1–5 Investigation of the Concentrations of Radionuclides in Seabed Sediments

— The Spatial Distribution of Radionuclides in Seabed Sediments off the Ibaraki Coast —

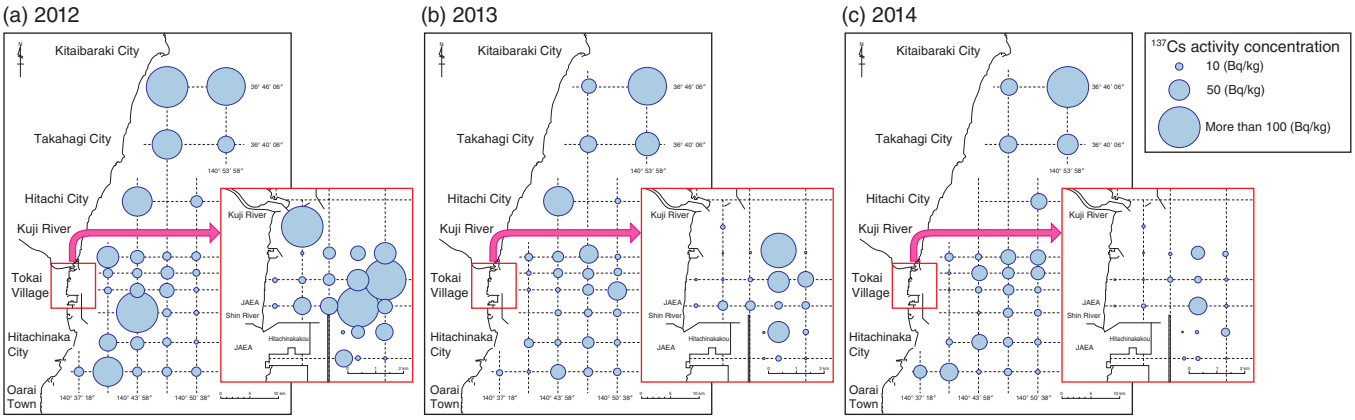

Fig.1-12 Time series of ^{137}Cs concentrations in seabed sediments off the Ibaraki coast
Starting in 2012 and continuing for the next two years, we collected 51 seabed sediment samples in coastal regions from Kitaibaraki City to Oarai Town in Ibaraki Prefecture, spreading approximately 50 km north to south and approximately 20 km offshore. ^{137}Cs radioactivity concentrations are indicated in 2012 (a), 2013 (b), and 2014 (c) by circle size. Thus, we could understand the distributions and time series of the ^{137}Cs radioactivity concentrations.

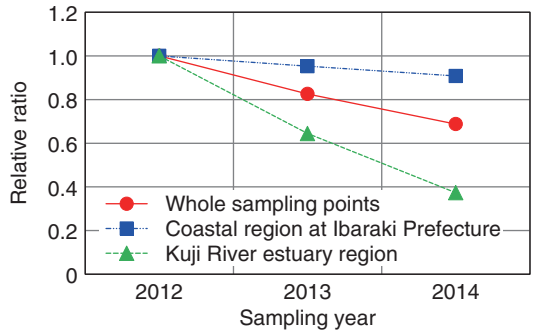

Fig.1-13 Time series of ^{137}Cs concentrations in seabed sediments
Time series of radioactivity concentrations in 2013 and 2014 are indicated, and are normalized to unity for the concentrations in 2012. Concentrations were averaged using the whole data of sampling points and two divided datasets for the coastal region at Ibaraki Prefecture and the Kuji River estuary region.

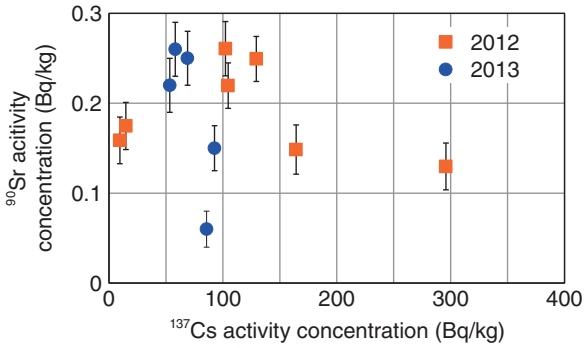

Fig.1-14 The relationship between ^{137}Cs and ^{90}Sr concentrations in seabed sediments
We investigated the correlation between ^{137}Cs and ^{90}Sr concentrations in seabed sediments collected in 2012 and 2013 using samples with higher ^{137}Cs concentrations.

Various radionuclides were discharged into the environment by the accident at the TEPCO's Fukushima Daiichi NPS (1F). We have continuously investigated the radioactivity concentrations in seabed sediment, seawater, and marine organisms on the Ibaraki coast from before the accident to the present time, and confirmed that the concentrations were influenced by the accident at 1F. Therefore, to estimate the influence in detail, we studied the radioactivity concentrations of cesium-134 (^{134}Cs), cesium-137 (^{137}Cs), strontium-90 (^{90}Sr), and plutonium (^{238}Pu and ^{239,240}Pu) in 51 dried seabed sediment samples collected in the coastal regions of Ibaraki Prefecture.

We collected seabed sediment at the same points for three years during May–July 2012, June–July 2013, and May–July in 2014 and determined ^{134}Cs and ^{137}Cs concentrations. Then, ^{90}Sr and Pu were analyzed using seabed sediments with higher ^{137}Cs concentrations.

Fig.1-12 shows time series of ^{137}Cs concentrations over three years. Most concentrations decreased overall with time. The highest ^{137}Cs concentration in 2012 was approximately 100 times higher than the values (about 1 Bq/kg) observed before the accident but decreased to several tens of times higher than those values in 2013 and 2014. Some ^{137}Cs concentrations decreased to the level they had had prior to the accident in 2014. We investigated the decreasing tendency of ^{137}Cs concentrations for three years and found that there were different tendencies among the sampling points, especially between the coastal region (30 points) at Ibaraki Prefecture and the Kuji River estuary region (21 points), as shown in Fig.1-13. We suggest that the difference could have been caused by influence of geographical features and particle size in the sediment and so on.

The ^{90}Sr-concentrations ranged from ND (not detected) to 0.26 Bq/kg in 2012 and 2013. Moreover, we found no correlation between ^{137}Cs and ^{90}Sr concentrations in this study (Fig.1-14). Therefore it seemed that the influence of ^{90}Sr concentration was smaller than those of the ^{134}Cs and ^{137}Cs concentrations because of the accident in the seabed sediments off the Ibaraki coast. Moreover, Pu concentrations were very low and no influence of the accident was recognized in this study.

We will continue to investigate the influence of the accident on environmental monitoring in the regions.

Reference

Nagaoka, M. et al., Spatial Distribution of Radionuclides in Seabed Sediments off Ibaraki Coast after the Fukushima Daiichi Nuclear Power Plant Accident, Journal of Radioanalytical and Nuclear Chemistry, vol.303, issue 2, 2015, p.1305–1308.