L-I5

PAH in recent Sediments of the Eastern Adriatic Coast determined by UV-fluorescence spectroscopy method

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The samples of recent sediments from the offshore Adriatic sea and from the coastal area in two bays were collected in July 1987. One bay is under the strong anthropogenic influence (Kaštela Bay - Split area) and the other is relatively unpolluted area (Boka Kotorska Bay) (Figure 1).

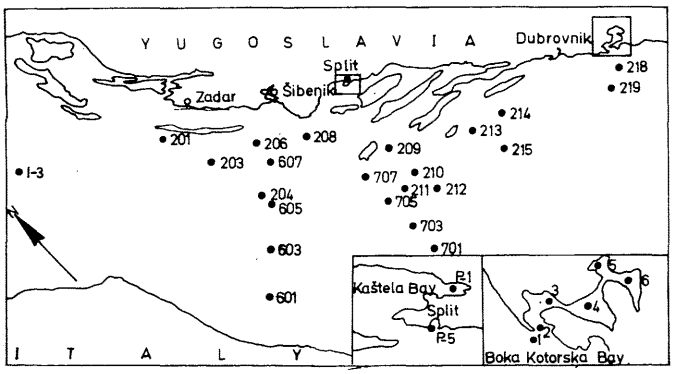

Figure 1. Investigated area

The samples of sediments after freeze drying were analysed by fluorescence spectrosopy (UVF) method (IOC, 1982) in order to provide information on the levels of hydrocarbons generally present in the sediments of the East part of the Adriatic sea. The contents of PAH in sediments collected from the offshore area are presented in the Table 1. They ranged from 0.29 to 1.21 µg/g dry weight chrysene equivalents and 3.57 to 14.35 µg/g dry weight Kuwait oil equivalents. For unindustrial area of Boka Kotorska Bay the levels of PAH ranged from 1.45 to 5.10 µg/g dry weight chrysene equivalents and 17.17 to 60.20 ug/g dry weight Kuwait oil equivalents. The samples from Split area are subject to domestic and industrial inputs. The content of PAH in these sediments is 15.38 µg/g dry weight chrysene equivalents (mean value).

Hydrocarbons present in the marine sediments are derived from a wide range of sources. Emission spectra of the sediment samples from offshore area were generally similar. Spectra from polluted area were with predominant aromatics with 2-4 rings. Concentration of PAH in surface sediments was law in offshore area, it was higher in the Bay of Boka Kotorska and the highest in Split area. This characteristic of Boka Kotorska Bay is the consequence of shipping loss, and for Split area is of petroleum and petroleum products, diagenetic and combustion origin. We can speculate that the contents of PAH in surface sediments in the offshore area are the consequence of sedimentation processes in the whole of the Adriatic Sea (Pigorini, 1968).

Table 1. Distribution of contents of PAH in recent marine sediments from the Adriatic Sea. The values are given in µg/g dry weight in chrysene and Kuwait oil equivalents

Station	Area	Water Depth (m)	Sediment type	Contents of PAH: Chrysene	Contents of PAH: Kuwait oil	DW/WW
201	Offshore	64	Sand	0,45	5,42	1,48
203	"	157	Sand	0,67	8,09	1,53
204	"	260	Mud	0,63	7,56	2,80
206	"	200	Muddy sand	0,52	6,21	2,30
207	"	150	Mud	0,33	4,14	1,83
208	"	140	Mud	0,33	3,91	1,47
210	"	108	Mud	0,30	3,69	1,57
211	"	148	Sand	0,62	7,39	2,00
212	"	150	Muddy sand	0,68	8,16	2,28
213	"	130	Mud	0,29	3,57	1,44
214	"	145	Mud	0,53	6,40	2,00
215	"	212	Mud	0,41	5,08	1,60
218	"	200	Mud	0,87	10,49	1,50
219	"	200	Mud	0,54	6,55	2,61
601	"	122	Mud	1,21	14,35	2,1
603	"	240	Mud	0,83	9,91	2,0
605	"	260	Mud	0,74	8,86	2,7
607	"	200	Mud	0,42	5,13	3,1
701	"	117	Mud	1,06	12,68	2,4
703	"	130	Mud	0,65	7,77	2,0
705	"	170	Muddy sand	0,55	6,57	2,1
707	"	152	Mud	0,48	5,81	2,8
1	Boka	77	Sandy mud	1,45	17,17	1,61
2	Kotorska	50	Muddy sand	1,68	18,96	1,45
3	"	43	Mud	2,35	27,73	2,15
4	"	43	Mud	5,10	60,20	1,92
5	"	32	Mud	4,77	56,56	2,50
6	"	34	Mud	3,52	41,74	2,10
P-1	Split	14	Mud	12,34	148,86	1,98
P-5	"	7	Mud	20,46	240,10	1,63
I-3	Offshore	40	Muddy sand	1,00	11,84	-

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L-I6

Seasonal fluctuations of organochlorine compounds in the water of the Strimon River (N. Greece)

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This study aims to monitor the pollution of the water of the Strimon river by organochlorine compounds HCB, Lindane, Heptachlor, Aldrin, Dieldrin, DDT and its metabolites DDD and DDE, PCB's. Samples of mussels (*Mytilus galloprovincialis*) from the Strimonikos gulf were also collected and analysed for the above compounds to compare the results of this study with a previous one by Kilikidis et al. (1981).

The R.Strimon rises on M.Scombio (Bulgaria) and flows out into the Strimonikos gulf (N.Greece). 115 km of the Strimon's 330 km total length pass through N.Greece, via Kerkini Lake (a man-made lake). Four sampling locations (1,2,3,4) were selected along the river and three in the Strimonikos gulf (A,B,C), as shown in fig. 1. Sampling took place monthly from Oct. 1985 to Sep. 1986. For the determination of organochlorine compounds in the water and mussel samples, Gas Chromatography methods were used according to the techniques of Jensen et al. (1973) and Johnson (1965).

HCB, Lindane and Aldrin were only detected in the water samples of the Strimon river. The seasonal changes in the concentration of the above compounds are shown in fig. 2 and the corresponding concentrations in table I.

HCB, Lindane, DDT, DDD and DDE were detected in the mussel samples. The analytical concentrations of these compounds per sampling location compared with the previous study by Kilikidis et al. (1981), are shown in table II.

The presence of HCB, Lindane and Aldrin in the water samples of the Strimon river indicate agricultural pollution of the river because of the extensive cultivation of the catchment area. Although the use of Aldrin has been officially prohibited in Greece since 1972, its presence presumably shows that it is still in use unofficially or that it comes from Bulgaria.

The later is more likely because the detection of Aldrin was seasonal and its concentration was at first higher in sampling location 1 than in location 4.

The absence of PCB's in the mussel tissues was probably due to the decrease of the pollutant sources in the catchment area. In contrast to the previous study, the concentrations of Lindane were significantly increased.

In conclusion, the pollution of the Strimon river by organochlorine compounds has effects on the water quality of the Strimonikos gulf.

Table 1. Concentrations of organochlorine compounds in water of R.Strimon (ppt)

Date	HCB 1	HCB 2	HCB 3	HCB 4	LINDANE 1	LINDANE 2	LINDANE 3	LINDANE 4	ALDRIN 1	ALDRIN 2	ALDRIN 3	ALDRIN 4
10/85	0.9	1.8	1.3	1.1	1.3	2.6	1.7	1.2	-*	-	-	-
11/85	2.1	2.2	2.2	1.5	3.4	4.5	6.7	7.7	-	-	-	-
12/85	1.8	2.1	2.4	2.2	4.6	6.3	7.8	7.9	-	-	-	-
1/86	1.3	1.0	0.8	1.2	1.8	2.3	1.6	3.4	5.8	5.0	5.3	4.2
2/86	0.9	1.2	1.0	1.8	1.3	2.4	2.4	3.6	5.9	5.0	5.8	6.6
3/86	1.1	1.5	1.6	1.5	2.1	2.3	5.1	8.2	15.3	12.0	12.4	15.4
4/86	1.3	1.8	1.7	1.6	11.0	12.6	11.8	12.1	8.8	9.7	10.2	14.2
5/86	2.4	2.0	1.9	2.8	10.8	10.5	11.0	11.3	-	-	-	-
6/86	2.2	2.5	3.0	2.0	9.0	3.0	3.1	2.3	-	-	-	-
7/86	1.4	1.0	0.8	1.2	4.6	2.1	2.3	2.8	-	-	-	-
8/86	0.9	1.0	0.8	0.9	1.2	0.6	0.4	0.5	-	-	-	-
9/86	1.0	0.8	0.5	1.0	0.6	0.4	0.3	0.7	-	-	-	-

*Below detection limit (<0.9 ppt)

Table 2. Concentrations of organochlorine compounds in mussels of Strimonikos gulf (ppb w.w.)

Organochlorine compounds	This study A	This study B	This study C	Previous study* A
HCB	1.7	1.9	0.5	2.0
LINDANE	1.3	1.1	0.4	0
ALDRIN	0	0	0	0.7
pp'DDT	5.0	4.0	1.6	6.0
pp'DDD	6.0	3.8	2.6	7.0
pp'DDE	6.7	3.3	2.1	8.0
PCB's	0	0	0	261.0

*Kilikidis et al (1981)

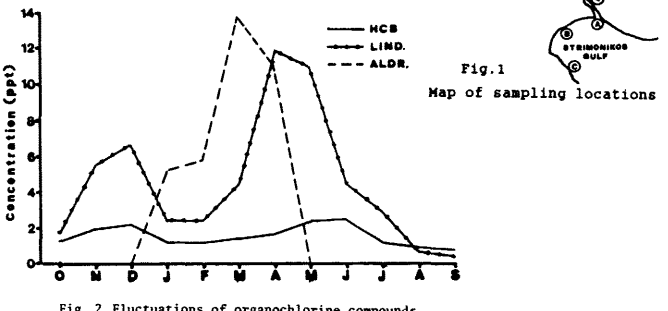

Fig.1 Map of sampling locations

Fig. 2. Fluctuations of organochlorine compounds during Oct. '85 - Sept. '86.

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