Survey Report* for Fish and Seashells within a 20km radius of Fukushima Daiichi Nuclear Power Station

(Samples taken during the period between July and September, 2015)

Tokyo Electric Power Company

December 9, 2015

TEPCO 東京電力

*Except for the data obtained for fish and seashells in the port of Fukushima-Daiichi Nuclear Power Station.

1. Purpose for surveying fish and seashells within a 20 km radius of Fukushima Daiichi NPS

(1) Grasp radioactive cesium concentration of each fish species.

- Comparison with food product standards (the total of cesium: 100 Bq/kg)

(2) Grasp areal distribution of radioactive cesium concentration in fish and seashells.

- Sampling at fixed surveying points (gillnet and trawler fisheries)

(3) Grasp the transition with time of radioactive cesium concentration of fish and seashells.

- Obtaining the basic data to predict the transition.

2-1 Survey results (radioactive cesium concentration by fish species)

○ **More than 99% of the samples taken indicates that the radioactive concentration fell below the standard value.**

Standard value: The total of radioactive cesium : 100 (Bq/kg)

	JUL – SEP 2015		APL – JUN 2015	
No. of fish species	**36** **(Of which, 1 sample exceeded the standard value)**	**[Top 3 species with high concentration]** **(Unit: Bq/kg)** (1) Japanese angel shark 110 (2) Banded hound shark 89 (3) Flathead 53 [Below the detection limit value] (1) Redwing searobin, (2) Searobin (3) Yellow goosefish, (4) Dory , (5) Pitted stingray, and others.	**41** **(Of which, 2 sample exceeded the standard value)**	**[Top 3 species with high concentration]** **(Unit: Bq/kg)** **(1) Dasyatis akajei 256** **(2) Marbled sole 166** **(3) Microstomus achne 91** **[Below the detection limit value]** **(1) Yellow goosefish,** **(2) Ovalipes punctatus** **(3) Chub mackerel ,** **(4) Sea raven ,** **(5) Pitted stingray, and others.**
No. of measurements taken (total)	**256** **(Of which, 1 sample exceeded the standard value)**		**309** **(Of which, 2 sample exceeded the standard value)**	

[Note] Parts measured: Muscle: fish (except for yellow goosefish) and octopus-kind
A whole body: yellow goosefish, squids and crabs.

- **Species with a tendency to exceed the standard value: Japanese angel shark**
- **Species with a tendency to fall below the standard value: flounder, Marbled sole, Blue crab, starspotted smooth-hounds, and others**

2.2 Survey results (areal distribution of cesium concentration)

○ The ratio of exceeding the standard value remains low for gill-net surveying spots in the coastal area and offshore bottom trawling surveying spots. In rare cases, a few exceeds the standards for the gill-net surveying spots.

		JUL – SEP 2015			APL – JUN 2015		
		No. of measurements	No. of results exceeding the standard value	Ratio (%)	No. of measurements	No. of results exceeding the standard value	Ratio (%)
Bottom trawling	T-B1	27	0	0	23	0	0
	T-B2	28	0	0	37	0	0
	T-B3	27	0	0	31	0	0
	T-B4	29	0	0	28	0	0
Gill-net	T-S1	21	0	0	30	0	0
	T-S2	25	1	4	30	1	3
	T-S3	22	0	0	32	0	0
	T-S4	20	0	5	37	0	0
	T-S5	19	0	0	18	1	6
	T-S7	20	0	0	18	0	0
	T-S8	18	0	0	25	0	0

2.3 Survey results (transition with time of radioactive cesium concentration)

[Tendency observed for the area within a 20 km radius of Fukushima Daiichi NPS]

- The data obtained from the measurement within a 20 km radius of Fukushima Daiichi NPS was all in all within the range of the measurement results obtained by an independent measurement conducted by Fukushima prefecture for outside the radius, showing a decreasing tendency. (ref: P5 figure1, 2)

[Tendency of radioactive cesium concentrations]

- Fish species with a decreasing tendency over time: flounder, greenlining, and others.
- Fish species exceeding the standard value (limited): Japanese angel shark.

Note 1: Further data is to be collected for fish and seashells within a 20km radius of Fukushima Daiichi NPS.

Note 2: It is assumed that their respective living characteristic such as feed type, habitat environment (seawater and marine sediment, etc.) and the way of traveling may have affected the transition with time.

[Reference] Transition with time of cesium concentration of flounder and greenling

Figure 1: Measurement results of flounder (Cs134+137）

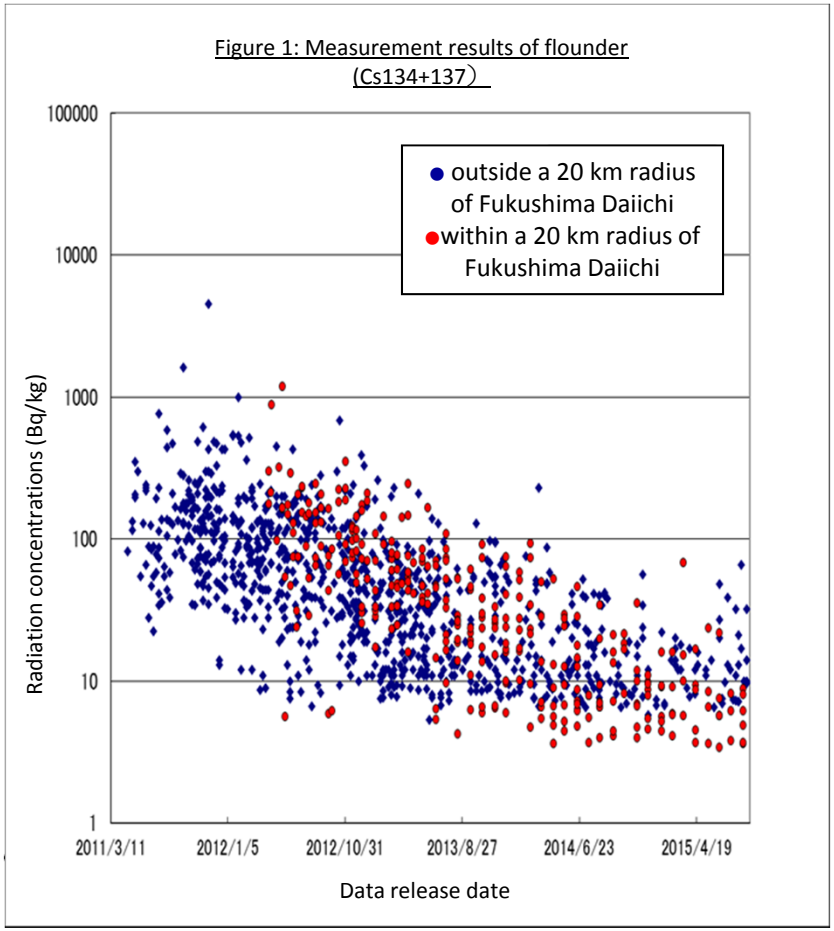
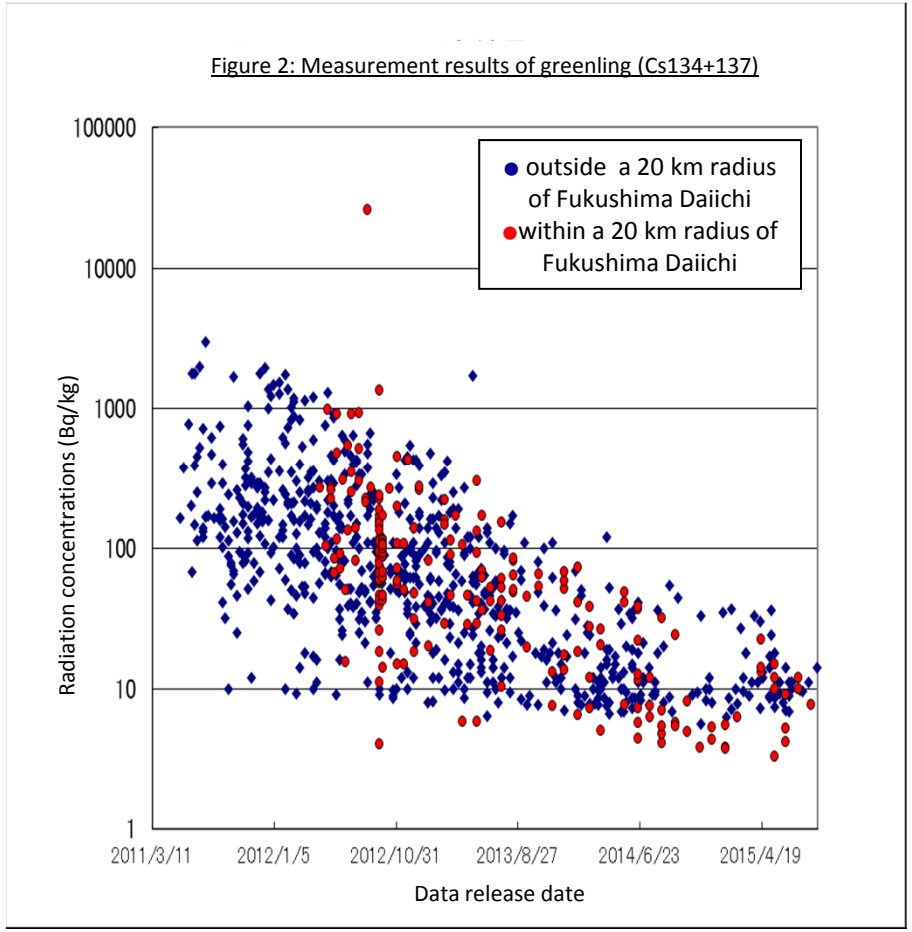


Figure 2: Measurement results of greenling (Cs134+137)



(Note) Measurement results for the area outside a 20 km radius of Fukushima Daiichi NPS were obtained from the website of the Fishery Agency and are converted into graph. Of note, the data remained below the detection limit value is not plotted.

2-4 Survey results for nuclides other than cesium

Unit: Bq/kg

Nuclide (half-life)	JUL – SEP 2015		APR – JUN 2014	
	No. of samples	Result	No. of samples	Result
*1 Strontium 90 (Approx. 29 yrs)	6 (Japanese angel shark :3 Banded houndshark, Slime flounder, flathead: 1 each)	Max.: 0.47 Min.: 0.030 Ave.: 0.20	5 (Slime flounder: 3, Whip ray: 1 Marbled sole: 1)	Max.: 0.64 Min.: 0.036 Ave.: 0.39
*2 Tritium (Approx. 12 yrs)	3 (flounder: 3)	Max.: 0.10 Min.: 0.067 Ave.: 0.087	2 (flounder: 2)	Max.: 0.11 Min.: 0.091 Ave.: 0.10

*1 Top five fish samples with high cesium concentration detected during the specified period for the sampling were measured after they had become ashes.

*2 Measured result of tritium concentration included in the water in muscle of flounder (free-water type tritium). Compared with the concentration of sea water where the fish lives. Sample frequency: Once in a month

- Strontium 90: The concentration is quite low at 1/1200 to 1/ 85 compared with that of Cesium 137.
- Tritium (measured with flounder and sea water of 4km -off shore of Kumagawa (T-S8) : the concentration of free-water type tritium of flounder has been measured at 0.067 to 0.10 (Bq/L), which is nearly equal to that of sea water at 0.077 to 0.15 (Bq/L)

3 Survey plan

○ Survey for the following three items continue to be conducted to grasp:

(1) A tendency of radioactive cesium concentration by fish species,

(2) Areal distribution of radioactive cesium concentration of fish and seashells, and

(3) Transition with time of radioactive cesium concentration of fish and seashells.

○ For the time being, these sampling/ measurement activities are conducted on a monthly basis at the eleven sampling spots. (sampling may be ceased due to weather conditions.)

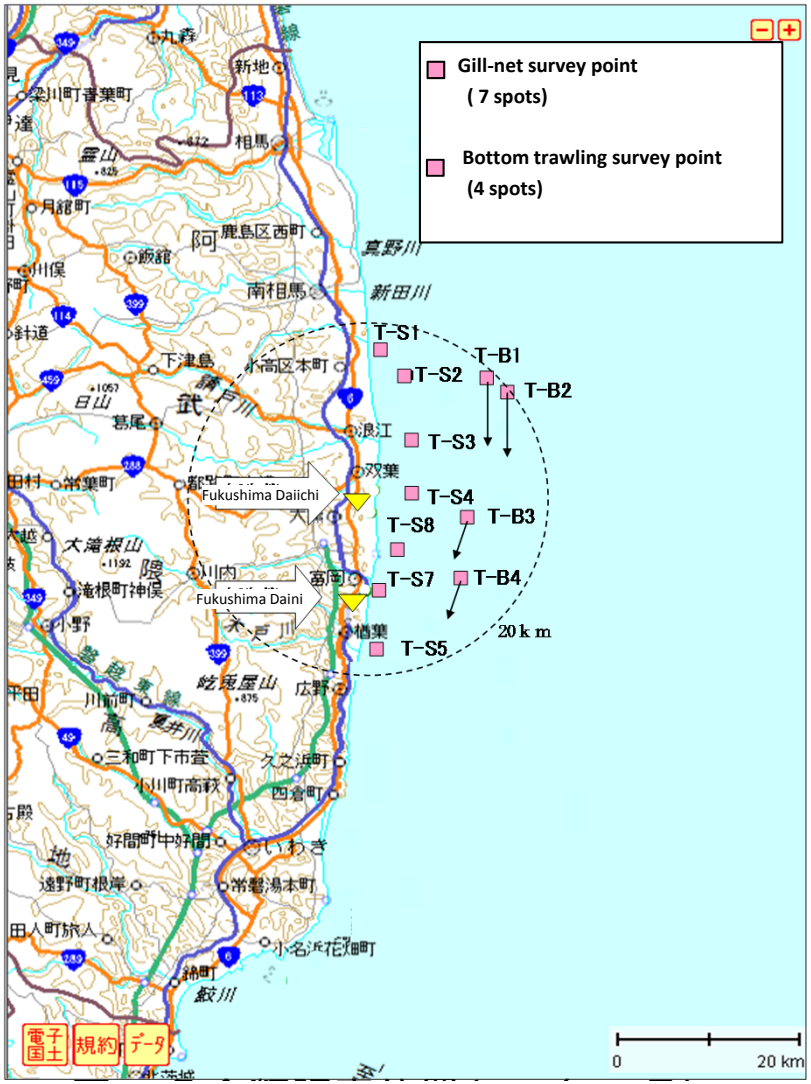


Figure 3: Survey locations for fish and seashells (Sep. 2015)