

SOME ASPECTS OF ECOLOGICAL INVESTIGATIONS IN THE BALTIC SEA

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Among ecological problems of the Baltic basin two of them seem to be the most serious at present.

The first one is connected with significant radioactive pollution of the sea as a result of Chernobyl accident in 1986. The second one is connected with the possible collapse of the flooded chemical ammunition in 1946-47 and with the influx of poisoning chemical substances data, the Cs-137 horizontal distribution into the environment. The results of ecological researches in the Baltic Sea carried out in terms of these two problems in 1996 and 1997 are submitted in this report. As an example, there were estimated the parameters of radionuclide pollution in the surface layers of sea water at 40 stations having been made in the Baltic sea and in the south-east part of the Northern Sea. The same parameters were estimated for water and bottom sediments in the regions of chemical weapons interring.

As it is seen from the submitted radiochemical data, the Cs-137 horizontal distribution (fig. 1) is characterized by spatial fluctuations, the presence of which is explained, first of all, by non-uniform influx of radionuclides into various parts of the Baltic Sea in 1986 and by the absence of intensive exchange between separate areas of the sea.

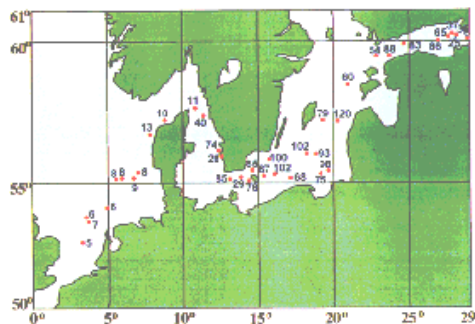


Fig. 1

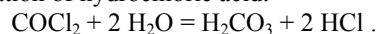
The reduction of activity with depth is a characteristic of Cs-137 vertical distribution in bottom sediment. However, in some samples there were found out the significant variations of activity on various horizons, what may be associated with the different speed of deposits moving in these areas.

The comparison of the received data on Cs-137 specific activity in separate polygons with the results of our previous researches (see table 1) testifies that Cs-137 average content in water monotonously decreases. The received data show that horizontal moving of water weights has resulted by now in washing out of

"spots" with the increased radionuclides activity in superficial layers of the seawater observed in 1986 and 1987. The significant isolation of the Baltic Sea results in the considerably exceed level of Cs-137 concentration in waters of the Baltic Sea against the level of the Northern Sea.

Unlike Cs-137 distribution, the field of Sr-90 concentration in water has not undergone essential changes caused by atmospheric fallouts and the structure of its concentration field is close to that one that were observed in waters of the Baltic Sea up to 1986. Unsufficient speed of the water masses clearing from radioactivity may be explained by the shallow of the Baltic Sea, so as by geochemistry characteristics of the bottom sediments.

The distribution of chemical parameters in superficial layers carries rather uniform character with local variations caused first of all by geographical situation and hydro physical conditions in the areas of sampling. In comparison with "background" polygon, superficial waters in the areas of PS (poison substances) burial places are not marked with significant fluctuations of various parameters. At the same time variation of chloride content is essential. The concentration of chlorides in the bottom layers achieves 11.7 g/l. That is almost half as much again the content of chloride-ions in the bottom layers of background servers. These data can testify that in the regions of dumping there might took place the influx of contaminative substances into the seawater as the process of their hydrolysis leads to the formation of hydrochloric acid:



For the bottom sediments, the deeper levels of a core punch appeared to be the most informative. So, for Liepele burial the X-ray fluorescent data received for horizon of 10-11cm detected significant exceeding of arsenic, which is a compound product of lewisite. The characteristic of Bornholm burial is the heightened content of the elements, which are the components of the ammunition bodies. As it is also seen from the obtained data the level up sediment layers are not marked with significant exceeding of technogenic contaminations. Such exceeding do not appear as in bottom layers so as in silt waters.

While analyzing the received results taking into account geochemical data on sedimentation rate in the Baltic Sea it is possible to believe that the burials of chemical ammunition, which was carried out after the war in the areas of Liepal and Born Holm polygons by immersing of separate shells on the bottom, should not

significantly increase nowadays the ecosystem load. That is connected as with the shielding influence of a covering surface of the bottom deposits, so as with the sorption of various elements and radioactive isotopes by an oozy surface of the bottom sediments.

Quite another picture may be observed near PS burial places in channels Scagerak and Kattogat, as the

ammunition there is in great amounts on board of the flooded vessels. In a case of possible shells depressurization there might be PS volley release that may lead to a considerable pollution of the environment. However, final conclusions on ecological situation in these regions can be made only after conducting full-scale investigations.

Table 1

Years	1986	1987	1989	1990	1996-1997
Regions of the Sea:					
Central part	134 ± 40	131 ± 40	115 ± 45	125 ± 49	100 ± 30
Southeast part	162 ± 48	144 ± 66	145 ± 57	130 ± 52	92 ± 25
Water part waters of Russia	186 ± 60	170 ± 50	126 ± 49	116 ± 45	75 ± 20

Table 2

№	№ St.	Position of Station	Horizont	pH	Cl, g/l	F, g/l
1	33	Gotland burial place	Surface water Deep water	8.2 7.12	5.39 8.29	3.48 3.27
2	34	Gotland background station	Surface water Deep water	7.4 7.51	5.41 6.77	3.35 3.48
3	36	Bornholm burial place	Surface water Deep water	7.91 7.33	6.10 11.26	3.5 4.12
4	37	Bornholm burial place	Surface water Deep water	7.97 7.29	6.81 11.69	4.9 2.05
5	38	Bornholm background station	Surface water Deep water	7.41 7.24	6.56 6.63	3.08 3.15

Table 3

Position of Station	№ St. (deep, m)	Horizon, cm	Sr	Rb	Pb	As	Br	Zn	Cu	Ni	Co	Cr	V	Ba	Fe	Mn	Ti
Gotland background station	34	10-11	100	160	78	26	320	170	<10	48	26	100	42	0.069	3.4	0.030	<0.01
Gotland burial place	33 (120)	10-11	83	220	86	100	230	260	<10	35	36	98	36	<0.01	4.5	0.056	0.35
Bornholm burial place	36 (96)	10-11	210	190	86	20	270	250	<10	67	33	94	95	0.07	4.7	0.31	<0.01
Bornholm burial place	37 (90)	10-11	130	98	64	<10	230	240	<10	36	<5	25	62	0.046	4.7	0.29	0.3
Bornholm burial place	38 (background)	10-11	280	65	65	<10	22	53	<10	18	<5	29	63	0.057	0.95	0.01	0.16