L-II1

LEVELS AND TRENDS OF THE POLLUTION OF CHLORINATED HYDROCARBONS IN MUSSELS FROM THE MEDITERRANEAN SEA

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It is well documented that synthetic chlorinated hydrocarbon residues are widespread throughout the oceanic ecosystem. The Mediterranean Sea, as a semi-enclosed body of water, is of special interest and there are many baseline studies to measure the existing levels of these contaminants in various components of the ecosystem in order to gauge the magnitude of possible future pollution by these or other similar chemicals. In such baseline studies chlorinated hydrocarbons are measured in many marine species, from plants to various planktonic organisms as well as from fish to birds and mammals. However mussels, as very popular and widespread indicator organisms were analyzed most frequently in comparison with other species. Figure 1 presents summarized data of such baseline studies on the chlorinated hydrocarbons pollution of mussels from the Mediterranean Sea which have been published in literature or are available in other ways. Presented averages were calculated as arithmetic means by using separate data, but if such data were not available for the investigated area, averages were calculated by combining available arithmetic means and arithmetic means obtained from single data. It means that for some areas averages are presented as arithmetic means obtained from arithmetic means available in previously published papers. Data are presented as concentrations on a wet weight basis. In cases where data in literature were published only on dry weight basis, concentrations on wet weight basis were calculated by dividing concentrations on dry weight basis with 5.2.

Seasonal changes of the concentrations of chlorinated hydrocarbon residues in the mussels from the Mediterranean Sea and various methodological difficulties encountered in comparison of the obtained results are discussed.

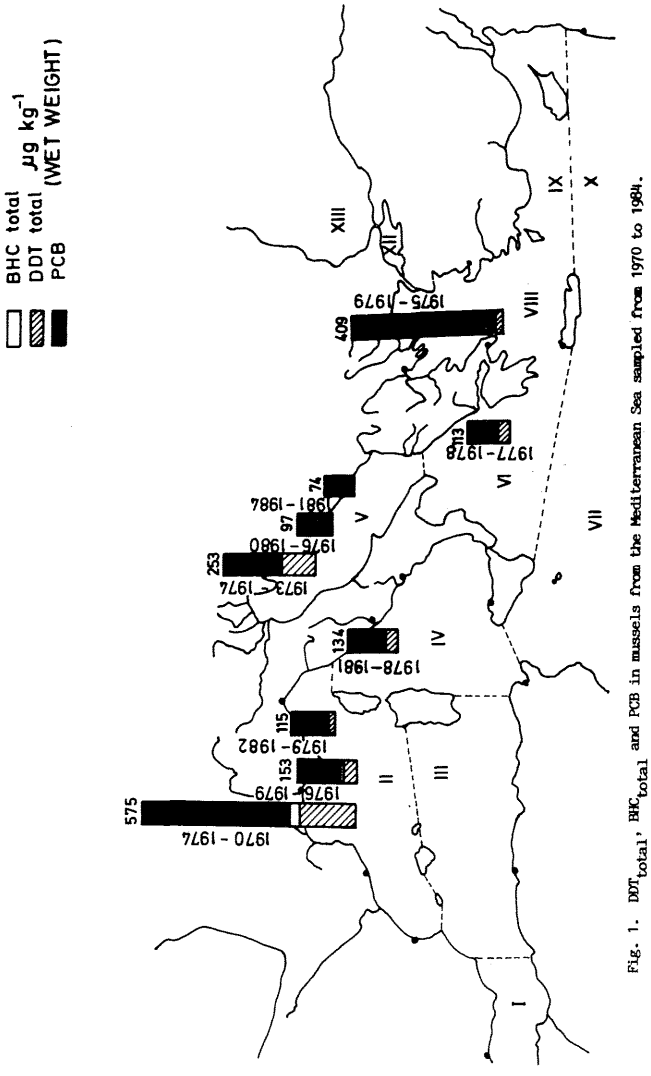

Fig. 1. DDT_{total}, BHC_{total} and PCB in mussels from the Mediterranean Sea sampled from 1970 to 1984.

L-II2

CHLORINATED HYDROCARBONS AND ATRAZINE IN THE WATERS OF TAGLIAMENTO ESTUARY, NORTH-EAST ITALY

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From March, 1983 to August, 1984 water samples were monthly collected at one station, Bevazzana, located 5 km upstream from the mouth of Tagliamento river (North-East Italy) and analysed for chlorinated hydrocarbon and atrazine content. Water samples were taken at a depth of 0.5 - 1.0 m and immediately filtered through Gelman A/E glass fiber filters.

For chlorinated hydrocarbon determination, 15 l of filtered water and filters were separately extracted with n-hexane. The extracts were cleaned-up with concentrated sulphuric acid and fractioned into classes of chlorinated hydrocarbons by elution from a silica gel microcolumn. Analyses were then accomplished by Ni-63 ECD gas chromatography.

For atrazine determination, 5l of filtered water and filters were separately extracted with benzene. The extracts, dried over anhydrous sodium sulphate and concentrated, were analysed by alkali-flame detector gas chromatography.

The average concentrations of chlorinated hydrocarbons and atrazine in water and suspended particulate matter (s.p.m.) are summarized in Table 1.

Chlorinated hydrocarbons were generally low and not always present in our samples at concentrations higher than the detectable levels. α and γ isomers of HCH were identified in all water samples (>0.05 ng/l) and also in 34% of s.p.m. ΣDDT was quantified in all samples analysed (>0.1 ng/l). Of the three fractions of ΣDDT, pp'DDT and pp'DDE were usually the major ones and pp'DDD always the smallest, this latter often being below detection level. PCBs were found in all samples analysed (>0.2 ng/l). As for atrazine, it was present in all wate samples (>10 ng/l), while it was absent in s.p.m.

Of the considered compounds, only chlorinated hydrocarbons showed high affinity for particulate matter, in fact 29% of ΣHCH, 43% of ΣDDT and 54% of ΣPCB were associated with s.p.m. This finding is consistent with their low solubilities compared with other compounds.

Table 1. Chlorinated hydrocarbon and atrazine residues in water and suspended particulate matter of Tagliamento estuary. Mean values and standard deviations expressed as ng/l.

	No.	ΣHCH	ΣDDT	ΣPCB	Atrazine
water	18	1.2 ± 1.6	0.5 ± 0.5	2.5 ± 1.3	89 ± 95
s.p.m.	17	0.5 ± 0.8	0.4 ± 0.4	2.8 ± 1.9	<10
water + s.p.m.	17	1.7 ± 1.7	0.9 ± 0.8	5.2 ± 2.4	89 ± 95

Although chlorinated pesticides and PCBs show some fluctuations, no clear evidence was obtained for a seasonal pattern or for a significant correlation with rainfall or s.p.m., indicating the absence of a local source of contamination. This is not surprising in view of the fact that from some years the environmental use of chlorinated pesticides and PCBs is greatly restricted in Italy. By contrast, atrazine occurs in much higher concentrations in river waters than chlorinated hydrocarbons, and furthermore, it shows a marked seasonality: maximum concentrations (up to 416 ng/l) were observed during runoff events following the heavy atrazine application at planting time; minimum concentrations were in winter and early spring (16 - 30 ng/l), the supply of atrazine being gradually exhausted during summer and autumn.

The total load of chlorinated hydrocarbons and atrazine carried by the river through Bevazzana station, estimated on the basis of their mean concentrations and a flow of 62 m^3/s, was: 3.3 kg/y for ΣHCH, 1.8 kg/y for ΣDDT, 10.2 kg/y for ΣPCB and 174 kg/y for atrazine.