国家海洋环境监测中心

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Assessment on marine environmental impact from artificial radionuclides in the coastal waters of Liaodong Bay

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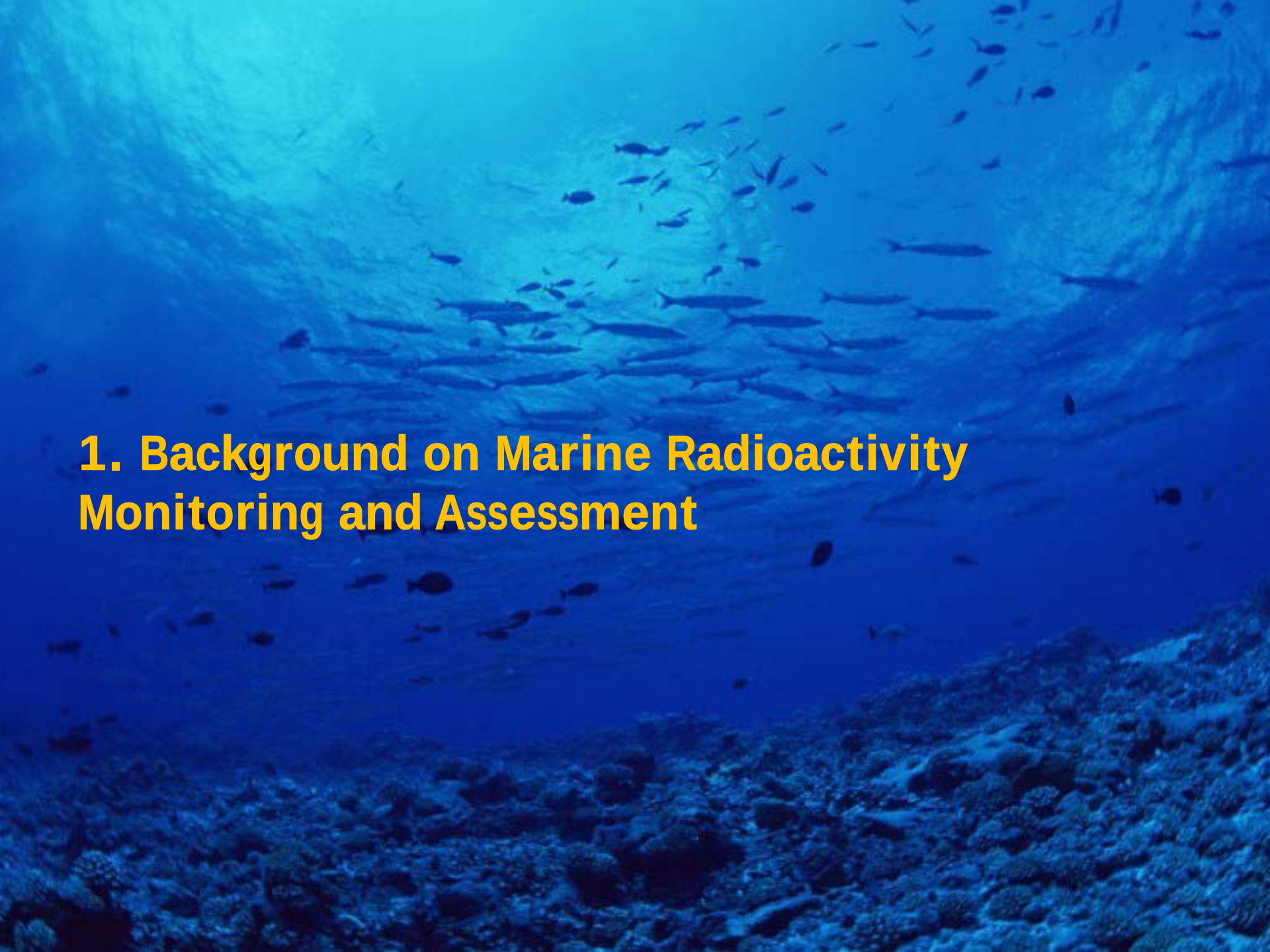
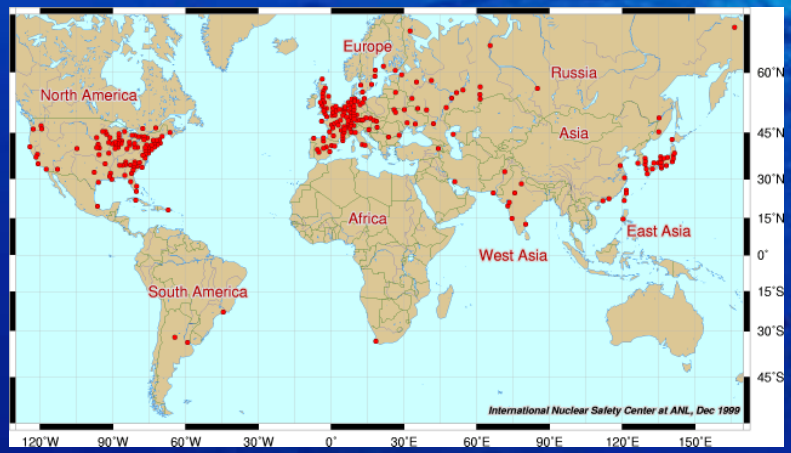
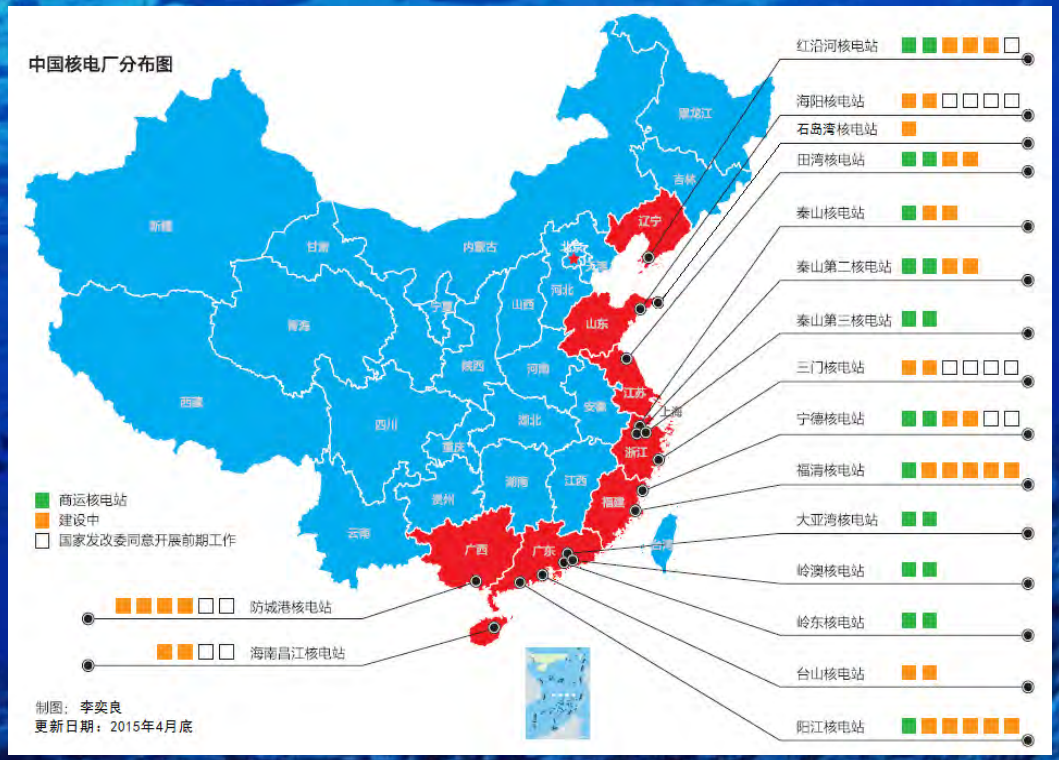


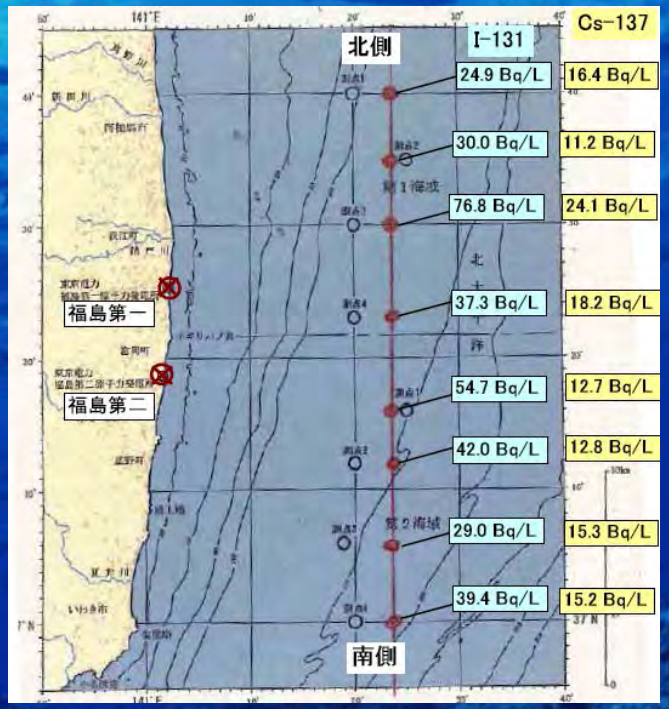
1. Background on Marine Radioactivity Monitoring and Assessment

Worldwide Distribution of Nuclear Power Plants（NPP）

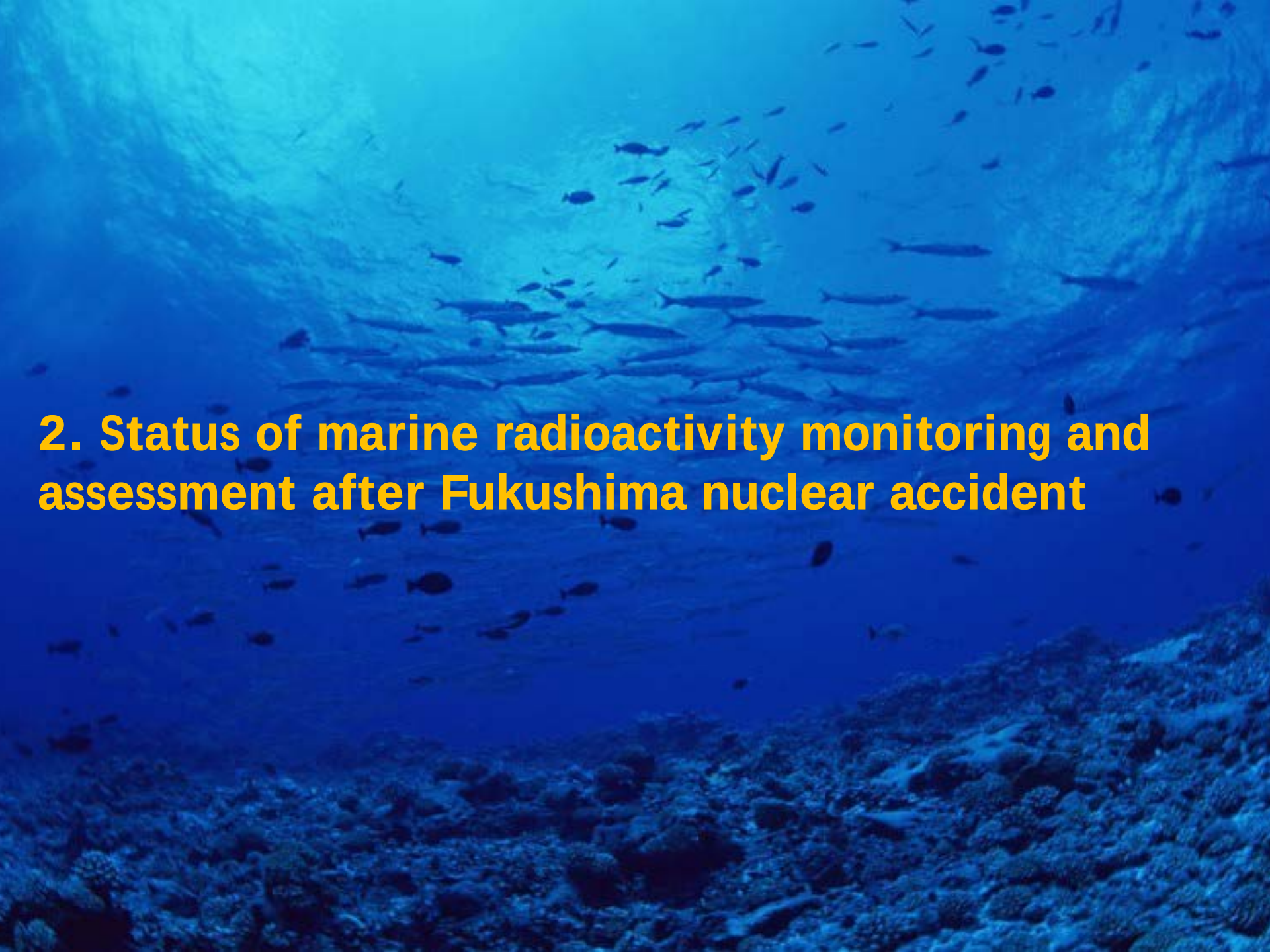




Effect of the accident at Fukushima NPP



- Accident caused massive amount of radionuclides leaking into the sea;
- Total quantity of leaked radioactivity matter published by Japanese Authority is 630 thousand trillion Bq.



2. Status of marine radioactivity monitoring and assessment after Fukushima nuclear accident

Japan

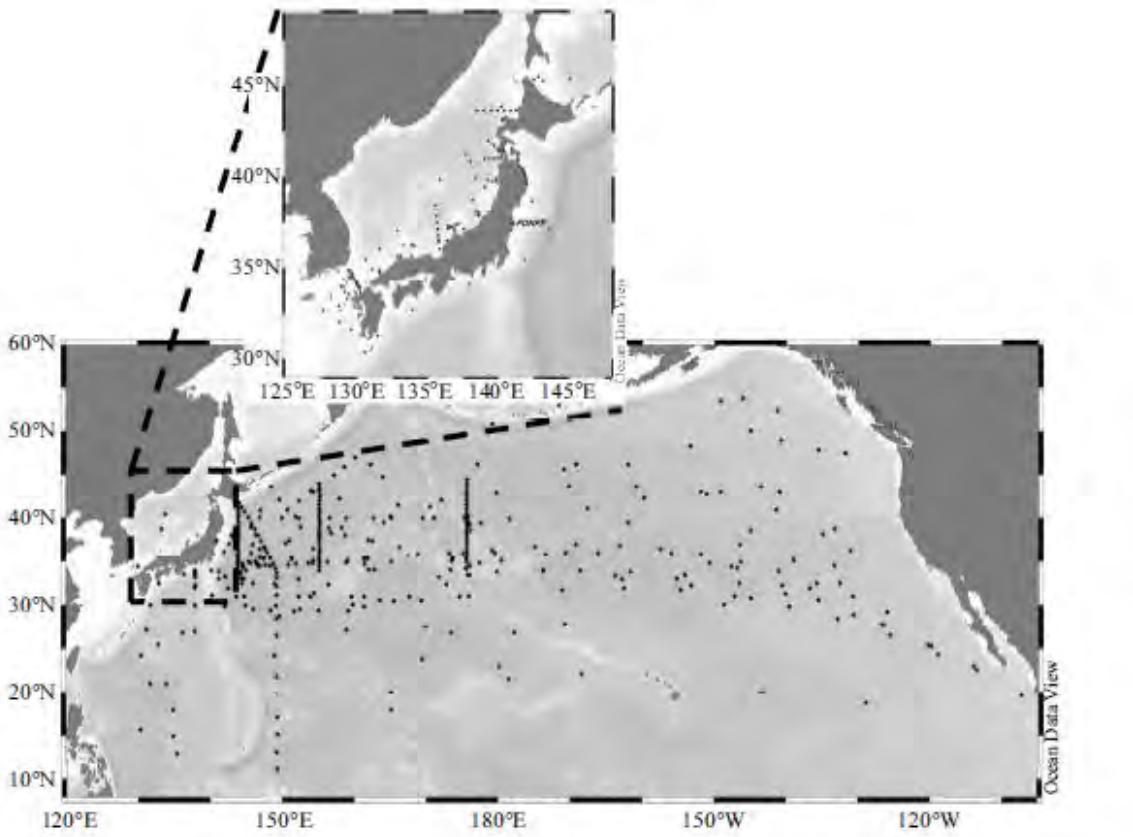


图 1 福岛核事故后日本在近岸及北太平洋监测站位空间分布

Fig.1 Radioactive monitor stations near the coast of Japan and Pacific Ocean after the FNA (Data from Japan)

- In the early days after FNA, near-coast Cs-137 activity peaked at 6.8×10^6 Bq/m^3 ;
- In the later stages, open-water Cs-137 activity as high as 10 Bq/m^3.

(Inoue M et.al, 2012,2013; Oikawa S et.al, 2013; Kumamoto Y et al, 2013,2014)

(LIN Wuhui et.al, 2015)

USA

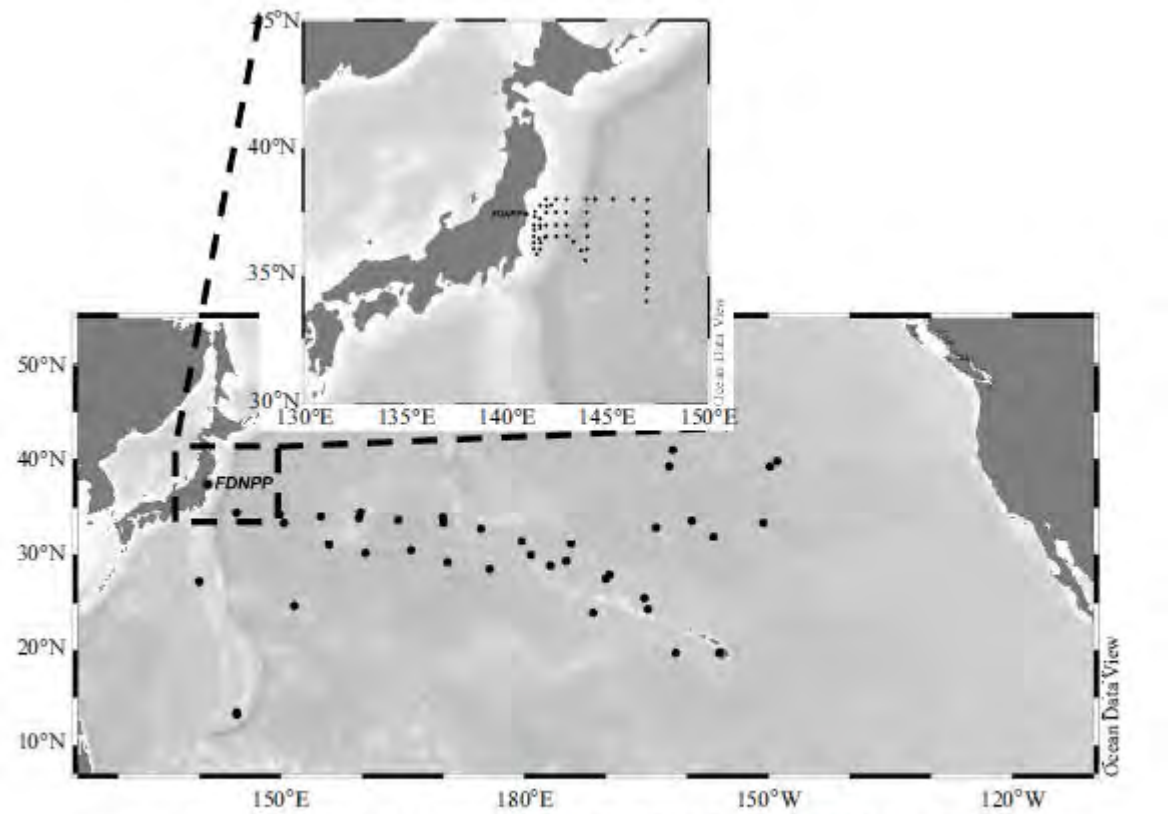


图 2　福岛核事故后美国等开展的海洋放射性监测站位空间分布

Fig.2　Radioactive monitor stations in the North Pacific Ocean after the FNA (Data from the USA)

- Two years after FNA, Hawaii's surrounding waters recorded Cs-137 activity range at 1~4Bq/m^3, 2~3 times higher than pre-FNA level.

(Povinec P et.al, 2013; Buesseler K O et.al, 2012; Kamenik J et.al, 2013)

(LIN Wuhui et.al, 2015)

Korea

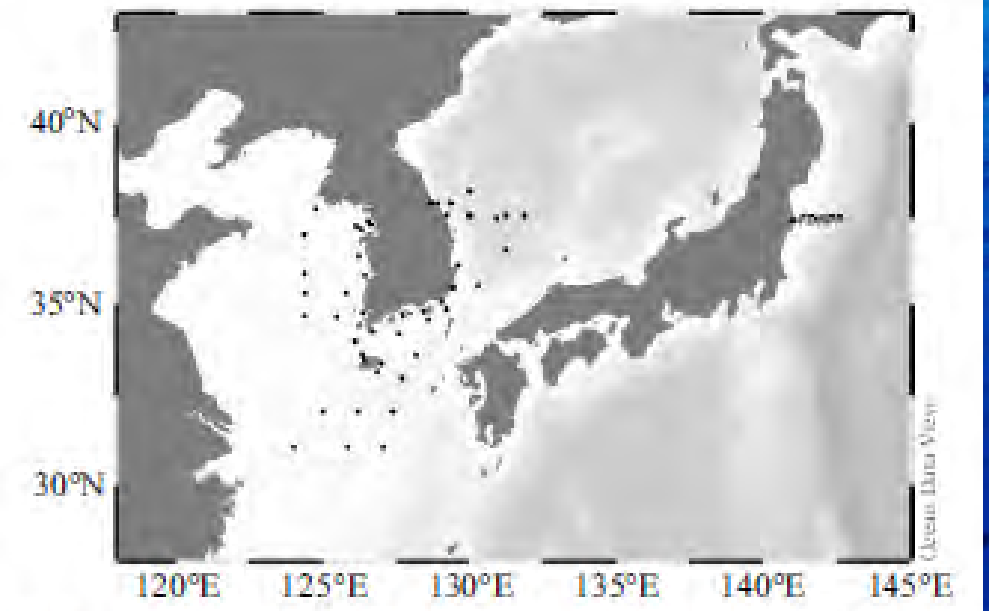


图 3　福岛核事故后韩国海洋放射性监测站位空间分布

Fig.3　Radioactive monitor stations of Korean after the FNA

- No radionuclide signal from FNA had been observed in the coastal waters of Korea during March to July 2011.

(Kim C-K et.al, 2012)

(LIN Wuhui et.al, 2015)

Russia

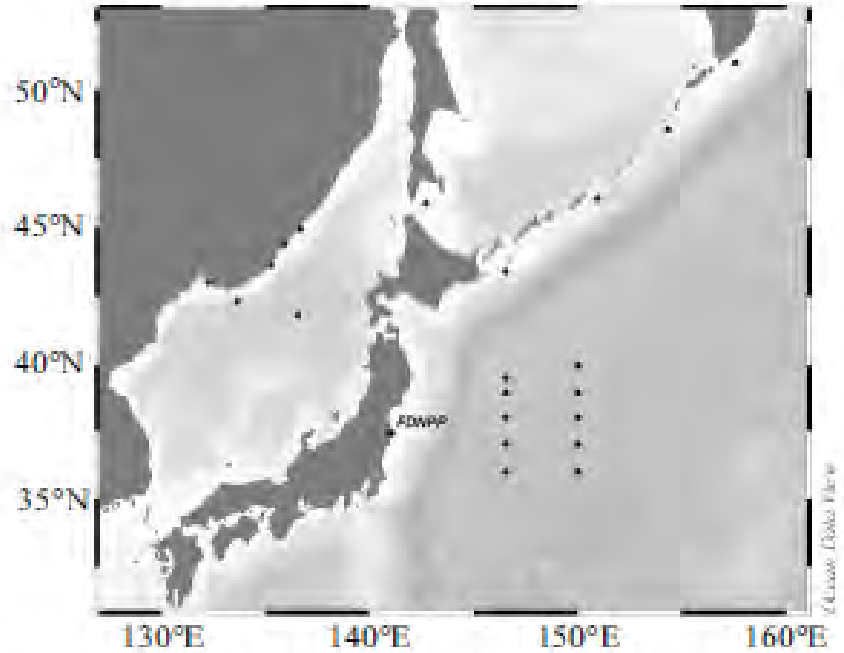


图 4　福岛核事故后俄罗斯海洋放射性监测站位空间分布

Fig.4　Radioactive monitor stations of Russia after the FNA

(LIN Wuhui et.al, 2015)

- Cs-137 inventory in waters to the east of Japan is 4.6 times higher than pre-FNA level.

(Ramzaev V et.al, 2014)

China

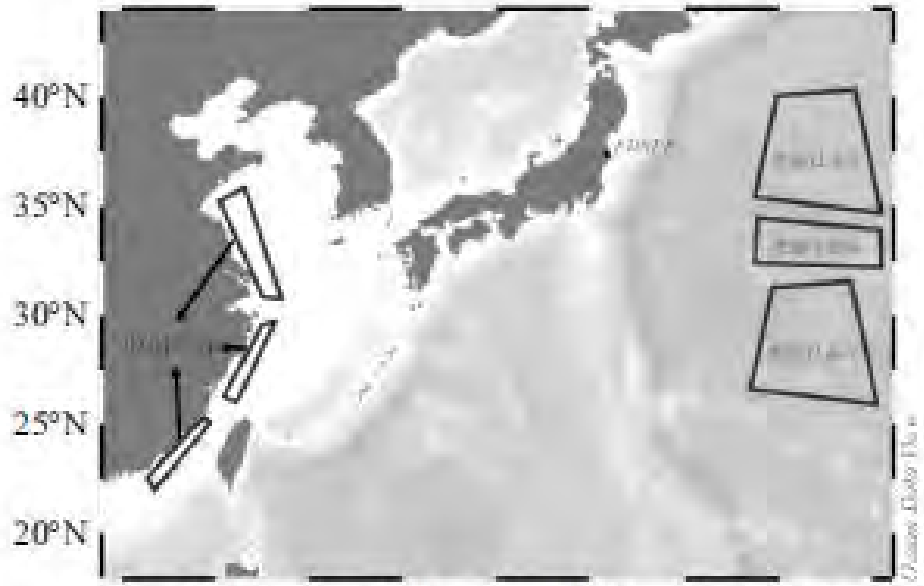


图 5　福岛核事故后中国海洋放射性监测区域

Fig.5　Radioactive monitor regions of China after the FNA

(LIN Wuhui et.al, 2015)

- No radionuclide signal from FNA has been detected so far in China's coastal waters.

(Wu J et.al, 2013)

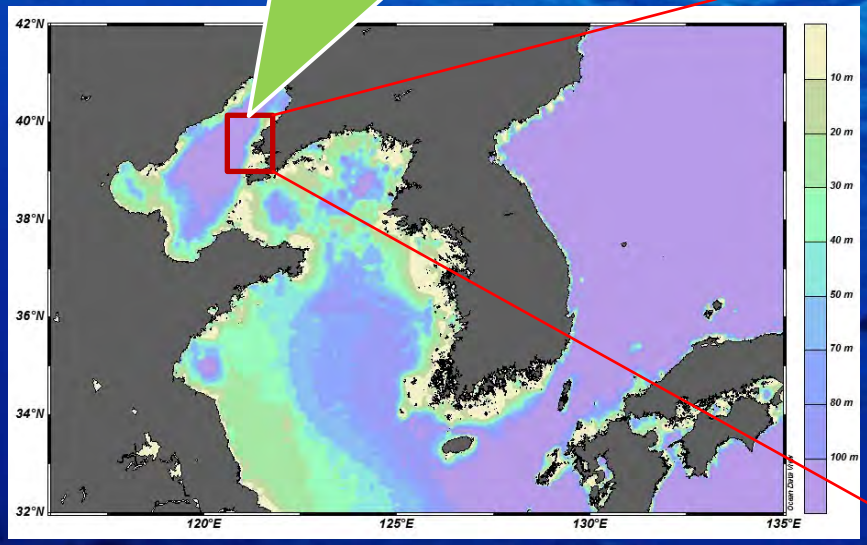
Summary

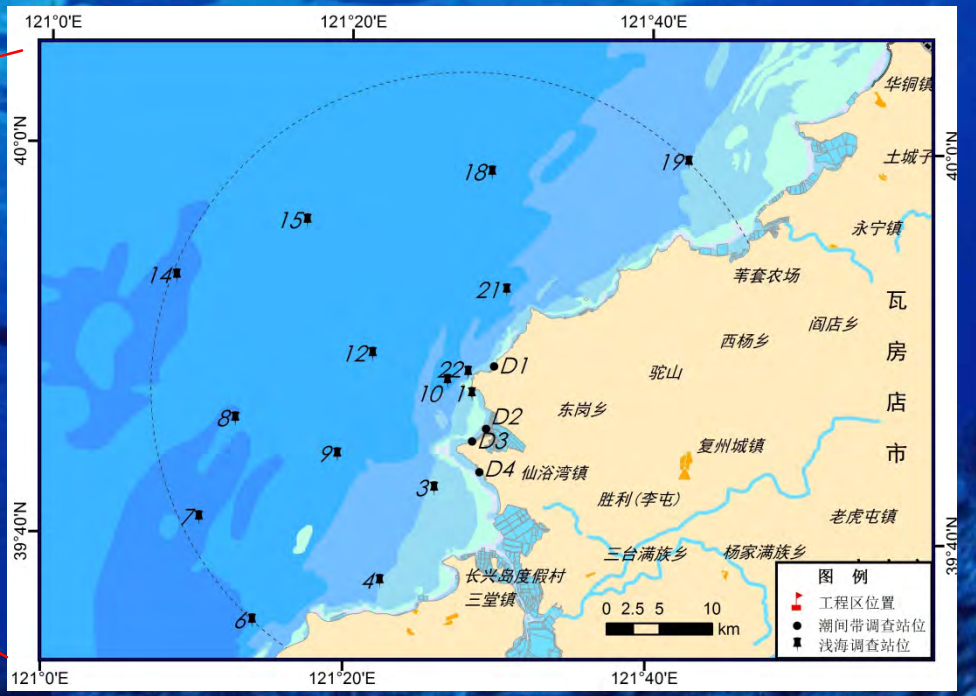
1. Radioactive materials from FNA migrated and dispersed along horizontal and vertical directions, contamination radius kept increasing, while radionuclide activity kept decreasing due continuous dilution;
2. The highest level of Cs-137 activity in open ocean waters is around 10Bq/m^3, apparently higher than pre-FNA Cs-137 base level in North Pacific waters, which was around 1~2Bq/m^3 ;
3. Cs-137 activity in North Pacific waters is far lower than the limit specified by different countries.

3. Radioactivity Monitoring in coastal waters of Liaodong Bay

Study area and stations

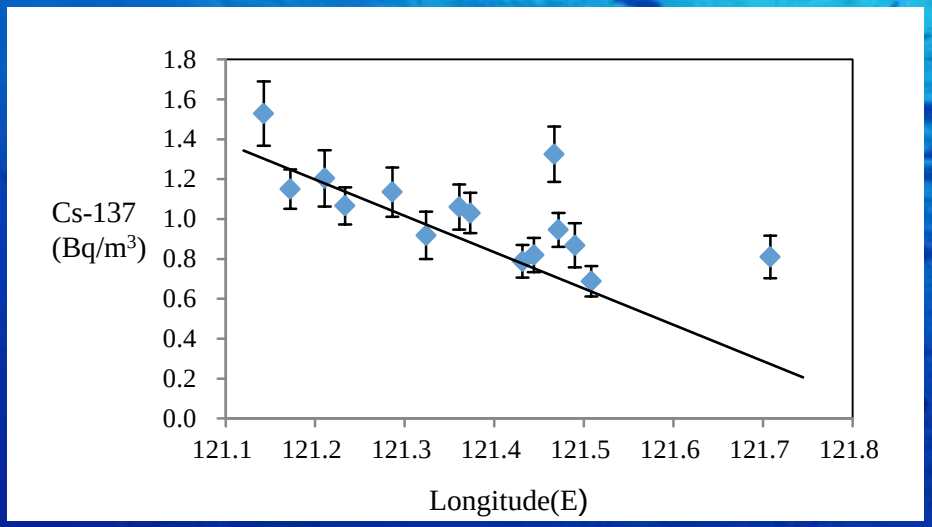
Liaodong Bay, located in Bohai sea

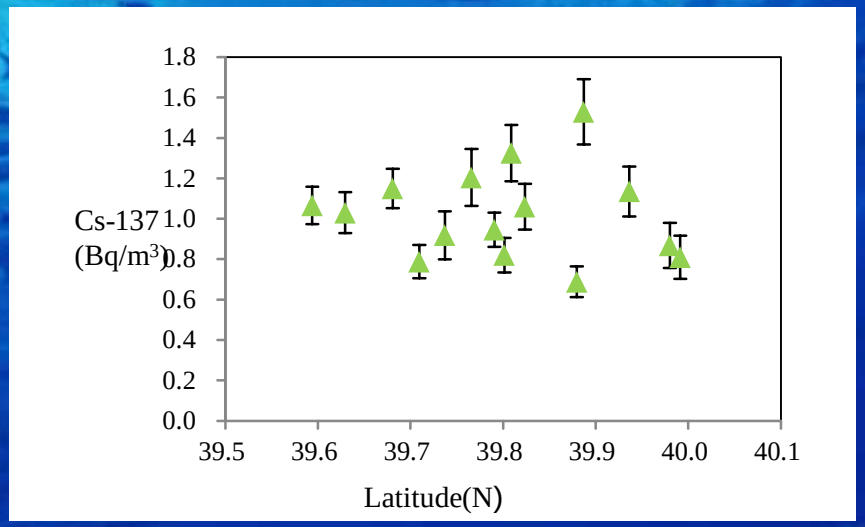




- Samples: 15 surface water, 9 surface sediment, 1 fish sample of a dominant species
- Time: May 2014

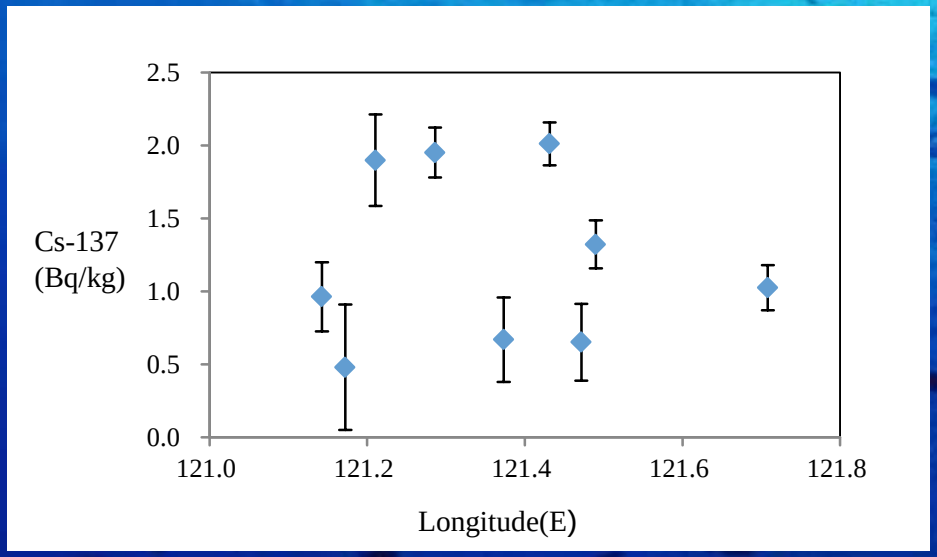
Results—sea water

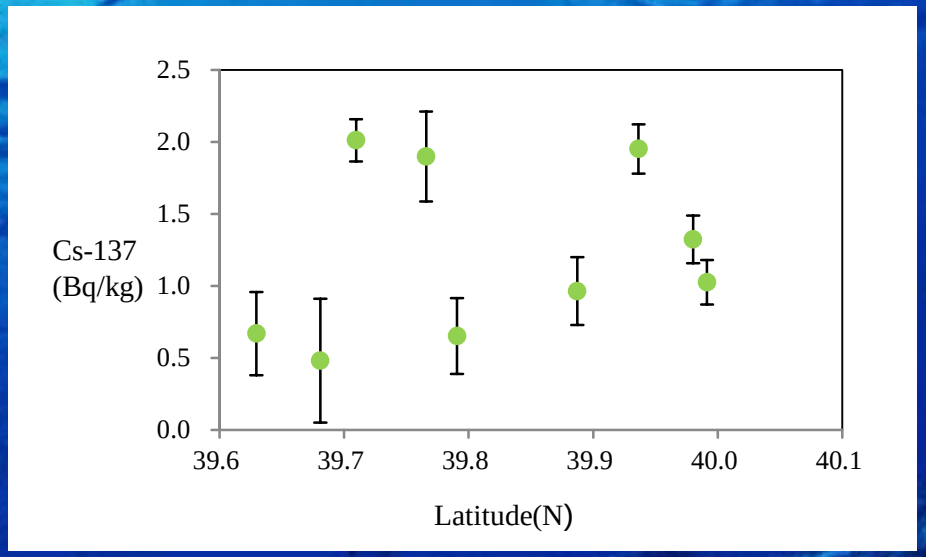




- The level of Cs-137 in seawater is 0.69~1.53 Bq/m^3
- The average level of Cs-137 is 1.02 Bq/m^3
- The background range of Cs-137 in water of Bohai sea is 0.2~2.55 Bq/m^3

Results—sediment





- The level of Cs-137 in sediment is 0.48~2.01 Bq/kg dry weight
- The average level of Cs-137 is 1.22 Bq/kg dry weight
- The background range of Cs-137 in sediment of Bohai sea is 1.2~15.75 Bq/kg dry weight

Result—Fish

Cynoglossus semilaevis （半滑舌鳎）

- The level of Cs-137 is 0.024 Bq/kg wet weight
- The background range of Cs-137 in biota of Bohai sea is 0.01~0.24 Bq/kg wet weight

Conclusions

1. Cs-134, Co-58,60 and Ag-110m is not detected in seawater, fish nor sediment;
2. The levels of Cs-137 in seawater, fish and sediment is 0.69~1.53 Bq/m^3, 0.024 Bq/kg wet weight, and 0.48~2.01 Bq/kg dry weight, respectively;
3. The levels of Cs-137 in seawater, fish and sediment are all within background ranges of Bohai sea;
4. Cs-137 activity is nearly uniform throughout the study area in sediment, however it is more concentrated in water further from shore;
5. The coastal waters of Liaodong Bay have not been contaminated by artificial radionuclides.

Thank You!

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