

# MUSSELS AS INDICATOR OF ORGANOCHLORINE POLLUTION IN A MAN-AFFECTED GULF (SARONIKOS GULF, HELLAS)

E. GEORGAKOPOULOU-GREGORIADOU, R. PSYLLIDOU-GIOURANOVITS,  
F. VOUTSINOI-TALIADOURI and V.A. CATSIKI

National Centre for Marine Research, 166 04 Hellenikon, Hellas

Chlorinated insecticides and polychlorinated biphenyls are among the most persistent and toxic pollutants in aquatic and terrestrial ecosystems, because of their stability and bioaccumulative capacity. Although their use has been restricted or discontinued in recent years, their residues remain in the environment for a long time and continue to pose problems (TANABE, 1988). Mussels are considered as an appropriate indicator for organisms showing chlorinated hydrocarbon contamination derived from local sources. This is due to their sedentary and filter feeding habit (National Academy of Sciences, 1980).

The study area is the Saronikos Gulf, a typical semi-enclosed basin, that receives the sewage of urban activities and the industrial discharges of the Greater Athens Metropolitan area. During the 1988-91 period mussels (*Mytilus galloprovincialis*) have been collected from three coastal stations A, B, C (fig. 1), by

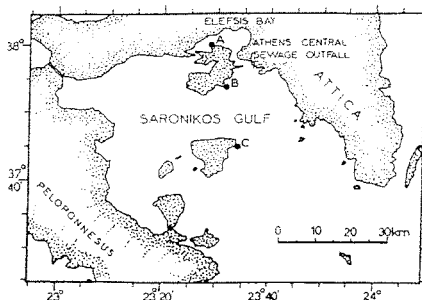


Fig. 1 : Sampling locations in the Saronikos Gulf

scuba diving from a depth 1 to 3 m. Samples consisted of 30 individual animals with shells 3-5.5 cm long. Soft tissue was removed from shell and after lyophilization and grinding a subsample was extracted with n-hexane. The cleaning-up and fractionation took place on alumina columns and the fractions were measured on a GC with ECD Ni 63 and Megabore column 30 m long, (SATSMADJIS *et al.*, 1988). The organochlorines analysed were : PCBs (Aroclor 1254, Aroclor 1260), DDT and its metabolites (DDE, DDD), HCHs ( $\alpha$ ,  $\gamma$ ) and Dieldrin. The lipids content was also determined in an aliquot of the extrate.

The analysis of the data reveals that the major pollutants are PCBs, ranged from 42.3 to 383.9 ng/g dry weight. DDTs concentrations vary between 7.3 and 142.0 ng/g dry wt. while the HCHs and Dieldrin levels are relatively low (Table 1).

Table 1: Concentrations (ng/g dry wt.) of organochlorine residue in mussels (*Mytilus galloprovincialis*) from Saronikos Gulf (Athens, Hellas) during the 1988-91 period.

| St | PCBs  |            | DDTs |            | HCHs |          | Dieldrin |         |
|----|-------|------------|------|------------|------|----------|----------|---------|
|    | Mean  | Range      | Mean | Range      | Mean | Range    | Mean     | Range   |
| A  | 211   | 88.5-383.9 | 25.3 | 11-44.5    | 5.3  | 3.1-11.9 | 2.7      | 1.1-5.5 |
| B  | 153.9 | 94.9-216.9 | 37.0 | 18.4-142.0 | 5.4  | 2.4-21.2 | 3.2      | 0.5-8.9 |
| C  | 85.6  | 42.3-122.0 | 16.9 | 7.3-25.3   | 8.0  | 4.6-17.9 | 3.5      | 1.8-6.1 |

In all samples Aroclor 1254 is found in higher concentrations than Aroclor 1260. The pattern of abundance of the DDT group of compounds is DDE>DDD>DDT (ICES, 1974), while the  $\gamma$  isomer predominates in relation to  $\alpha$  in the HCHs isomers. The ratio PCBs/DDTs is higher than 1 (in all stations), suggesting that the industrial activities are greater than agricultural ones in this region (PICER *et al.*, 1978). Figures 2 and 3 are showing the annual distribution of PCBs and DDTs in the study area.

Generally, we can say that the concentrations of organochlorine compounds determined in this study, are lower than the ones reported for other Mediterranean coastal areas (Med. Action Plan, 1990) and below the health hazard limits.

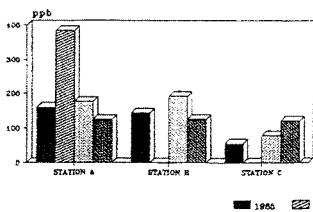


Fig. 2 : Annual distribution of PCBs

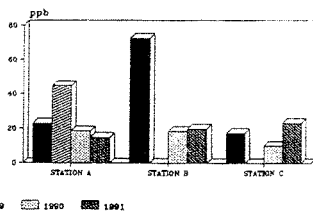


Fig. 3 : Annual distribution of DDTs

## REFERENCES

- ICES, 1974. Report of working group for the International Study of the Pollution of the North Sea and its effects on living resources and their exploitation. Cooperative Report Res. Serial n°39 : 191.
- MEDITERRANEAN ACTION PLAN (MED POL), 1990. Assessment of the state of pollution of the Mediterranean Sea by organohalogen compound. *Technical Reports Series*, n°39.
- NATIONAL ACADEMY OF SCIENCES, 1980. The International mussel watch. Report of a workshop sponsored by the Environmental Studies Board Commission on Natural Resources. National Research Council, Washington D.C., pp. 163-235.
- PICER, M., PICER, N. and AHEL, M., 1978. Chlorinated Insecticide and PCB Residues in Fish and Mussels of East Coastal Waters of the Middle and North Adriatic Sea, 1974-75. *Pesticides Monitoring Journal*, 12 : 102-112.
- SATSMADJIS, J., GEORGAKOPOULOU-GREGORIADOU, E. and VOUTSINOI-TALIADOURI, F., 1988. Separation of chlorinated hydrocarbons on alumina. *J. Chromatography*, 437 : 254-259.
- TANABE, S., 1988. Problems in the future. Foresight from current knowledge. *Environ. Pollut.*, 50 : 5-29.