May 24, 2013
Tokyo Electric Power Company

Nuclide Analysis Results of Fish and Shellfish
(The Ocean Area Within 20km Radius of Fukushima Daiichi NPS)

1. Categorized by the radioactive cesium level (by fish species, since April 2013)

- Updated measurement results from the previous report (fish and shellfish)

[Within 20km Radius of Fukushima Daiichi NPS (exclude in the Port of Fukushima Daiichi NPS)]

- Total amount of radioactive cesium 134 and 137
  Unit: Bq/kg (Raw)
- Sampling date: April 16 - 24, 2013
- Guideline value (April 1, 2012 and later): 100Bq/kg

Fish	Maximum	Minimum	Number of measurements (Measurement results exceeding the guideline value)
Sea bass	530	15.4	4(2)
Marbled sole	430	13.9	8(5)
Schlegel's black rockfish	420	5.2	3(2)
Microstomus achne	390	8.4	8(5)
Greenling	300	5.8	6(2)
Common skete	237	74	8(7)
Stone flounder	122	28	3(1)
Flatfish	85	36	7
Lophius litilon	48	ND	6
Common Japanese conger	40	5.1	3
Pacific cod	34	8.6	7
Sea raven	29.6	21.4	2
Drumfish	23.2	-	1
Stingray	19.2	-	1
Northern dogfish	18.5	ND	5
Barfin flounder	17.8	-	1
Littlemouth flounder	14.3	5.9	3
Lepidotrigla microptera	10.2	ND	4
Roundnose flounder	4.8	3.7	2
Crimson sea bream	4.6	ND	4
Striped jewfish	ND	-	1
Spotted halibut	ND	-	1
Ridged-eye flounder	ND	-	1

(Remark) ND for Cs134: approx. 3.1Bq/kg, Cs137: approx. 3.1Bq/kg

Number of samples	28
Samples with cesium exceeding 100Bq/kg	7 (25%)
Number of measurements	101
Number of measurement results exceeding 100Bq/kg	24 (24%)

* Figures in parenthesis are ratios over 100 Bq/kg.

2. Categorized by the radioactive cesium level (by fish species, sampled in FY2012)

(1) Sampled in the first half of FY 2012

- Total amount of radioactive cesium 134 and 137
  Unit: Bq/kg (Raw)
- Sampling period: March 29 - September 19, 2012

[Fish with radioactive cesium level exceeding 100Bq/kg]

Fish	Maximum	Minimum	Number of measurements (Measurement results exceeding the guideline value)
Greenling	25800	ND	86 (44)
Sebastes cheni	1880	540	6 (6)
Barfin flounder	1670	690	2 (2)
Sea bass	1610	33	17 (11)
Banded dogfish	1430	4.4	9 (3)
Microstomus achne	1260	ND	36 (22)
Flatfish	1190	5.6	51 (30)
Common skete	1000	168	47 (47)
Marbled sole	920	21.3	42 (23)
Spotbelly rockfish	830	-	1 (1)
Starry flounder	810	580	2 (2)
Sea raven	670	25	7 (5)
Schlegel's black rockfish	620	410	4 (4)
Stingray	460	55	7 (5)
Stone flounder	390	29	10 (4)
Angel shark	222	66	4 (3)
Dasyatis matsubarai	205	ND	10 (2)
Flathead (Platycephalus sp.)	187	140	3 (3)
Smooth dogfish	169	4.7	10 (2)
Acanthopagrus schlegeli	160	94	2 (1)
Drumfish	127	38	15 (4)
Sea robin	107	19.9	6 (1)
Pacific cod	107	16.7	11 (1)
Littlemouth flounder	103	10	8 (1)

(2) Sampled in the second half of FY 2012

- Total amount of radioactive cesium 134 and 137
  Unit: Bq/kg (Raw)
- Sampling period: October 9, 2012 - March 29, 2013

[Fish with radioactive cesium level exceeding 100Bq/kg]

Fish	Maximum	Minimum	Number of measurements (Measurement results exceeding the guideline value)
Marbled sole	1690	16	43 (17)
Schlegel's black rockfish	1470	ND	13 (8)
Sea bass	880	5.9	19 (3)
Common skete	780	53	62 (47)
Microstomus achne	480	9.8	29 (17)
Greenling	450	ND	31 (14)
Angel shark	420	8.7	10 (7)
Sea raven	410	21.7	12 (9)
Spotted halibut	410	165	2 (2)
Banded dogfish	390	270	2 (2)
Flatfish	350	16	61 (17)
Pacific cod	350	4.4	29 (2)
Stone flounder	290	ND	18 (2)
Stingray	178	6.4	9 (2)
Acanthopagrus schlegeli	153	35	3 (1)
Flathead (Platycephalus sp.)	139	31.9	6 (4)
Smooth dogfish	121	5.8	14 (1)

(1) The first half of FY 2012

Number of samples	59
Samples with cesium exceeding 100Bg/kg	24 (41%)
Number of measurements	605
Number of measurement results exceeding 100Bg/kg	227 (38%)

* Figures in parenthesis are ratios over 100 Bq/kg.

(1) The second half of FY 2012

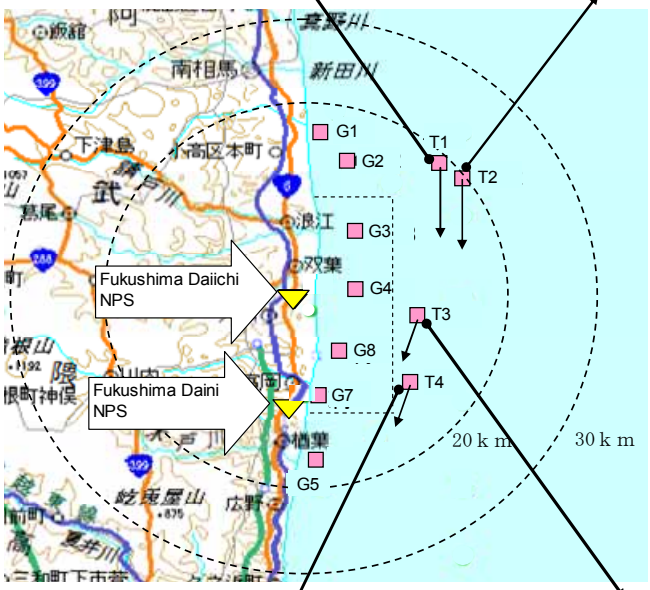
Number of samples	53
Samples with cesium exceeding 100Bg/kg	17 (32%)
Number of measurements	595
Number of measurement results exceeding 100Bg/kg	162 (27%)

* Figures in parenthesis are ratios over 100 Bq/kg.

Measurement results by the measurement points (Trawl net measurement point)

Measurement Point (Date of Sampling)	Samples (Sample names in blue letters: 100Bq/kg or less)
T1 (February 4)	Flatfish, Sea bass, Stone flounder, Greenling, Gnathophis nystromi nystoromi, Microstomus achne, Lepidotrigla microptera, Pacific cod, Loliginid, Littlemouth flounder, Roundnose flounder Common skete, Marbled sole
T1 (February 21)	Common skete, Greenling, Pacific cod, Flatfish, Stone flounder, Lepidotrigla microptera, Octopus (Enteroctopus) dofleini Microstomus achne
T1 (March 22)	Sea bass, Marbled sole, Northern dogfish, Microstomus achne, Littlemouth flounder, Flatfish, Lepidotrigla microptera, Greenling, Common Japanese conger, Loliginid, Crimson sea bream, Octopus (Enteroctopus) dofleini, Loligo bleekeri Pacific cod
T1 (April 19)	Greenling, Marbled sole, Pacific cod, Microstomus achne, Common Japanese conger, Littlemouth flounder, Crimson sea bream, Lepidotrigla microptera, Lophius litilon, Octopus (Enteroctopus) dofleini Stone flounder

T2 (February 4)	Pacific cod, Stone flounder, Microstomus achne, Littlemouth flounder, Sea bass, Flatfish, Lepidotrigla microptera, Ridged-eye flounder Common skete
T2 (February 21)	Flatfish, Marbled sole, Pacific cod, Microstomus achne, Sea bass, Littlemouth flounder, Ridged-eye flounder, Lepidotrigla microptera, Roundnose flounder Common skete
T2 (March 22)	Common skete, Flatfish, Sea bass, Marbled sole, Littlemouth flounder, Ridged-eye flounder, Lophius litilon, Pacific cod, Microstomus achne, Roundnose flounder, Common Japanese conger, Greenling, Lepidotrigla microptera, Loliginid, Crimson sea bream, Octopus (Enteroctopus) dofleini, Loligo bleekeri Stone flounder
T2 (April 19)	Common skete, Flatfish, Microstomus achne, Marbled sole, Pacific cod, Littlemouth flounder, Greenling, Common Japanese conger, Roundnose flounder, Striped jewfish, Lepidotrigla microptera, Lophius litilon, Loliginid, Crimson sea bream, Octopus (Enteroctopus) dofleini, Ridged-eye flounder, Loligo bleekeri



T3 (February 4)	Flatfish, Pacific cod, Sea bass, Sea raven, Marbled sole, Common Japanese conger, Balloonfish, Lepidotrigla microptera, Stone flounder, Octopus (Enteroctopus) dofleini Greenling, Common skete
T3 (February 18)	Sea bass, Marbled sole, Flatfish, Pacific cod, Stone flounder, Microstomus achne, Schlegel's black rockfish, Andrea cuttlefish, Loliginid, Takifugu pardalis, Octopus (Enteroctopus) dofleini Common skete, Greenling
T3 (March 16)	Marbled sole, Littlemouth flounder, Microstomus achne, Flatfish, Pacific cod, Stone flounder, Common Japanese conger, Lepidotrigla microptera Common skete
T3 (April 16)	Greenling, Flatfish, Common Japanese conger, Stone flounder, Pacific cod, Sea bass, Lepidotrigla microptera, Crimson sea bream, Octopus (Enteroctopus) dofleini Marbled sole, Microstomus achne, Common skete

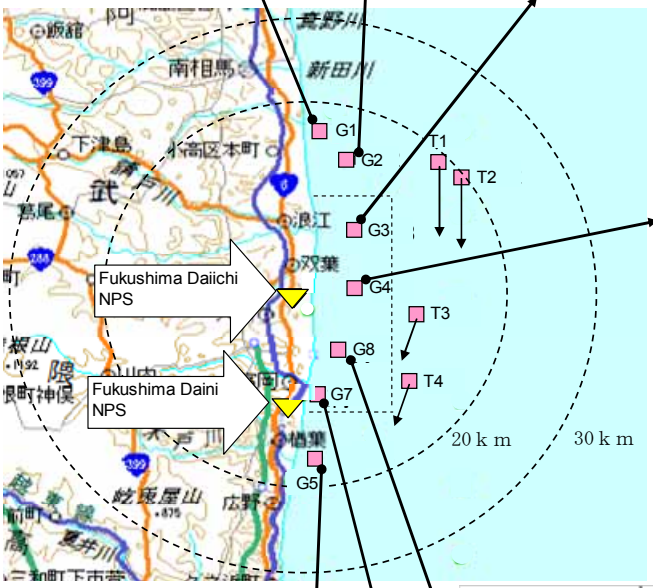
T4 (February 4)	Microstomus achne, Flatfish, Pacific cod, Marbled sole, Balloonfish, Roundnose flounder, Sea bass, Black scraper Common skete
T4 (February 18)	Greenling, Schlegel's black rockfish, Marbled sole, Flatfish, Pacific cod, Roundnose flounder, Northern dogfish, Ridged-eye flounder, Takifugu pardalis, Lepidotrigla microptera, Sea bass, Andrea cuttlefish, Loliginid, Octopus (Enteroctopus) dofleini Common skete
T4 (March 16)	Flatfish, Marbled sole, Ridged-eye flounder, Pacific cod, Roundnose flounder, Lepidotrigla microptera, Octopus (Enteroctopus) dofleini Common skete, Microstomus achne
T4 (April 16)	Flatfish, Pacific cod, Greenling, Sea raven, Sea bass, Littlemouth flounder, Marbled sole, Lepidotrigla microptera, Microstomus achne, Crimson sea bream, Roundnose flounder, Lophius litilon, Loliginid, Octopus (Enteroctopus) dofleini, Loligo bleekeri Common skete

Measurement results by the measurement points (Gill net measurement point)

Measurement Point (Date of Sampling)	Samples (Sample names in blue letters: 100Bq/kg or less)
G1 (January 31)	Ovalipes punctatus Greenling, Schlegel's black rockfish, Common skete
G1 (February 7)	Common skete, Schlegel's black rockfish, Pacific cod
G1 (March 8)	Pacific cod, Schlegel's black rockfish Common skete, Sea bass
G1 (April 12)	Common skete, Flatfish, Microstomus achne, Greenling, Pacific cod, Lophius litilon, Snailfish, Ovalipes punctatus Schlegel's black rockfish, Sea bass

G2 (January 31)	Pacific cod, Marbled sole, Flatfish Common skete
G2 (February 7)	Common skete, Pacific cod
G2 (March 8)	Marbled sole, Flatfish, Pacific cod, Ovalipes punctatus
G2 (April 12)	Common skete, Microstomus achne, Sea raven, Greenling, Flatfish, Pacific cod, Northern dogfish, Spotted halibut Marbled sole

G3 (January 29)	Flatfish, Sea raven, Pacific cod, Snailfish Schlegel's black rockfish, Common skete, Microstomus achne, Greenling
G3 (February 20)	Flatfish, Pacific cod, Northern dogfish, Ovalipes punctatus, Snailfish Sea bass, Common skete, Marbled sole, Sea raven
G3 (March 27)	Greenling, Flatfish, Marbled sole, Pacific cod, Ovalipes punctatus Common skete, Microstomus achne
G3 (April 24)	Lophius litilon, Flatfish, Sea raven, Northern dogfish, Barfin flounder, Pacific cod, Ovalipes punctatus, Spotted halibut Microstomus achne, Marbled sole, Common skete



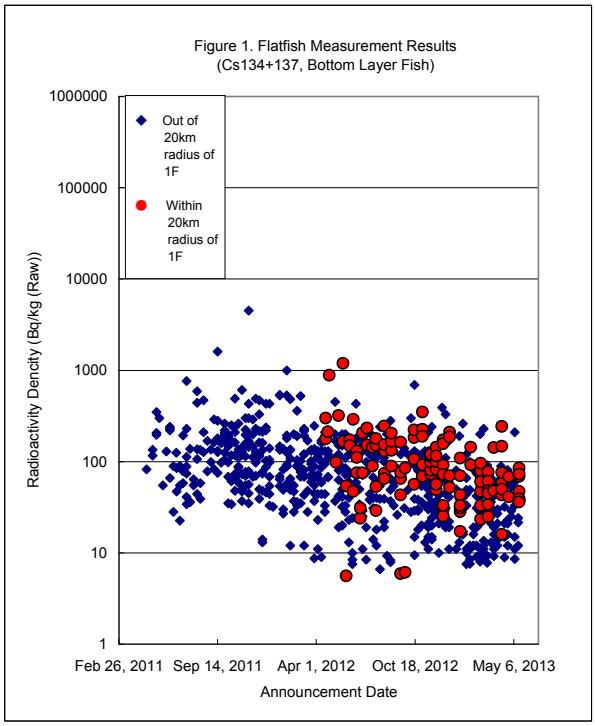
G4 (January 29)	Flatfish, Pacific cod, Snailfish Schlegel's black rockfish, Microstomus achne, Marbled sole, Common skete
G4 (February 20)	Flatfish, Pacific cod, Northern dogfish, Ovalipes punctatus Marbled sole, Schlegel's black rockfish, Common skete, Microstomus achne, Sea raven
G4 (March 27)	Flatfish, Pacific cod, Octopus (Enteroctopus) dofleni Microstomus achne, Common skete, Marbled sole
G4 (April 24)	Flatfish, Pacific cod, Stone flounder, Northern dogfish, Schlegel's black rockfish, Ovalipes punctatus Microstomus achne, Common skete, Marbled sole, Greenling

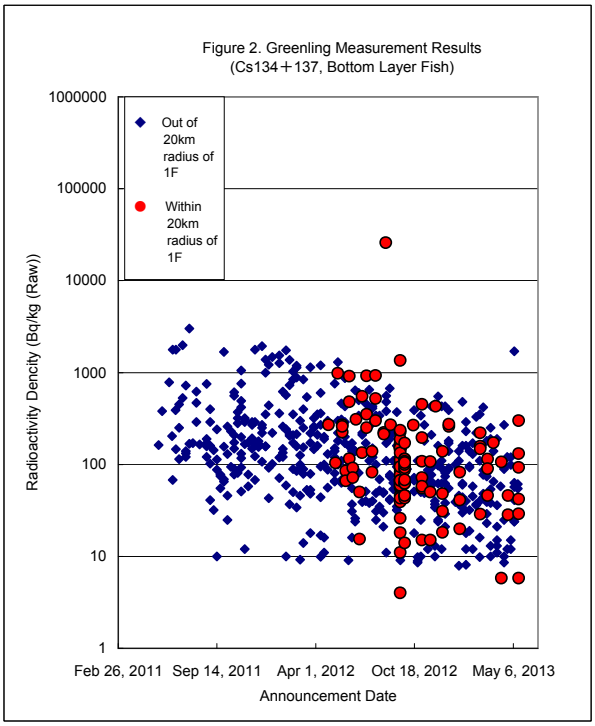
G8 (February 10)	Flatfish, Pacific cod, Blue crab, Snailfish Marbled sole, Common skete
G8 (February 26)	Pacific cod, Blue crab, Snailfish Spotted halibut, Common skete, Marbled sole, Flathead (Platycephalus sp.)
G8 (March 26)	Pacific cod, Ovalipes punctatus Marbled sole, Common skete
G8 (April 23)	Pacific cod, Lophius litilon, Ovalipes punctatus, Northern dogfish, Blue crab Sea bass, Common skete, Marbled sole

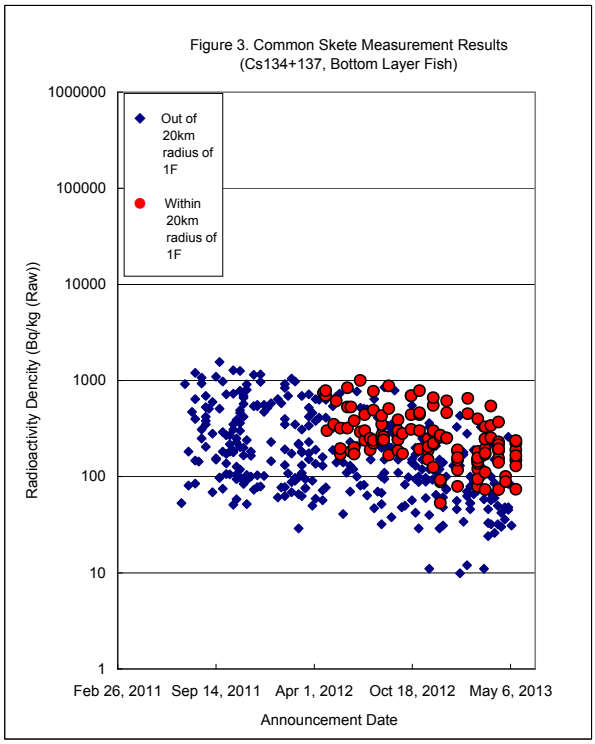
G7 (January 20)	Flatfish, Pacific cod, Acanthopagrus schlegeli, Stone flounder Common skete, Microstomus achne, Marbled sole
G7 (February 28)	Schlegel's black rockfish, Common skete
G7 (March 29)	Stingray, Sea raven Common skete, Microstomus achne, Flatfish
G7 (April 20)	Flatfish, Drumfish, Northern dogfish, Lophius litilon Sea bass, Schlegel's black rockfish, Microstomus achne, Greenling, Common skete, Marbled sole

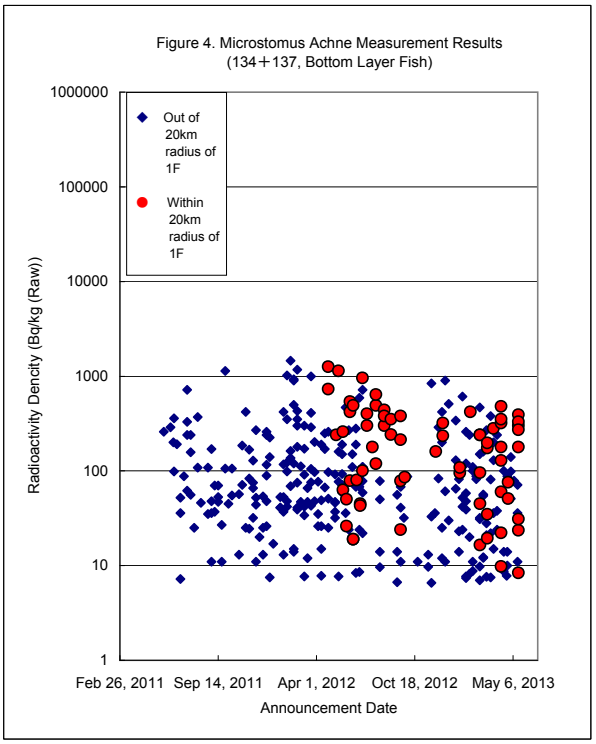
G5 (January 20)	Sea robin Common skete, Marbled sole, Acanthopagrus schlegeli, Flatfish, Schlegel's black rockfish
G5 (February 28)	Pacific cod, Sea raven, Common skete, Microstomus achne, Greenling, Flatfish
G5 (March 29)	Pacific cod Microstomus achne, Common skete, Flatfish
G5 (April 20)	Flatfish, Stingray, Northern dogfish Microstomus achne, Common skete, Schlegel's black rockfish

Change of radioactive cesium density of fish over time





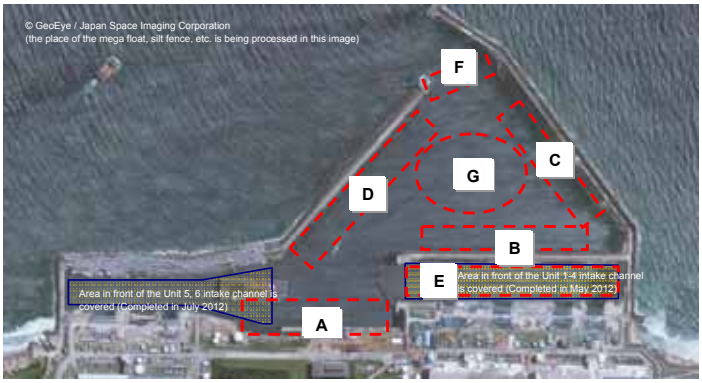




(Remark) The measurement results of "Out of 20km radius of 1F" was obtained from the Japan Meteorological Agency website.

As of May 21, 2013

Fish sampling situation in the port of Fukushima Daiichi NPS (flash report)



A: Around the Shallow Draft Quay
B: Around the East Seawall Break
C: Around the South Breakwater
D: Around the North Breakwater
E: Around the Water Intake Open Conduit at Unit 1-4
F: Around the Port Entrance
G: Around the Center of the Port

(1) Since Feb 8, 2013, silt fence has been installed at point A, and gill net has been installed at point F.
(2) Since Feb 27, 2013, gill nets have been installed continuously at inner side of silt fence at point A and point B.
(3) Since Mar 5, 2013, 35 baskets have been installed continuously at point E. On Mar 13, 15 baskets have been added continuously at point E.
(4) From Mar 7 to Mar 8, 2013, gill net fishing was conducted at point C.
(5) From Mar 12 to Mar 13, 2013, gill net fishing was conducted at point A,B,D.
(6) On Mar 15-16, 2013, gill net fishing will be conducted at point G.

Figure. Place of Sampling

1. Gill net in the port entrance

Date of Sampling	Place of Sampling	Number of sampling	Sampling of Highest Cesium Density (Place of Sampling)	Cesium Density (Unit: Bq/kg (Raw))		
				Cs-134	Cs-137	Cesium Amount
Feb 12, 2013	F	154	Greenling	86,000	160,000	246,000
Feb 13, 2013	F	47	Spotbelly rockfish	55,000	99,000	154,000
Feb 15, 2013	F	17	Greenling	50,000	90,000	140,000
Feb 16, 2013	F	8	Sebastes cheni	30,000	55,000	85,000
Feb 17, 2013	F	6	Greenling	180,000	330,000	510,000
Feb 19, 2013	F	2	Flathead (Platycephalus sp.)	430	830	1,260
Feb 20, 2013	F	5	Spotbelly rockfish	53,000	95,000	148,000
Feb 21, 2013	F	3	Sebastes cheni	57,000	100,000	157,000
Feb 22, 2013	F	44	Sebastes cheni	43,000	79,000	122,000
Feb 25, 2013	F	11	Schlegel's black rockfish	33,000	60,000	93,000
Feb 26, 2013	F	7	Spotbelly rockfish	19,000	34,000	53,000
Feb 28, 2013	F	3	Sebastes cheni	13,000	24,000	37,000
Mar 1, 2013	F	5	Sebastes cheni	29,000	54,000	83,000
Mar 4, 2013	F	14	Greenling	100,000	190,000	290,000
Mar 5, 2013	F	7	Sebastes cheni	17,000	31,000	48,000
Mar 6, 2013	F	23	Sebastes cheni	45,000	82,000	127,000
Mar 7, 2013	F	18	Sebastes cheni	43,000	79,000	122,000
Mar 8, 2013	F	12	Greenling	150,000	280,000	430,000
Mar 9, 2013	F	8	Sebastes cheni	25,000	46,000	71,000
Mar 12, 2013	F	18	Sebastes cheni	76,000	140,000	216,000
Mar 15, 2013	F	10	Sebastes cheni	17,000	32,000	49,000
Mar 16, 2013	F	4	Spotbelly rockfish	61,000	110,000	171,000
Mar 22, 2013	F	21	Sebastes cheni	43,000	79,000	122,000
Mar 23, 2013	F	8	Sebastes cheni	38,000	71,000	109,000
Mar 25, 2013	F	6	Microstomus achne	60,000	110,000	170,000
Mar 26, 2013	F	14	Sebastes cheni	49,000	92,000	141,000
Mar 27, 2013	F	12	Sebastes cheni	39,000	75,000	114,000
Apr 9, 2013	F	3	Sebastes cheni	13,000	25,000	38,000
Apr 11, 2013	F	9	Sebastes cheni	31,000	59,000	90,000
Apr 16, 2013	F	20	Spotbelly rockfish	24,000	46,000	70,000
Apr 17, 2013	F	1	Drumfish	ND	86	86
Apr 29, 2013	F	3	Spotbelly rockfish	880	1,500	2,380
May 9, 2013	F	21				
May 10, 2013	F	13				
May 16, 2013	F	60				
May 18, 2013	F	41				
May 20, 2013	F	93				

The samples are currently under radioactivity density measurements

2. Basket fishing

Date of Sampling	Place of Sampling	Number of sampling	Sampling of Highest Cesium Density (Place of Sampling)	Cesium Density (Unit: Bq/kg (Raw))		
				Cs-134	Cs-137	Cesium Amount
Oct 10, 2012	A	4	Common Japanese conger (A)	5,900	9,600	15,500
Dec 20, 2012	A,C	29	Spotbelly rockfish (A)	94,000	160,000	254,000
Jan 18, 2013	A,B,C,D	42	Spotbelly rockfish (B)	51,000	90,000	141,000
Jan 30, 2013	A,B,C,D	28	Spotbelly rockfish (B)	75,000	130,000	205,000
Feb 15, 2013	A,A*,B,C,D	21	Spotbelly rockfish (A*)	97,000	180,000	277,000
Feb 21, 2013	E*	6	Greenling (E*)	260,000	480,000	740,000
Feb 27, 2013	A,B,C,D	14	Greenling (B)	36,000	67,000	103,000
Mar 13, 2013	A,B,C,D	41	Spotbelly rockfish (D)	53,000	98,000	151,000
Mar 26, 2013	A,B,C,D	33	Spotbelly rockfish (D)	69,000	130,000	199,000
Apr 10, 2013	A,B,C,D	50	Spotbelly rockfish (D)	59,000	110,000	169,000
Apr 24, 2013	A,B,C,D	59	Spotbelly rockfish (D)	59,000	110,000	169,000
May 9, 2013	A,B,C,D	36		The samples are currently under radioactivity density measurements		

* Sampled at inner side of Silt Fence.

3. Gill net fishing in the port

Date of Sampling	Place of Sampling	Number of sampling	Sampling of Highest Cesium Density (Place of Sampling)	Cesium Density (Unit: Bq/kg (Raw))		
				Cs-134	Cs-137	Cesium Amount
Mar 8, 2013	C	4	Sebastes cheni (C)	24,000	43,000	67,000
Mar 13, 2013	A,B,D	5	Greenling (D)	27,000	51,000	78,000
Mar 15, 2013	B	Approx. 30		No sampling due to fish degradation		
Mar 16, 2013	G	2	Marbled sole (G)	11,000	21,000	32,000
Mar 22, 2013	A,B,D	13	Spotbelly rockfish (D)	25,000	46,000	71,000
Mar 26, 2013	C,G	13	Sebastes cheni (G)	49,000	92,000	141,000
Mar 28, 2013	A,B,D	57	Spotbelly rockfish (B)	150,000	280,000	430,000
Apr 2, 2013	C,G	2	Sebastes cheni (C)	480	870	1,350
Apr 10, 2013	A,B,D	21	Greenling (A)	56,000	110,000	166,000
Apr 16, 2013	C,G	17	Marbled sole (C)	1,500	2,900	4,400
Apr 23, 2013	A,B,D	27	Sebastes cheni (D)	28,000	54,000	82,000
May 1, 2013	C,G	39	Spotbelly rockfish (G)	60,000	120,000	180,000
May 8, 2013	A,B,D	30	Scorpion fish (B)	29,000	55,000	84,000
May 14, 2013	G	38		The samples are currently under radioactivity density measurements		
May 21, 2013	A,B,D	22				

Total amount of sampling	Approx. 1,430

<Reference>
May 24, 2013
Tokyo Electric Power Company

Outline Process (Draft) of the Countermeasures for Fish in the Port at Fukushima Daiichi NPS

① Preventing fish from moving out
② Sampling (extermination) of fish
②-1: Basket fishing ②-2: Gill net in the port
③ Improving environment of the marine soil in the port (dredging)

		FY 2012						FY 2013								
		10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	Overall Schedule	Sampling (extermination) of fish, Preventing fish from moving to outside the port of Fukushima Daiichi NPS, etc. (Trend monitoring the number and the radioactivity level of fish and review the countermeasures accordingly.)														
1	Preventing fish from moving out															
	<Placement of gill net at the port entrance of Fukushima Daiichi NPS>					Ongoing since February 8			Doubled the net since May 9							
	<Placement of block fence at port entrance (permanent installation)>						Consruction of fence			Installation of fence scheduled in the late June						
	<Placement of partition net inside the embankment>				Arrangement of the net			Construction to place the net since March 20*			Preventing fish from moving by partition net					
		* On March 23, installation of partition net was completed around the east seawall bank														
	<Placement of silt fence and gill net at shallow draft quay>					Installation of silt fence since February 8			Instsallation of gill net since February 27							
2	Sampling (extermination) of fish															
	<Basket fishing> ②-1 5 sampling points (Shallow draft quay, south and north breakwater, east seawall bank, in the Water Intake Open Conduit at Unit 1-4)	● (1 point)		● (2 points)		Around 3 times a month										
	<Gill net fishing> ②-2 In the port of Fukushima Daiichi NPS					Ongoing sequentially since February 27										
	<Gill net fishing> 2 points in north and south sea area outside the port of Fukushima Daiichi NPS					(Under discussion toward implement)										
3	Improving environment of the marine soil in the port															
	<Dredging the ocean lane and the anchorage>													*		
														* Under consideration toward early launch		