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Expert Group on Monitoring of Radioactive Substances
in the Baltic Sea

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Background

The document contains results of radiological monitoring in the Lithuanian part of the Baltic Sea during 2020.

Action

The Meeting is invited to take note of the information

Results of radiological monitoring in the Lithuanian part of the Baltic Sea during 2020

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The Baltic Sea ecosystem samples for the radiological monitoring were taken in different seasons, water salinity, temperature and total depth in the sampling stations (Fig.1) were measured also.

Radionuclides were determined from the unfiltered sea water. ^{137}Cs activity concentration in samples was measured by gamma spectrometers CANBERRA and ORTEC with the HPGe detector. ^{90}Sr was measured by ^{90}Y emission after radiochemical separation using Multi-Low-Level-Counter FHT 770 T (Thermo ECE).

In 2020, the results of ^{137}Cs concentrations shows the uniformly distribution radionuclide in the surface waters of the Baltic Sea. In the investigated area the concentration changed in the range from 20.0 Bq m^{-3} to 21.9 Bq m^{-3} (Table 1). The average concentration of ^{137}Cs in seawater was the same as last two years – about 20 Bq m^{-3} (Fig. 2). The salinity of surface waters varied from 6.78 ‰ to 7.20 ‰. ^{90}Sr concentration varied in the range 5.38 – 7.69 Bq m^{-3} with the mean value 7 Bq m^{-3} .

In the Curonian Lagoon concentrations of ^{137}Cs radionuclide in all periods below MDA were observed. ^{90}Sr concentrations varied in the range from 2.35 Bq m^{-3} to 4.08 Bq m^{-3} (Table 1). An average value in 2020 is almost the same as in 2019 (Fig. 2).

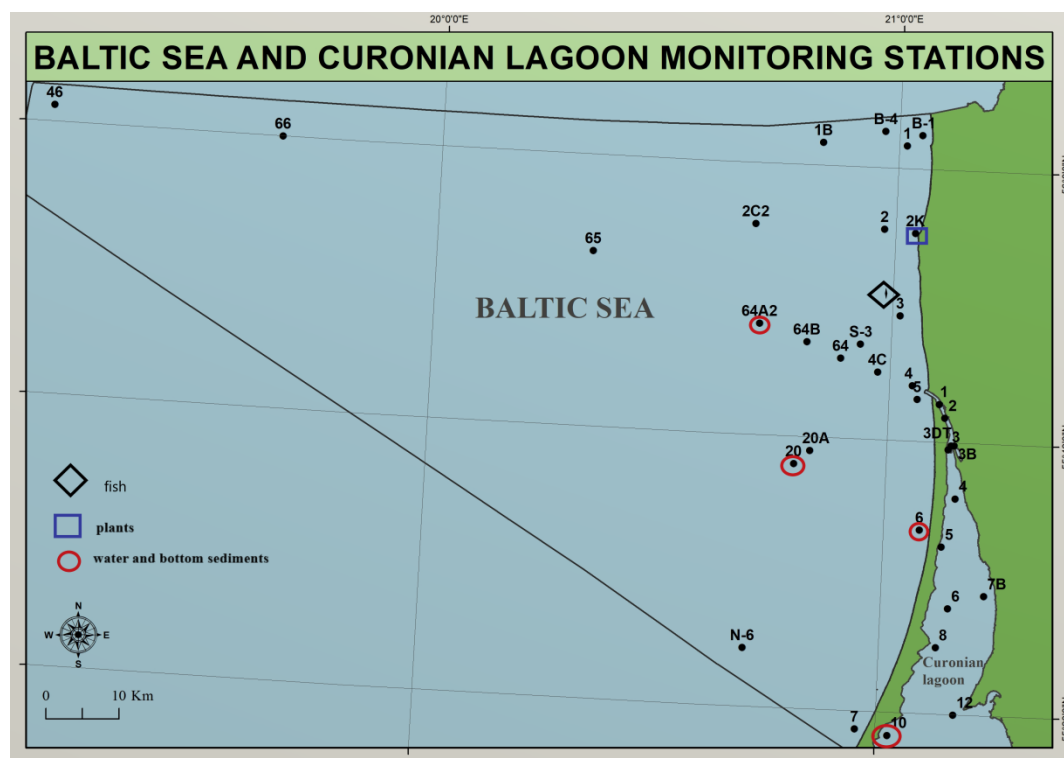


Fig.1 Monitoring stations

Table 1. Activity concentration of radionuclides in surface water

Sampling station	Sampling date	Salinity, ‰	Temperature, °C	¹³⁷ Cs, Bq m ⁻³	⁹⁰ Sr, Bq m ⁻³
Baltic Sea					
LT20	2020-05-25	7,20	9,8	20.3±2.74	5.38±1.23
LT20	2020-08-04	6,81	18,9	20.7±3.40	5.65±1.27
LT20	2020-11-10	6,94	12,1	20.2±3.84	6.39±1.28
LT6	2020-05-25	7,20	11,3	21.9±4.40	7.69±2.19
LT6	2020-08-04	6,81	18,8	20.7±5.42	7.54±1.56
LT6	2020-11-10	6,94	11,1	21.2±2.92	-
LT64A2	2020-08-05	6,78	19,1	20.0±4.30	7.59±1.54
Curonian Lagoon					
LTK10	2020-02-07	0,31	2,7	<4.27	2.35±1.00
LTK10	2020-05-05	0,25	12,4	<4.11	3.97±1.15
LTK10	2020-08-24	0,24	21,6	<4.11	4.08±1.40

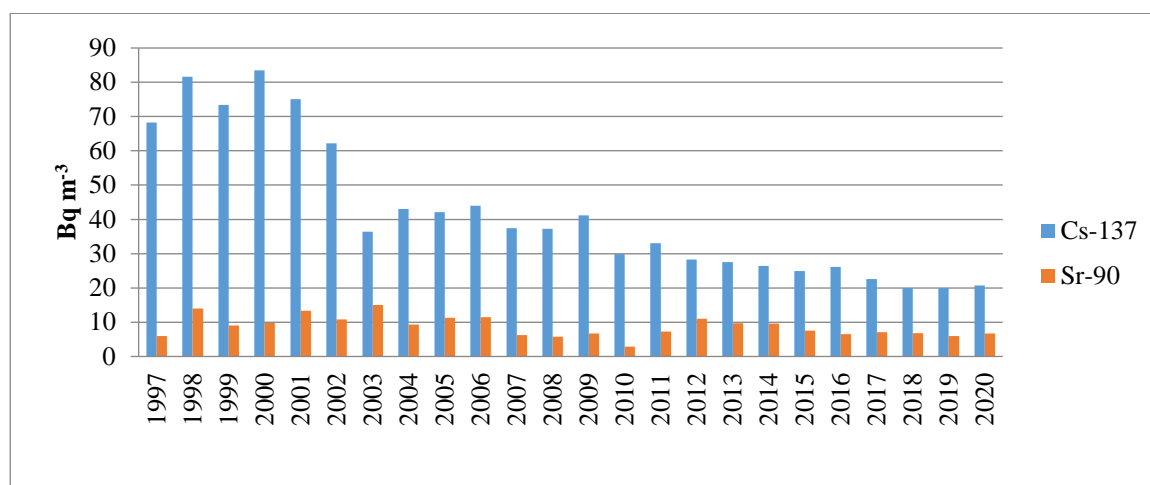


Fig.2 Annual averages of activities of ¹³⁷Cs and ⁹⁰Sr in surface water in the Lithuanian part of the Baltic Sea 1997-2020

¹³⁷Cs concentrations in the bottom sediments of the Baltic Sea changed in the range from 1.41 Bq kg⁻¹ to 21.3 Bq kg⁻¹ (Table 2). The highest concentrations of radionuclide in the Curonian Lagoon muddy sediments were observed (Fig.3). ⁹⁰Sr concentrations in the bottom sediments of the Baltic Sea and the Curonian Lagoon were similar (Table 2). (Fig. 4).

In macrophytes (*Furcellaria lumbricalis*) ¹³⁷Cs concentration was almost the same as in 2018 - 5.28 Bq kg⁻¹ (Fig.4).

In fishes ¹³⁷Cs concentration did not exceed 3 Bq kg⁻¹ (Table 4).

Table 2. Specific activity of radionuclides in bottom sediments

Sampling stations	Total depth, m	Sampling date	^{137}Cs , Bq kg $^{-1}$	^{90}Sr , Bq kg $^{-1}$
Baltic Sea				
LT20	45	2020-05-25	1.41±1.70	1.59±0.89
LT20	45	2020-08-04	12.9±0.49	7.48±1.71
LT6	13	2020-05-25	8.58±0.91	1.76±0,85
LT6	13	2020-08-04	8.69±0.91	<1.40
LT64A2	41	2020-08-05	21.3±2.28	<1.34
Curonian Lagoon				
LTK10	3.8	2020-05-05	42.9±4.51	2.85±1.08
LTK10	3.7	2020-08-24	47.1±5.01	5.89±1.42
LTK10	4.2	2020-11-11	46.9±1.76	1.76±1.10

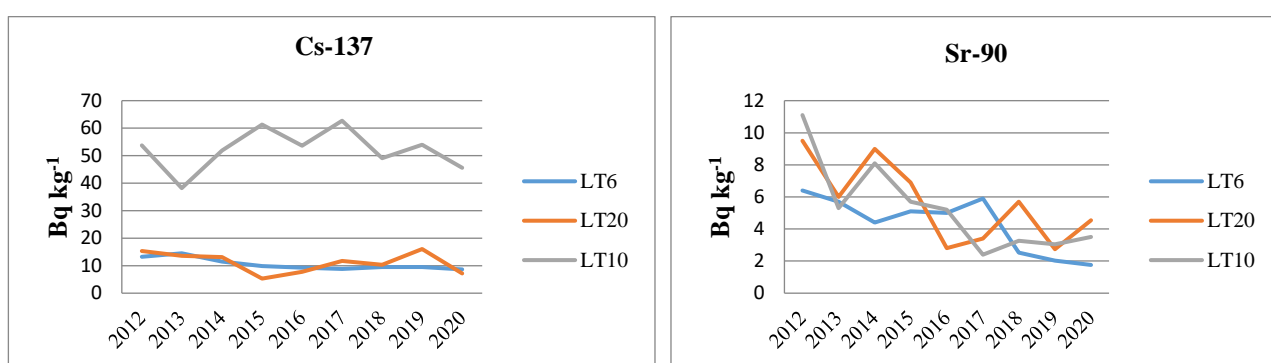


Fig.3 Annual averages of activities of ^{137}Cs and ^{90}Sr in the Baltic Sea and the Curonian Lagoon bottom sediments 2012-2020

Table 3. Specific activities of radionuclides in plants

Sampling station	Sampling date	^{137}Cs , Bq/kg (d.w.)	^{90}Sr , Bq/kg (d.w.)	^{40}K , Bq/kg (d.w.)
<i>Furcellaria lumbricalis</i>				
LT2K	2020-11-05	5.28±0.948	1,81±0.94	206±27.5

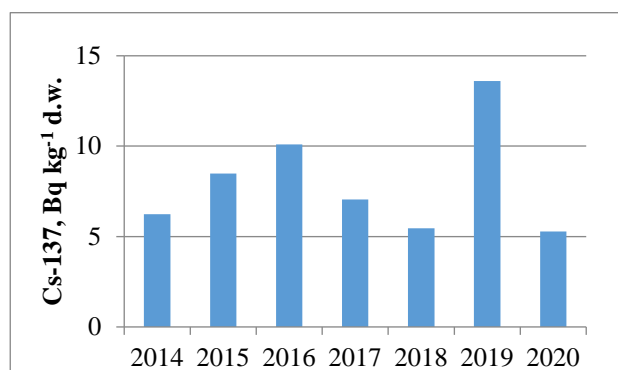


Fig.4 Concentration of ^{137}Cs in plants (*Furcellaria lumbricalis*)

Table 4. Specific activities of radionuclides in fish

Coordinates	Sampling date	^{137}Cs, Bq/kg (w.w.)	^{40}K, Bq/kg (w.w.)
<i>Baltic herring</i>			
55°46'60.00"N 20°56'0.00"E	2020-09-16	2.69±0.329	108±11.5
<i>Flounder</i>			
55°46'60.00"N 20°56'0.00"E	2020-09-16	2.15±0.760	91.8±17.4
<i>Cod</i>			
55°46'60.00"N 20°56'0.00"E	2020-09-16	2.51±0.310	89.2±9.63