LONG-TERM CHANGES OF THE NORTHERN ADRIATIC TROPHIC CONDITIONS

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Abstract

Trophic index and Secchi depth data were used to assess trophic conditions along the Po River delta – Rovinj profile in the last 30 years. A marked gradient in trophic condition was observed along the profile. A decrease in the trophic index was identified only in the most western part and could be related to the change of nutrients composition of the Po River waters during the early eighties.

Keywords: TRIX, Transparency, Northern Adriatic

Introduction

Trophic conditions of the shallow northern Adriatic are heavily influenced by the Po River flow (1). It is the main reason for the eutrophication and Secchi depth gradient between the Po Delta and the opposite Istrian coast. Eutrophication is a significant environmental problem in areas with seasonally limited exchange of water such as the northern Adriatic. Trophic index (TRIX) was calculated using 30 years data of oxygen saturation, chlorophyll *a* and nutrients, with the aim to numerically describe the trophic state in the studied region.

Materials and methods

The data were collected at 5 stations along the Po River delta – Rovinj profile during the period 1972-2002. The profile is delimited by stations SJ108, 12 Nm off the Po River delta (44° 45,4' N; 12° 45,0' E), and SJ107, 13 Nm from Rovinj, western Istria coast, Croatia (45° 2,8' N; 13° 19,0' E). The water was collected with 5 L Niskin (dissolved oxygen and nutrients) and 6 L VanDorn (chlorophyll *a*) samplers. Dissolved oxygen was determined by Winkler titration. Nutrient analyses were performed aboard immediately after sample collection with spectrophotometric methods widely used in oceanography (2). The chlorophyll *a* was determined fluorimetrically after acetone extraction (2). Statistical analysis of the data was performed for the first 5 m were the eutrophication processes are more marked.

Results and discussion

This is the first evaluation concerning the trophic conditions of the northern Adriatic open waters using TRIX. The overall 30 years data (Fig. 1) clearly demonstrate a sharp trophic gradient from west to east that can be attributed mainly to the Po River, the major nutrients source in the area (1), with more than 75% of the total input. The least squares means indicate that over the entire investigated area the ecological status can be classified as high. The transparency of the water column also shows this gradient and it is also more pronounced than for TRIX. This difference may be attributed mainly to organic and inorganic suspended matter content of the Po waters.
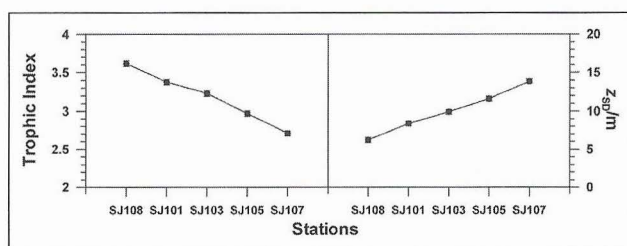

Fig. 1. Least squared means and standard errors for trophic index and transparency (Secchi depth, z_{SD}) at stations SJ108 and SJ107 for the period 1973-2002.

Long-term changes of TRIX for the western and eastern stations bounding the profile (SJ108 and SJ107 respectively) show a significant change in trophic conditions at the beginning of the eighties. A slight decrease is evident and can be related to the change in the nutrient composition of the Po River waters. The phosphorous load of the waters was halved due to the replacement of polyphosphates with other compounds in detergents, and other sanitations measures within the watershed (3).

Data related to Secchi depth measurement do not show significant changes for the past 30 years. The oscillations between years are related to changes in the hydrological regime of the Po River, more evident at the stations closer to the delta (Fig. 2).
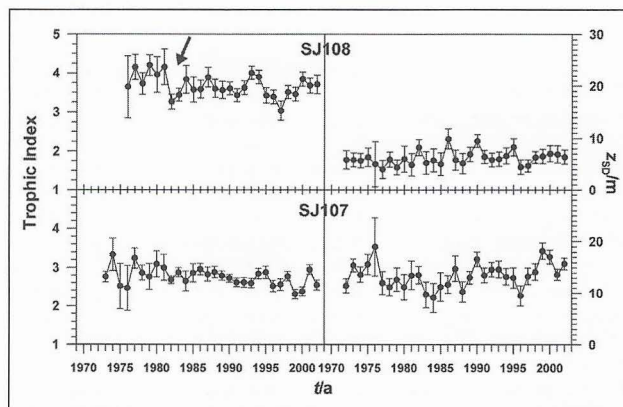

Fig. 2. Least squared means and standard errors for trophic index and transparency (Secchi depth, z_{SD}) at stations on the Po River delta – Rovinj profile in the period 1973-2002.

Classification of waters that have great variability of environmental conditions (nutrient inputs, hydrodynamic and meteorological fluctuations) using only TRIX may underestimate the real trophic state. Additional parameters, including transparency and biological observations (phytoplankton population densities) should significantly improve the trophic classification of waters.

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