

PRINCIPAL COMPONENT ANALYSIS PHYSICO-CHEMICAL AND BIOLOGICAL PARAMETERS IN THE INNER PART OF BOKA KOTORSKA BAY

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Abstract

In the period from September 2003 to August 2004, physico-chemical and biological parameters (phytoplankton abundance and chlorophylla) were analysed at five sampling locations in the inner part of the Boka Kotorska Bay. Principal component analysis showed the greatest interaction between chlorophyll *a* and silicates then follows its interaction with nitrites and phosphates in the first group of data. In the second group of data a great interaction between temperature and nitrites was present as well as between transparency and salinity.

Keywords : Adriatic Sea, Eutrophication.

Introduction

The Boka Kotorska Bay is located in the south eastern part of the Adriatic Sea, comprising a part of the Montenegrin coast. The ecological studies of seawater at the Montenegrin coast, conducted in different seasons between 1995 and 2005 [1], showed that the problem of anthropogenic eutrophication increased. The results of Principal Component Analysis (PCA) carried out using physical, chemical and biological parameters in the inner part of the Boka Kotorska Bay (Adriatic Sea) are presented in this paper.

Materials and Methods

Seawater samples were taken on a monthly basis from September 2003 to August 2004 from five sites in the inner part of the Boka Kotorska Bay. Temperature, salinity and oxygen concentration were measured *in situ* by the use of an oxygen meter. Turbidity was determined with a Secchi disk. Nutrients were estimated by standard methods [2]. Chlorophyll *a* concentration was calculated according to Jeffrey et al. [3]. Abundance of phytoplankton was calculated according to Utermöhl [4]. Statistics 7 was used for statistical analyses of data. Biplot for the studied elements was obtained by using S-Plus statistical programme.

Results and discussion

Principal Component Analysis (PCA) was carried out by the use of physical, chemical and biological data from the inner part of the Boka Kotorska Bay (Fig. 1).

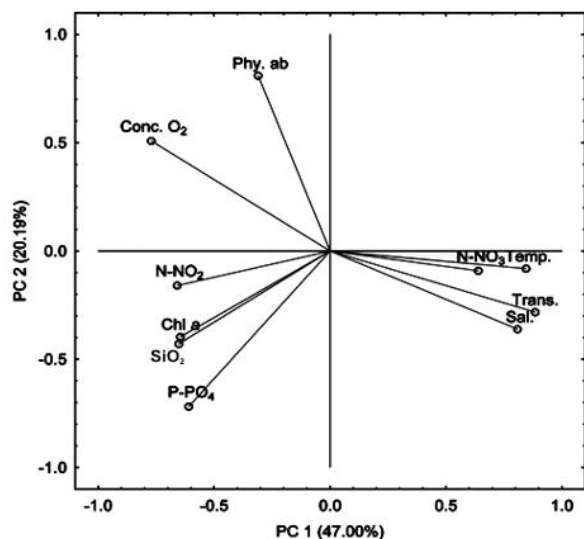


Fig. 1. Biplot of studied physico-chemical and biological parameters at explored sites in the inner part of the Boka Kotorska Bay.

In daily data results of Perez-Ruzafa et al. [5], the relationship between chlorophyll *a* with nutrients is negative, disagree with traditional models, and suggest that phytoplankton controls nutrient concentration. In the researches of Weckström et al. [6], a great negative correlation between silicates and salinity was expected because the rivers are the main external

sources of silicate in the coastal waters of Finland and that can be accepted as explanation for the data obtained for the Boka Kotorska Bay. Also, great interaction and correlation between chlorophyll *a* and silicates point out to the statements of Kristiansen & Hoell [7], that silicon is an important element in still insufficiently known mechanism of harmful algal bloom. It is possible that the input of nutrients by rain in spring and autumn was the main cause of increased abundance of phytoplankton and chlorophyll *a* during these researches, while temperature was not a limiting factor that is in concord with the model of Dugdale & Goering [8]. While in the investigations of Dorgham et al. [9] the salinity was determined as an important factor in relation to the concentration of chlorophyll *a*, in this study the relationship between them is negative. A permanent monitoring has to be organized for a better understanding of the interaction between physico-chemical and biological parameters that influence the process of eutrophication in the Boka Kotorska Bay.

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