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Impact assessment of the Fukushima Nuclear Power Plant accidental emission on the Barents Sea ecosystem

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The traces of emissions from the Fukushima-1 NPP in atmospheric aerosols of the Kola Peninsula near the Barents Sea coast were detected by radiation monitoring stations of the Murmansk Division of the Hydrometeorological Survey MDHMS in the end of March 2011. From the end of March 2011 until April 20, ^{131}I, ^{134}Cs, ^{132}Te, ^{137}Cs radioisotopes were observed in the atmospheric air. The major role was played by ^{131}I isotope; its peak concentrations were (140-220)$\times 10^{-6}$ Bq/m^3, and it was recorded for several days (March 30-April 1), then radioactivity decreased. ^{134}Cs, ^{132}Te, and ^{137}Cs isotopes were recorded episodically.

The supply of radionuclides from accidental emissions into the atmosphere of the Kola Peninsula did not cause significant changes in gamma-radiation dose rates EDR. This value remained within the limits of the average long-term norm, and continued so during the following months 2011.

Possible dry and humid precipitation of radionuclides within the water catchment area and in the marine basin did not influence on radioecological state in both coastal and off-shore parts of the Barents Sea. Short-lived isotopes as ^{131}I, ^{134}Cs, and ^{132}Te, which might confidently indicate a trace from the Fukushima-1 NPP, have not been recorded in the samples.

In 2011-1012 volumetric activity of ^{137}Cs and ^{90}Sr in water of the Barents Sea (section VI along the meridian 33˚30' N) varied in the range of 1.3–2.5 and 3.4–6.3 Bq/m^3, respectively.

Radioactive contamination of bottom sediments in the Barents Sea was very low. The specific activity of ^{137}Cs varied from 1 to 8 Bq/kg, the activity of ^{90}Sr did not exceed 4 Bq/kg.

Investigations of macrophyte algae showed extremely low concentrations of artificial radionuclides. The specific activity of ^{137}Cs in most samples was at the level of trace concentrations, from 0.2 to 1.5 Bq/kg of dry mass. The content of ^{90}Sr in algae changed in the range of 0.4–4.1 Bq/kg of dry mass.

In soft tissues of bivalves *Mytilus edulis* collected on littoral of bays, the specific activity of ^{137}Cs did not exceed the trace quantity as well (less than 0.5 Bq/kg of raw mass).

The latest radioecological studies of the Barents Sea commercial fish showed that all investigated species (such as Atlantic cod, long rough dab, spotted wolffish) contain less than 0.2 Bq/kg of ^{137}Cs.

Thus spectrum of artificial radioisotopes and their radioactivity level in both abiotic and biotic components of the Barents Sea ecosystem have not changed after the Fukushima accident. Compared to the data of recent years, these characteristics are stable; within the background limits owing to the global circulation of radionuclides.

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