

AN INVESTIGATION ON THE CONDITION OF THE COASTAL WATERS
OF THE GULF OF CAGLIARI

A. Loi, M. Massacesi, P. Mulas, and G. Sarritzu

Istituto Chimico Policattedra, Università di Cagliari, Italy

Summary

This paper examines the condition of the coastal waters of the Gulf of Cagliari in Southern Sardinia. In this study four different samplings have been made during a year to estimate the influence of domestic and industrial effluents on the marine environment. The findings of the chemical and physico-chemical parameters show the existence of two areas with different levels of pollution.

Riassunto

Vengono studiate le condizioni delle acque costiere del Golfo di Cagliari da Punta Zavorra a Torre Foxi. Sono stati effettuati quattro campionamenti nell'arco di un anno per osservare l'influenza degli scarichi urbani ed industriali nell'ambiente marino. L'esame di risultati chimici e chimico-fisici evidenzia l'esistenza di due zone di mare con diverso grado di inquinamento.

Introduction

The sea area examined is the inner part of the Gulf of Cagliari (Sardinia) bounded by Punta Zavorra in the west and by Torre Foxi in the east. In the last 15 years this part of the coast has seen a big increase in population and intensive growth in industrial activity, mainly in petroleum and petrochemical production. Many lagoons on the right and left side of the city of Cagliari receive several tributary rivers which collect the sewage of a lot of small towns. The more important is the S. Gilla lagoon with an area of about 15 km² and an average depth of 1.0 meter, where is verified the environmental pollution by domestic and industrial waste water. The sea area considered with a sandy bottom and the disturbances owing to marine currents are not important; the maximum tidal variation is about 30 cm and the water replacement, very limited, is mainly determined by the prevailing winds from the North-West and the South-West.

Results and discussions

Four samplings at 1 m and at 5 m from water surface were carried out during September 1977 to July 1978. Sampling stations were listed to provide a relatively uniform coverage of the studied area (Fig.1). Several parameters as temperature, transparency, pH, percentage of dissolved oxygen were determined directly in situ. On shore, in the laboratory, after appropriate stabilization of the samples, the measurements of conductivity, salinity, total suspended solids (SST), total organic carbon (TOC), ammonia⁽¹⁾, nitrite⁽²⁾, nitrate⁽³⁾, phosphate⁽⁴⁾ were carried out.

The eastern area shows higher transparency values, allowing often direct sight of the sea bed at depth of 30 m, while the average transparency in the Western part is only 4 m. This is in accordance with the level of suspended solids in the western area (60-70 mg/l). The levels of nitrogen and phosphorous compounds have a very large range ($\text{NH}_4^+\text{-N} \leq 20\text{-}170$, $\text{NO}_2^-\text{-N} < 0.7\text{-}3.4$, $\text{NO}_3^-\text{-N} < 0.7\text{-}20.0$, $\text{PO}_4^{3-}\text{-P} < 1.0\text{-}27.0$ $\mu\text{g/l}$) and are higher in the Western area where is more evident the influence of industrial and domestic effluents. The N^o9 and N^o10 stations show different behaviour with anomalous values ($\text{NH}_4^+\text{-N}$ 40-1870, $\text{NO}_2^-\text{-N}$ 1.0-38, $\text{NO}_3^-\text{-N}$ 3.5-1940, $\text{PO}_4^{3-}\text{-P}$ 1.3-400 $\mu\text{g/l}$) evidencing the effect of the highly polluted waters from the lagoon and from the sewage of the Cagliari town.

The saturation percentage of dissolved oxygen is generally greater than 100%, and its seasonal fluctuations agree with the biological activity. A low value of 85% found at Station N^o 10 in January 1978 is ascribed to the sewage outfall from the port area of the city of Cagliari. The Total Organic Carbon (TOC) confirm the general behaviour, emphasizing the greater pollution in the Western area. The highest values, at Station N^o 9, show the great role played by the waters of the Lagoon of S. Gilla in polluting the Gulf. Same trend is shown by the pH values except for the stations affected by the outflow of brackish water from the lagoon, where high differences are detected.

Apart from the industrial effluents seasonal variations observed during the summer are due to the high evaporation and very low raininess.

No significant stratification is noticeable from our results between the 1 and 5 meter layers examined, confirming the lack of current effect in the observed area apart from the movement induced by wind.

The analytical results show that the two part of the Gulf divided by the promontory of Capo S. Elia, have a markedly different degree of environmental pollution, and the promontory has an important role in partially preventing the direct mixing of the water from the eastern and western areas.

References

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"A preliminary investigation on the condition of the coastal waters of the Gulf of Cagliari"

Paper presented by A. Loi (Italy)

Discussion

P. Valenta: The metal concentration in the port is probably high because of the shipping waste. It is necessary to measure especially the concentration in the dilute state and in the particulate matter as in these states metals are directly available for the organisms. Polarography is especially attractive method for this.

A. Loi: I agree with this observation: the metal detention will be carried out in our actual program.

H.W. Nürnberg: a) Are the waste waters of Cagliari community discharged immediately into the sea or is there prior waste water treatment? The pollution is particularly high at the port and the lagoon S. Gilla.

b) Are there treatments of industrial waste waters, e.g. petroleum industry, as there the pollution levels are relatively low.

A. Loi: a) The waste waters of Cagliari community are discharged into the sea and the S. Gilla lagoon directly without treatment.

b) The waste waters of the industrial area of Sarroch are discharged into the sea after preliminary treatment.

M. Scaccini Cicatelli: Est-ce que les déterminations du phosphore se réfèrent au phosphore totale ou a celui soluble.

A. Loi: The phosphates content is referred only to total ortophosphates.

A. Ballester: J'ai compris que vous avez négligé vos resultats sur les metaux lourds dans l'eau. Est-ce que vous envisagez de faire quelques analyses sur les organismes et sediment?

A. Loi: This paper is the first point of our research. Our aim is to extend that study to sediments and heavy metals.