**Assessing marine pollution in the Black Sea: radionuclide dynamics in marine biota and sediments**

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SCIRENA (SCience and Information towards Regional ENvironmental Action for the Black Sea) is a collaboration between Bulgarian and Norwegian environmental authorities aimed at enhancing marine pollution monitoring in Bulgaria. Supported by funding from the EEA and Norway Grants, this project ensures compliance with EU legislation that mandates high environmental standards in Bulgarian waters. Given the heightened risks of marine pollution due to the Ukraine war, SCIRENA's findings will assist Bulgaria and its neighbors in addressing pollution and improving food safety in the Black Sea region. The project emphasizes capacity building and knowledge exchange on EU monitoring requirements under the Marine Strategy Framework Directive (MSFD).

In 2023 and 2024, the SCIRENA project conducted research cruises along the Bulgarian coastline and in deep waters, evaluating seafloor habitats and a range of pollutants in marine biota and sediments. This study focuses on anthropogenic and natural radionuclides.

Activity concentrations of the anthropogenic radionuclide cesium-137 (137Cs) in pooled samples of seven fish species ranged from below the detection limit to 0.59±0.06 Bq/kg fresh weight (fw) in Mediterranean horse mackerel (*Trachurus mediterraneus*). The results show a correlation between feeding habits, trophic level and the content of 137Cs. The levels of 137Cs are significantly below safety guidelines for food and pose no risk to marine life or human health.

In 36 surface sediments from depts between 12.5 and 97.8 m, 137Cs concentrations ranged from below detection limits to 90 Bq/kg dry weight (dw), primarily sourced from fallout from nuclear weapons testing and the Chornobyl accident in 1986. The highest concentration was found at the deepest station (97.8 m) off southern Bulgaria. Natural radionuclide levels (radium-226 (226Ra), radium-228 (228Ra), thorium-228 (228Th)) ranged from below detection limits to 40 Bq/kg dw, except for one coastal sample with a 226Ra concentration of 79 Bq/kg, potentially due to local phosphate production. Additionally, potassium-40 (40K) levels range from 158 to 926 Bq/kg dw. Overall, these levels align with other data from this area, though recent information is limited. Four sediment cores from depths between 74.8 and 915 m were analyzed for 137Cs, 226Ra 228Ra, 228Th, 40K and lead-210 (210Pb). The latter was determined to facilitate 210Pb-dating. Due to low radionuclide levels and a disturbed 210Pb-profile, dating was successful for only one core. The sediment cores show no recent increase in 137Cs levels.

This study examines geographical and temporal trends of radionuclides in Bulgarian sediments and their correlations with Total Organic Carbon (TOC), sediment grain size, and metals like iron (Fe), manganese (Mn) and aluminum (Al). The results provide a comprehensive update on the prevailing levels of radioactive contamination in the western part of the Black Sea, highlighting ongoing environmental challenges.