria, play an important role in the marine ecosystem, and number of heterotrophic bacteria serve as trophic level indicators. The coastal zone is an area where river and discharge receive great amounts of dissolved organic matter. Bacterioplankton can transform part of these substances to biomass supplying the grazing food chain in the ecosystem. In coastal areas distribution of bacterial numbers and activity is affected by fluctuations of some biotic and abiotic factors (1). The Black Sea is a semi-enclosed sea, constituting a *"unicum hydrobiologicum"* by virtue of its physical, chemical and biological conditions. During recent decades, the Black Sea has become seriously perturbed by anthropogenic forces, a large quantity of inorganic and organic compounds is introduced every year by rivers and by industrial and domestic discharges. The increasing nutrient inputs was reflected in changes in many abiotic and biotic factors with severe impacts on the entire marine ecosystem structure of the Black Sea (3). Therefore, it is necessary to understand function and structure of the ecosystem from eutrophied and polluted areas, in order to improve this ecosystem.

This paper reports the distribution and characteristics of heterotrophic marine bacteria in the coastal waters from the Mamaia Bay, Romania as affected by fluctuations of physico-chemical and biological factors during the 2000 year.

Material and Methods

Mamaia Bay (Fig.1) is an area from the Southern part of Romanian Black Sea coast in which there are many social and economic activities, especially touristic activities.

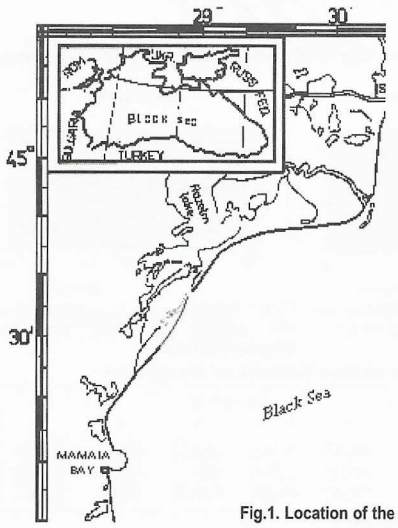

Fig.1. Location of the Mamaia Bay area

The water quality from this site is under the influence either directly or indirectly of sewage discharges into the sea at various points along the coast, which increase during summer owing to the increase of the population. Therefore, seawater in this area may become gradually contaminated with pathogens, organic and inorganic compounds

Seawater samples were collected from Mamaia Bay at bimonthly intervals between January to December 2000. Samples were taken aseptically from 0.3 - 0.5 m below the surface and processed within a few hours after collection. Water temperature and salinity were assessed during the study.

Spreading technique on solid ZoBell's medium was used for determination of heterotrophic bacteria measured duplicate (2). The number of heterotrophic bacteria was expressed as CFU ml^{-1} (colony forming units) after 7 days of incubation of 21° C. For the determination of physiological groups of bacteria, gelatin (0.4%) for proteolytic bacteria, Tween 80 (0.1%) for lipolytic bacteria, and soluble starch (0.2%) for amylolytic bacteria were added, respectively as the sole carbon source to the basal mediu (2) .

Results and discussion

Water temperature (Table 1) and salinity fluctuated between 3.2 – 23.8° C and 13.69 – 17.99% respectively. Total saprophytic bacteria numbers (Fig. 2) ranged within 5.4x 10^2- 2.8x 10^5 CFU / ml showed distinct seasonal fluctuations, with maxima in summer (June) and minima in winter (January).

Table 1. Seasonal fluctuation of heterotrophic bacteria (CFU / ml , 1*=Total saprophytes, 2*=proteolytic bacteria, 3*=lipolytic bacteria, 4*=amylolytic bacteria), temperature and salinity in seawater from Mamaia Bay in 2000.

Month	° C	%0	1	2*	3*	4*
Jan.	3.2	15.6	$5.42x10^2$	$3.48x10^2$	1.2x102	$0.4x10^2$
Feb.	4.8	16.84	$8.76x10^2$	$5.66x10^2$	2.8x102	$0.6x10^2$
Mar.	6.1	16.75	$1.94x10^3$	$8.9x10^2$	8.6x102	$0.9x10^2$
Apr.	10.4	14.67	$4x10^3$	$1.5x10^3$	2x103	$1.6x10^2$
May	15	13.69	$4.8x10^4$	$2.8x10^4$	1.8x104	$8.1x10^2$
Jun.	20	15	$2.88x10^5$	$6.8x10^4$	2.4x105	$1.8x10^5$
Jul.	18.5	17.99	$7.8x10^4$	$3.8x10^4$	5.6x104	$3.5x10^3$
Aug.	23.8	15.25	$2.1x10^4$	$1.2x10^4$	1.8x104	$2.1x10^3$
Sep.	19.4	15.83	$3x10^4$	$2.4x10^4$	9.8x104	$1.6x10^3$
Oct.	14.7	14.17	$6.7x10^4$	$2.6x10^4$	3.8x104	$1.6x10^4$
Nov.	12.9	16.41	$8.4x10^4$	$6x10^4$	3.4x104	$1.5x10^4$
Dec.	8.7	14.99	$2.2x10^4$	$1.6x10^4$	5.8x103	$2.6x10^4$

The distribution of saprophyte numbers was strongly correlated with the water temperature and phytoplankton development (Fig. 2).

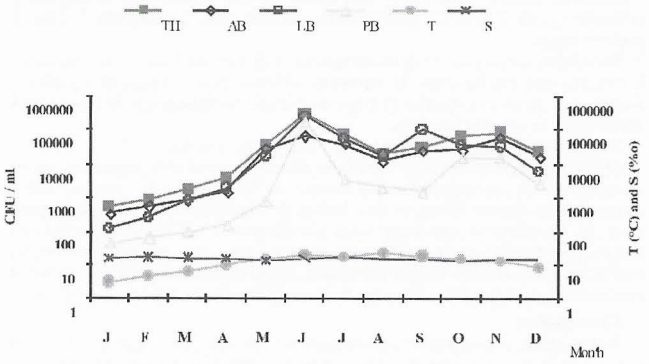

Fig. 2. Evolution of investigated bacteria and physico-chemical parameters according to seasons (TH= total heterotrophyc bacteria, PB= proteolytic bacteria, AB= amylolytic bacteria, LB= lipolityc bacteria, T= temperature, S= salinity)

The specialized bacteria also showed a similar tendency. This may be related to a greater availability of easily degradable organic compounds and to higher temperatures. In fact, during the summer the alochtonous inputs of organic substrates must have increased owing to the phytoplankton blooms, and the substrates released by the macrophytes which are usually more readily available during this period. In addition, the sewage outflow increases during summer due to large number of tourists in the Mamaia Bay.

References

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