# BACTERIAL BIOMASS IN SEDIMENTS OF COASTAL ADRIATIC SEA

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**Abstract**
The changes in bacterial biomass and morphological diversity of bacterial cells were studied in sediments of the eastern middle Adriatic Sea. Bacterial biomass showed seasonal changes, varying from 78 to 378 mg C $g^{-1}$. Rods dominated bacterial biomass during the whole year. The majority of cocci biomass consisted of cells with the volume between 0.01 -0.5 $mm^3$. During January and December, filamentous bacteria covered up to 17% bacterial biomass.

*Key words: bacterial biomass, sediment, Adriatic Sea*

## Introduction

Sediment bacteria comprise a large fraction of total benthic biomass. To elucidate their trophic role, accurate measurements of their biomass are needed. The changes in bacterial biomass depend upon environmental conditions. Nutrient limitations can lead to the formations of ultramicrocells (1). Under heavy protozoan grazing, the distribution of bacterial cell types may shift toward filamentous forms resistant to grazing (2).

## Materials and methods

Undisturbed sediment cores were collected monthly, from January to December 2002, with a piston corer, at one coastal station in Kaštela Bay, middle Adriatic Sea. Bacteria were counted and sized under epifluorescent microscope (3). The volume of each cell was calculated following equation of (4). Cell volumes were converted to bacterial biomass using the equation given by (5). The results were expressed in grams of sediment dry weight.

## Results

Bacterial biomass ranged from 78 to 378 μg C $g^{-1}$ (Fig. 1). Rods dominated bacterial biomass during the whole year, especially during winter, covering 61 -72% of bacterial biomass (Fig. 2). During non-winter period rods smaller than 0.5 $\mu m^3$ prevailed. Rods larger than 1 $\mu m^3$ dominated during winter. The importance of cocci increased during warmer months when they accounted for up to 45% of bacterial biomass. The majority of cocci biomass consisted of cells with the volume between 0.01 -0.5 $\mu m^3$. Filamentous bacteria covered 10 -24% of bacterial biomass. During the non-winter period, their biomass mainly consisted of cells smaller than 1 $\mu m^3$. During January and December, a shift toward cells larger than 1 $\mu m^3$ occurred. In that period, those cells covered up to 17% of bacterial biomass.

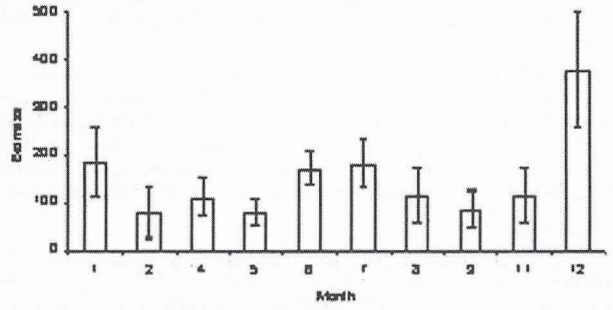


**Fig. 1. Monthly distribution of bacterial biomass (mean ± 1 SD) (μg C $g^{-1}$).**

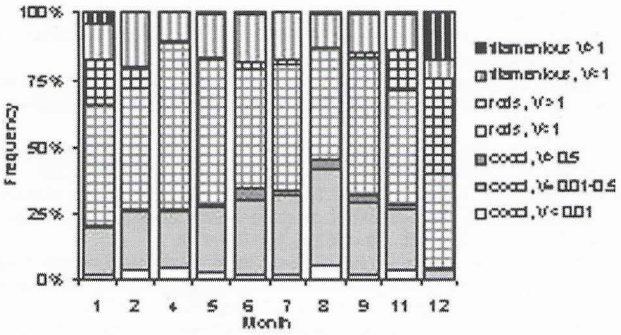


**Fig. 2. The contribution of different size classes of bacteria in bacterial biomass (V= volume in $\mu m^3$).**

## Discussion

Bacterial biomass was one order of magnitude higher than values reported in other coastal areas of the Mediterranean Sea (6). Our study indicates annual patterns of bacterial biomass changes.

The size and shape of bacterial cells are affected by the conditions in the environment. The quality and quantity of available organic matter, temperature and grazing pressure, can provoke changes in cell morphology. As opposite to water column, where protozoan predation exerts a major influence on bacterial biomass, in benthic environments grazing has no considerable impact on bacterial dynamics. According to (7), the major parameter that determines the distribution of bacteria and flagellates in sediments is the size of sediment particles. The decrease of sediment grain size is accompanied with decrease in bacterial production and increase in flagellate biomass. Therefore, flagellates could have a stronger control over bacterial dynamics only when bacterial production is minimal. In order to reveal the importance of predation for bacteria in sediments of coastal Adriatic Sea, it would be essential to elucidate the changes in bacteriovorous protozoa abundance, as well as in benthic bacterial production. The future investigations will focus on these problems.

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