

Project EURECOMARGE
Eutrophication and phytoplankton ecology
in the Thermaikos Gulf

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SUMMARY

The abundance and taxonomic diversities of phytoplankton has been studied in relation to sewage and rivers pollution in the Thermaikos Gulf, Greece. Surface water samples were collected from a series of stations in December 1984 and in May and September 1985. Water samples from the vicinity of sewer outfalls and rivers showed very high concentrations of nutrients, a greater abundance of phytoplankton, and a

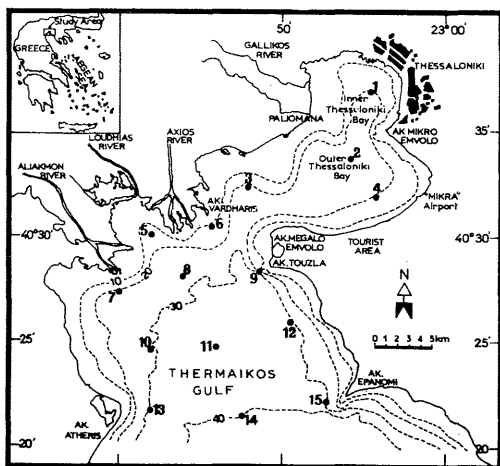


Fig 1. Location of the stations in the Thermaikos Gulf.

lower taxonomic diversity than samples remote from sewage outfalls and rivers. Thus, increase in abundance is highly correlated with PO_4^{3-} and NO_2^- concentrations and the decrease of salinity is highly correlated with the same parameter. A considerable variation in the occurrence of species and dominance occurred along the pollution gradient. Diatoms dominated in all the area and in the three seasons. *Nitzschia closterium*, *Cerataulina bergonii*, *Leptocylindrus minimus*, *Chaetoceros socialis* and *Thalassiosira* sp. were the most dominant species. Thus, the natural coastal phytoplankton community appears disturbed by the increased level of nutrients from sewage effluents and rivers.

Project EURECOMARGE
Research on the Adriatic and Tyrrhenian
continental shelves

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The first big impact of land derived materials, both from natural processes and human activity occurs in the continental shelf. This environment normally receives a continuous supply of suspended solids and associated pollutants whose fate and influence on the marine ecosystem are very difficult to assess. In this context, an interdisciplinary approach to the environmental research becomes necessary, and the EURECOMARGE stimulation program has been a notable attempt to focus the experiences of different scientists (geologists, oceanographers, chemists and biologists) to study selected environments of the Mediterranean margins, in preparation of a bigger effort in marine ecosystem studies supported by the EEC.

Our Institute took part to this stimulation program, because of its interest in geological, sedimentological and environmental marine researches. Our general aim is to study the sedimentary processes in terms of events, mechanisms and reactions which involve particulate materials. Even if some researches were performed in other areas to test methods and compare results, the main interdisciplinary effort was devoted to the Adriatic Sea.

Obviously the processes we study in the water column and in the sediment occur on different time scales ranging from present back to several thousand years.

In order to obtain quantitative basic information it is necessary to go through the following steps: 1) identify different sources of inputs (rivers, runoff, atmosphere); 2) follow sorting and dynamics of suspended solids in the marine environment and localize the sites of accumulation of fine materials; 3) estimate the nature and rate of solid-solution interactions in the water column; 4) estimate deposition fluxes to the bottom and influence of resuspension and mixing processes; 5) estimate benthic exchanges of ionic species at the sediment-water interface and their prevailing directions. Important sedimentological information can be obtained from the upper portion of the sedimentary column: 1) areal distribution of sediment characteristics; 2) downward distribution of geochemical and sedimentological parameters; 3) preservation or loss of distinct sedimentary structure.

High resolution seismic and side scan sonar data contribute to the reconstruction of specific sedimentary environments pointing out the sedimentary processes active during sediment deposition and layer formation. This is of great importance for a better understanding of the sedimentary dynamic processes both at large and fine scale. These techniques provide a framework for the environmental researches and can also be used to collect detailed information in order to position sampling stations and to locate the best zones for in situ experiments.

In this field the main research interest was focused on the last-glacial sea level fluctuation in the shelf of the Eastern Tyrrhenian. Erosional and depositional features suggest sea level drop during the last-glacial maximum to the present-day -110/-120 m bathymetry /1-2/. In these conditions the deeper parts of the shelf remained entirely submerged during the glacial hemicycle. These outer-shelf areas provide the excellent opportunity of studying the erosional and depositional features that originated during the sea level lowstand, since no younger sediment supply reached the area during and after the ensuing sea level rise.

The interaction between sediment supply and shelf-depth currents along the shelf was also pointed out /3/. Evidences of currents capable to winnow the sediments, at depths of as much as -110 m during highstand conditions, came from direct core sampling on top of morphologic reliefs /4/. A comparison between the Tyrrhenian and the Adriatic shelf is at this point expected to be constructive, for the two data-bases have improved greatly during the last few years and some interdisciplinary work is in progress.

Geological and sedimentological studies of the Adriatic shelf were described by many authors /5-6/. However, for a long time, these studies have been limited by the lack of information about recent sedimentation rates.

Radiochemical measurements of Cs-137 (from fallout) and Pb-210 are used to evaluate rates of sediment accumulation on the Adriatic Sea shelf. The activity-depth profiles provide a maximum apparent accumulation rate of the order of $2 \text{ g cm}^{-2} \text{ yr}^{-1}$ /7/ near the Po River delta. The Chernobyl signal (Cs-137 and Cs-134) /8/ and the radionuclide inventories show that the radionuclide supply from the drainage basins of major rivers significantly overcomes the input from direct fallout all over the shelf. On the contrary, fallout of Pb-210 seems to be more significant with increasing distance from the river mouths.

The radionuclide distributions in the sedimentary column can be due to sediment accumulation and mixing and the ratio of mixing to accumulation is important to understand the stratigraphic record. The incidence of mixing phenomena (bioturbation, resuspension) on the profile is now being evaluated to obtain the net accumulation rates. Moreover some assumptions in the application of the model calculations have to be verified.

Researches on sediment pollution for heavy metals, chlorinated hydrocarbons and nutrients were carried out on the continental shelves of the Italian seas, particularly in the NW Adriatic. Some of them were mainly concerned with areal distribution of pollutants /9/, some related sediment features with suspended particle fluxes and composition /10/. The results for the Northern Adriatic Sea have been reviewed by Frascari et al. /11/.

Much effort was afterwards devoted to benthic flux measurements /12-13/ and interstitial water analyses of nutrients and related ionic species /12-14/. These data were interpreted in order to estimate exchange reaction rates between water and sediment and assess the factors controlling sediment contribution to the mass balance of these substances. These measurements are still in progress with technological improvements.

In order to improve our knowledge about the processes occurring in the marine ecosystems and their influence on the environmental quality, we are prepared to insert our experience in the broad multidisciplinary perspective now available.

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