Pollution of Saronikos Gulf by Petroleum Aromatic Hydrocarbons

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Saronikos gulf is a semi enclosed bay in Greece. In order to study the pollution status of the gulf, Saronikos is divided into four regions: A (Elefsis bay), B (Western area), C (Internal area), D (External area) (Fig. 1). This work is done whithin the framework of MED-POL program. As a part of this program, samples of water from 1m depth, surface sediments, mussels (mytilus galloprovincialis) and fish (striped mullus and mullus barbatus), collected during 1988-89 are examined for PAHs content.

PAHs content in all samples are determined fluorimetrically, according to the standard methods of IOC (UNESCO, 1982, 1984). Synchronous fluorimetry ($\Delta\lambda$=4 nm) gave information on the constitution of PAHs mixture in samples (TUAN VO-DINH, 1978)

The spatial distribution of dissolved / dispersed petroleum hydrocarbons in water surface samples collected in February 1989 and seasonal distribution of DDPH are shown in Figures 1 and 2 respectively. The isolines of Figure 1 are similar to those of total polyaromatic hydrocarbons in the surface sediments (Figure 3). As concluded from Figures 1 and 3 Elefsis (A) seems to be the most polluted area of the gulf. (DDPH 3.9-11.3 µg/L, sediments 31-71.2 µg/g and mussels 72.9-80 µg/g expressed in chrysene equivalents). This is reasonable, since it is a shallow basin (max. depth 30m) which receives a great amount of sewage from the urban activity of the metropolitan area, as well as from the industries located at the northern part of the gulf.

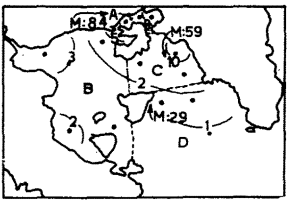

Fig. 1. Surface distribution of DDPH (µg/L) and values of PAHs in mussels (M:µg/g) from Saronikos gulf in chrysene equivalents.

The values of PAHs at the Western part area B, (DDPH 1.9-5.6 µg/L, sediments 5.2-16.1 µg/g) are low, though a slight increase at the upper part may be attributed to the oil refinery, located at the western coastal area.

In the internal basin (C), values of DDPH and PAHs in sediments appear higher than those in area B but clearly lower than those in Elefsis bay (DDPH 1.9-13.1 µg/L, sediments 9.5-29.5 µg/g, mussels 55.1-63.5 µg/g). Indeed the internal part of the gulf is polluted from Athens central sewage outfall.

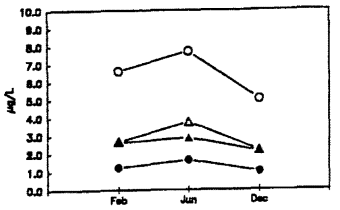

Fig. 2. Seasonal distribution of DDPH (0.5 m depth) in Saronikos gulf during 1989 (-O- area A, -Δ- area B, -▲- area C, -◆- area D).

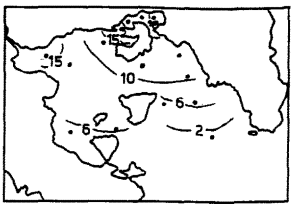

Fig. 3. Surface distribution of PAHs (µg/g) in sediments from Saronikos gulf, in chrysene equivalents.

Finally low values at the external part (DDPH 0.6-2.1 µg/L, sediments 0.8-6.2 µg/g, mussels 22.4-31.7 µg/g) are well explained by the fact that part D is the area of Saronikos gulf where renewal of water masses takes place twice a year.

Concentrations of PAHs in fish muscles collected in the gulf during 1988-89 show mean value of 22.4 ng/g for striped mullet and 14.5 ng/g for mullus barbatus correspondingly.

The above results indicate that it should not be concerned that pollution of Saronikos gulf has affected fish although mussels and sediments appear higher values of PAHs, playing the role of concentrators.

The synchronous fluorescence spectra show the presence of naphthalenes. Moreover the wide range of aromatic compounds appearing at the fluorescence spectra (Fig. 4) indicates the petroleum origin of PAHs examined.

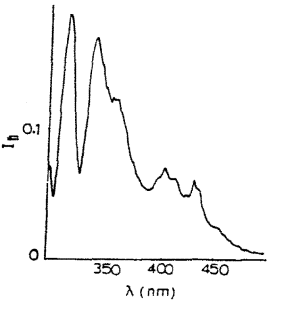

Fig. 4. Typical synchronous fluorescence spectrum ($\Delta\lambda$=4nm) of PAHs extract in hexane, from Saronikos gulf sediments.

REFERENCES

1. a) UNESCO (1982). IOC Manuals and Guides Nº 11.
   b) UNESCO (1984). IOC Manuals and Guides Nº 13.
2. TUAN VO-DINH (1978). Multicomponent analysis by synchronous fluorescence spectroscopy. Anal. Chem., 50 :396