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A CONTRIBUTION TO THE KNOWLEDGE OF FLUORIDE DISTRIBUTION IN THE CENTRAL AND SOUTHERN ADRIATIC

PRILOG POZNAVANJU RASPODJELE FLUORIDA
U SREDNJEM I JUŽNOM JADRANU

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INTRODUCTION

Fluoride survey in this area was initiated in order to determine the level of pollution in the Krka River Estuary (Buljan, Stojanoski, Vukadin 1976). Afterwards this survey extended over wider area. This paper reports the obtained results.

1. THE AREA OF INVESTIGATIONS

During 1973 samples were collected from Stations 25, 8, 9 and 3 in the central Adriatic and from Station 15 in the southern Adriatic and analysed for fluoride contents together with other oceanographic parameters (Fig. 1).

Samples were collected from Stations 25, 8 and 9 every month from February to November, and from 3 and 15 in March, June and September. Stations 25, 8 and 9 are under the influence from the coast (particularly Stat. 25 and 8) whereas Station 3 and 15 are offshore stations. Stations 3 and 15 are in the Jabuka pit (260 m) and South Adriatic pit (1190 m) which are two deepest Adriatic pits.

2. MATERIALS AND METHODS

Samples were frozen on board immediately after they were taken from the sea and analysed in the laboratory. Fluoride content was measured by authomatic method with alizarin complexone (Grasshoff, 1965). Sensitivity of the method is 0.006 mg/1.

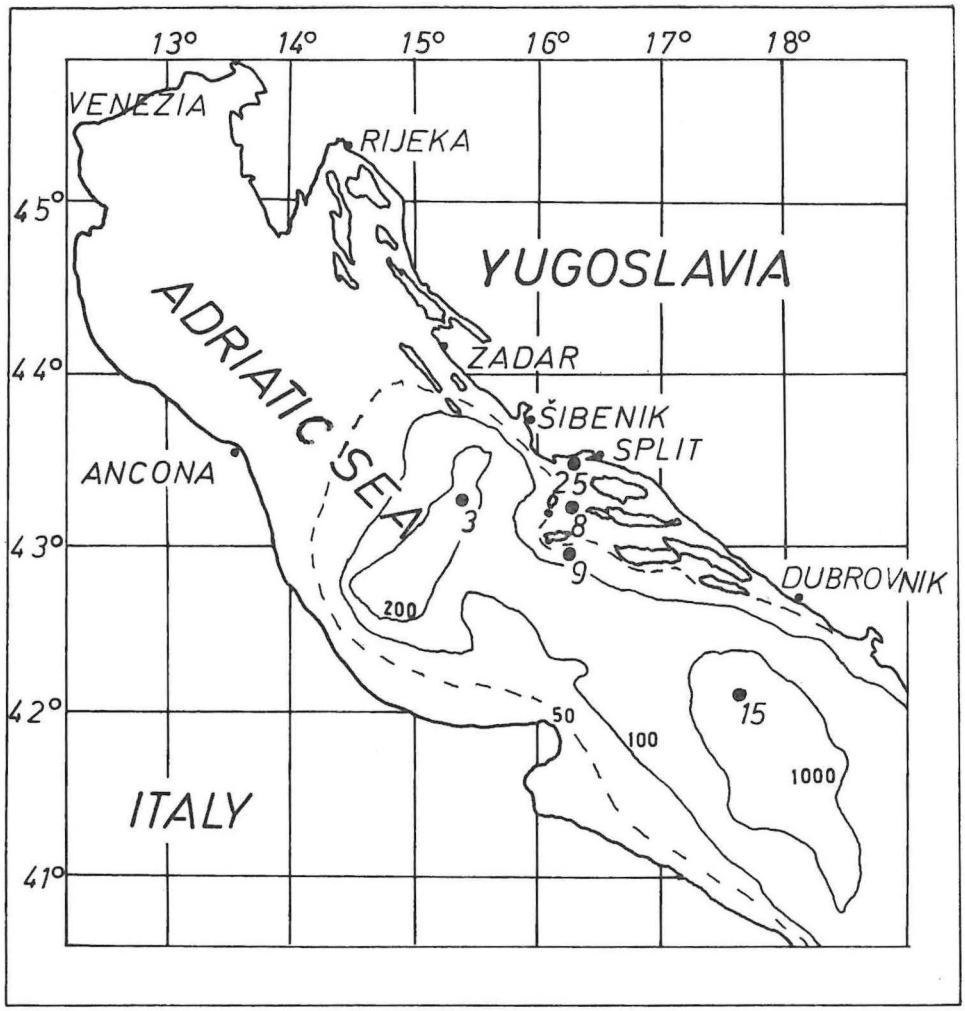

Fig. 1. — Stations locations

3. RESULTS AND DISCUSSION

Monthly, annual, and depth means are discussed. Fluoride and chloride means are given in Tables 1 and 2 added at the end.

Monthly distribution

Figure 2 shows that monthly means of fluoride vary between 1.3 and 1.5 mg/1 and that variations are greater in spring at all three stations. At Station 9, which is known to be the most maritime station along the profile Split —

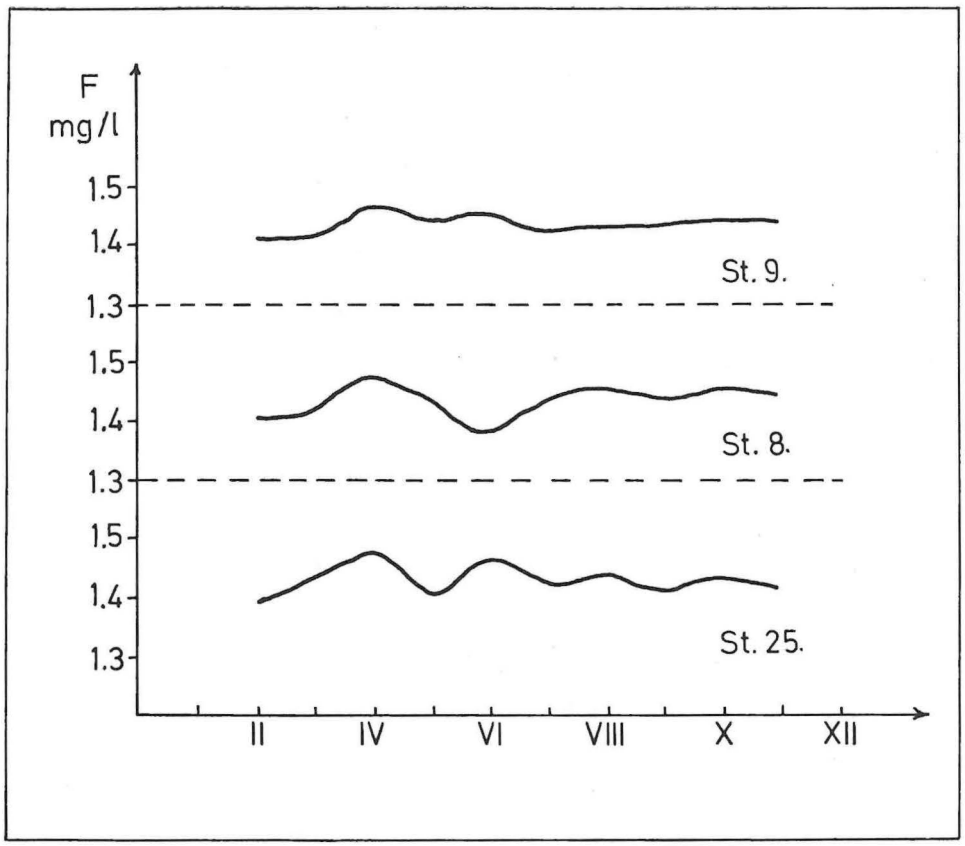

Fig. 2. — Seasonal distribution of fluoride

Monte Gargano, these variations are less than at Station 25 and 8 which are closer to the coast. The source of this feature is most probably in the influence of the coast on the latter two stations.

Vertical distribution

Figures 3 and 4 show fluoride vertical distribution at all the stations. An increase with depth is easily identifiable. Fluoride reached the maximum of 1.491 mg/l at 1190 m deep Station 15. This increase with depth is probably due to the solution of bottom fluoride minerals. The same was recorded from the deeper layers of the Mediterranean and Atlantic as well (R. Greenhalgh, J. P. Riley, 1963).

Ratio F/Cl

Normal fluoride to chloride ratio in the sea is 6.7×10^{-5} (R. Greenhalgh, J. P. Riley op. cit.). Ratios of monthly and depth means are given in Tables 1 and 2.

Monthly means (Table 1) vary to a certain degree. Minimum, 6,572 was recorded from Station 8 in June, and maximum, $7{,}121\times10^{-5}$ from Station 25 in April.

Depth means (Table 2) vary less. This ratio was somewhat higher than normal at all the layers of Station 25. Brackish water in this bay is the most likely cause of this higher ratio values. M a t i d a (1975) examined the effects of fresh water on F/Cl ration in the Gulf of Tokyo and found it higher in diluted seawater than in the oceanic waters. Station 9 showed the properties of the most maritime station in this respect also. The ratio at almost all the layers was closest to the normal. The highest ratio found in deepest parts of the Adriatic may be due to the bottom fluoride solution (op. cit.).

As indicated by the annual means of fluoride and F/Cl ratio (Fig. 5), fluoride content slightly increases (1,418—1,447 mg/1 F) whereas F/Cl ratio decreases ($6{,}842$—$6{,}747\times10^{-5}$) going off the coast.

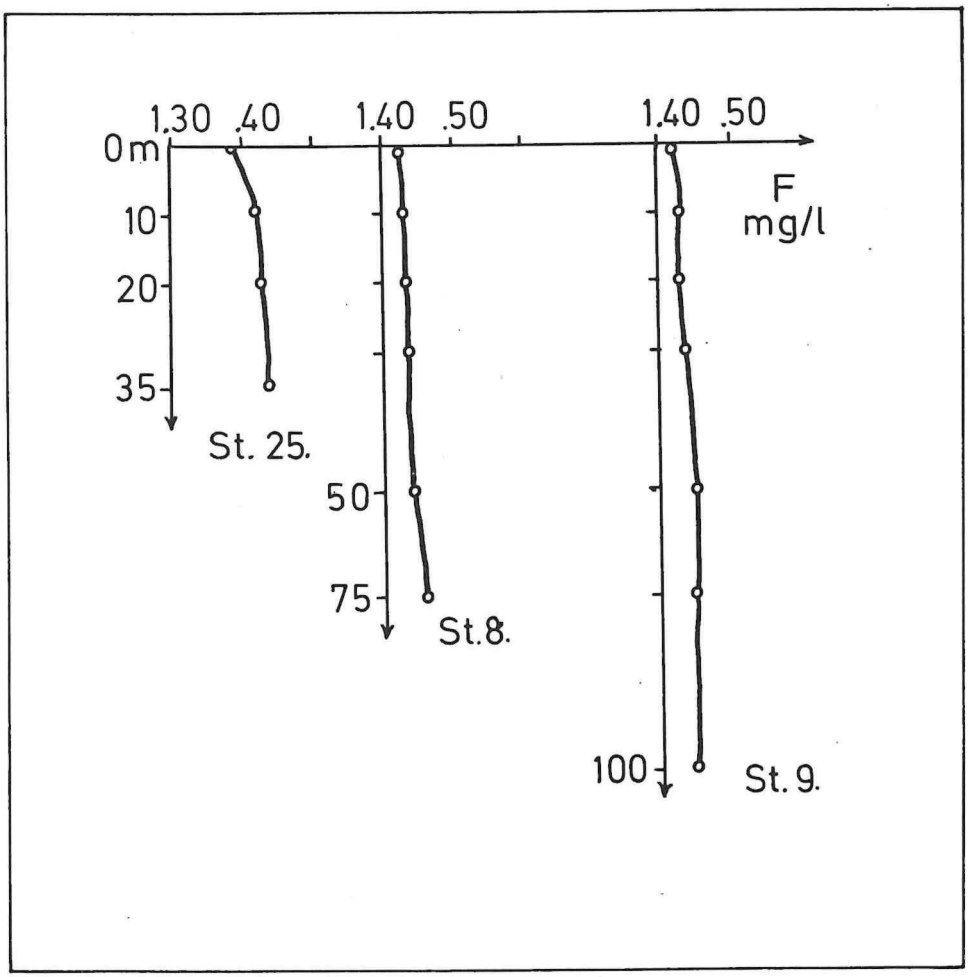

Fig. 3. — Vertical distribution of fluoride

St.	II	III	IV	V	VI	VII	VIII	IX	X	XI
25	6.771	6.905	7.121	6.880	6.649	6.834	6.859	6.740	6.899	6.756
8	6.662	6.720	7.030	6.854	6.572	6.731	6.905	6.789	6.899	6.814
9	6.646	6.635	6.949	6.812	6.876	6.703	6.725	6.781	6.812	6.761
3		6.853			6.712			6.836		
15		6.707			6.748			6.784		

Table 1. Monthly means of F/Cl×10−5

These fluctuations are difficult to account for since the oceanography of this area is rather complex. Namely, each of these stations is under a different influence.

4. CONCLUSIONS

Data on the fluoride content in the central and southern Adriatic are given. Samples were collected from five stations. Each of these stations is under a different influence what is evident from the results.

Maximum, 1,494 mg/1 F was found at depth of 35 m at Station 25 and at 100 m at Station 9. Minimum, 1,318 mg/1 F was recorded at 0 m at Station 25.

Depth	St.25	St.8	St. 9	Depth	St.3	St.15
0	6.835	6.790	6.735	0	6.854	6.709
10	6.883	6.769	6.739	20	6.792	6.656
20	6.820	6.779	6.718	50	6.726	6.706
30	6.832	6.800	6.759	100	6.800	6.751
50		6.805	6.814	300	6.786	6.646
75		6.869	6.790	500	6.859	6.723
100			6.782	1000		6.843
				1190		6.954

Table 2. Means of F/Cl×10−5

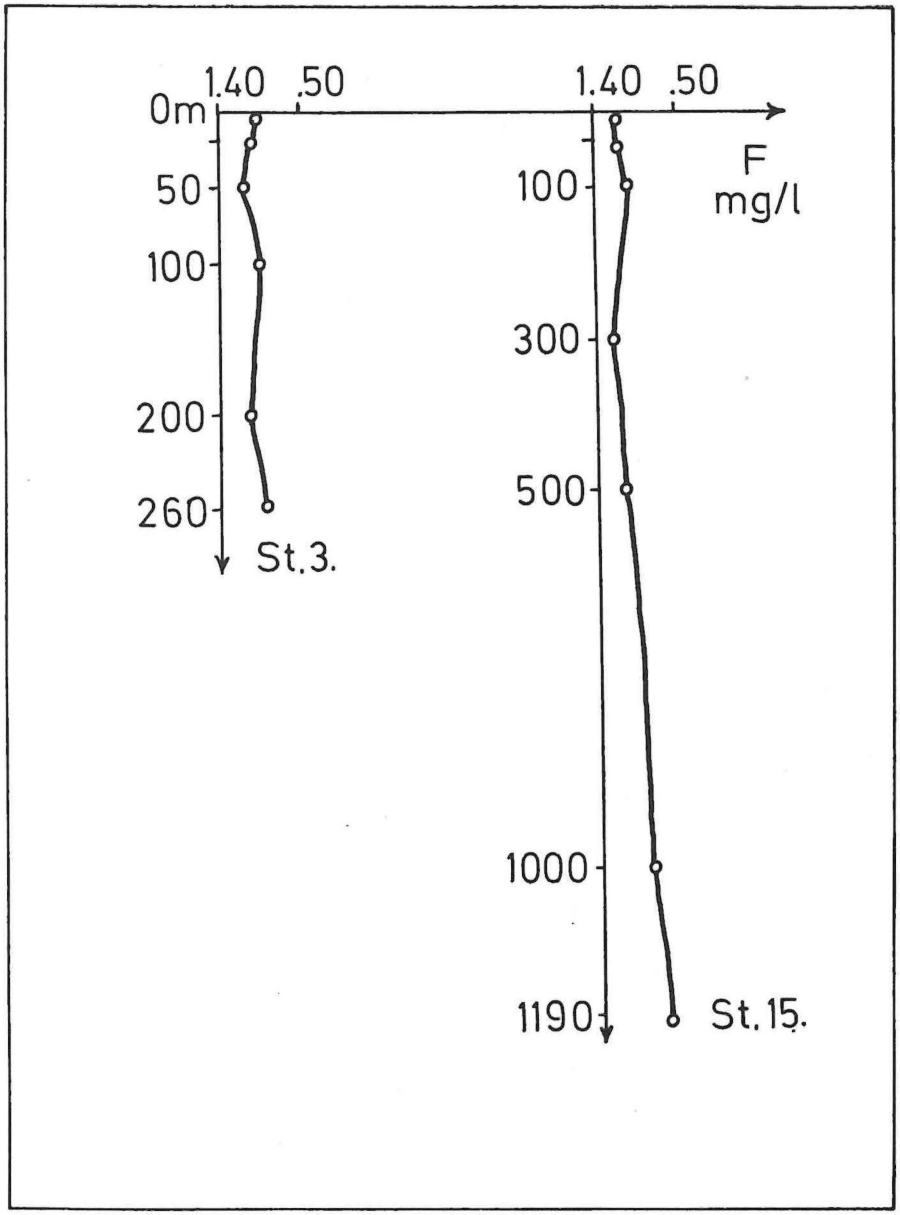

Fig. 4. — Vertical distribution of fluoride

Results are presented in the form of monthly and depth means and F/Cl ratio.

Fluoride content and F/Cl ratio showed that deep Adriatic waters are richer in fluoride. This may be due to the solution of bottom fluoride minerals. The same was reported from some parts of the Mediterranean and Atlantic.

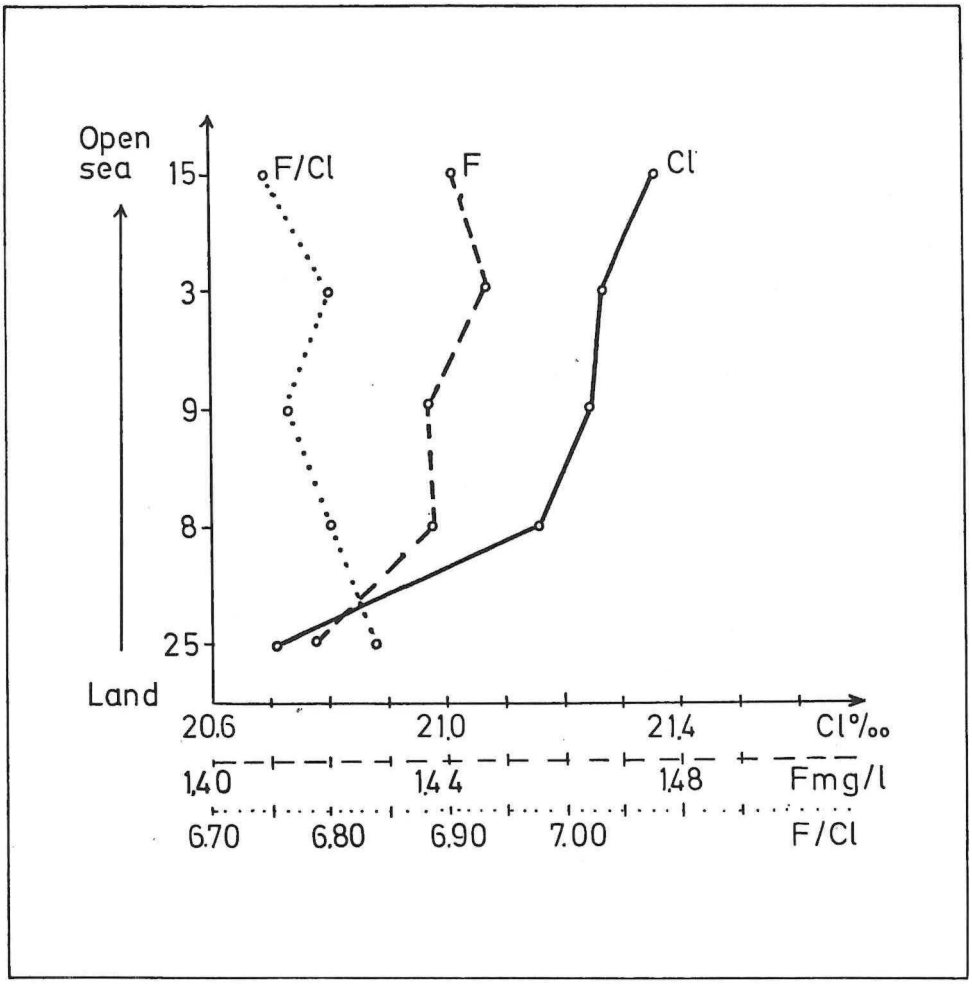

Fig. 5. — Geographic distribution of means of F, Cl and F/Cl ratio

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PRILOG POZNAVANJU RASPODJELE FLUORIDA U SREDNJEM I JUŽNOM JADRANU

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KRATAK SADRŽAJ

U ovom radu po prvi put je ispitivan sadržaj fluorida u Jadranu.

Uzorci su uzimani na pet postaja (25, 8, 9, 3 i 15) u području srednjeg i južnog Jadrana. Na postajama 25, 8 i 9 uzorci su uzimani od februara do novembra a na postajama 3 i 15 u martu, junu i septembru.

U diskusiji je razmatrana mjesečna i vertikalna raspodjela te omjer fluora i klora.

Nađeno je da je maksimalna vrijednost fluorida u ovom području bila 1,494 mg/l a minimalna 1,318 mg/l.

Sadržaj fluorida a i omjer F/Cl je pokazao, da su duboke vode Jadrana bogatije s fluoridima, što je vjerojatno uzrokovano otapanjem fluorida s dna kao što je slučaj u nekim područjima Mediterana i Atlantika.