

Appendix

Proceeding with Sea Area Monitoring

1 Implementation details

The relationship between the details of implementation with respect to seawater, sea sediment, and marine biota and Comprehensive Radiation Monitoring Plan is as set forth below:

Table 1: Implementation details for the monitoring of sea areas

Samples	Implementation details for the monitoring of sea areas	Applicable purposes in the Comprehensive Radiation Monitoring Plan
Seawater	To ascertain concentrations of radioactive cesium in particular and other radioactive materials	(vi)
Sea sediment*	To ascertain the distribution of radioactive cesium in particular and time-dependence and/or migration of radioactive materials	(vi)
Marine biota	To ascertain concentrations of radioactive materials and changes in concentrations of radioactive materials over time	(ii), (iii), (v), (vi)

* ... The qualitative properties of soil will be ascertained as required.

2 Implementation system

Nuclear Regulation Authority, Fisheries Agency, Ministry of Land, Infrastructure, Transport and Tourism, Japan Coast Guard, Ministry of the Environment, Fukushima Prefectural Government, Tokyo Electric Power Company Holdings, Inc.(TEPCO) (hereinafter referred to as “TEPCO”), research institutes, relevant local governments, fishery cooperatives, and other entities will conduct monitoring actions in collaboration with one another.

3 Sea areas where monitoring will be conducted

Monitoring will be conducted in the following sea areas around the Tokyo Electric Power Company Holdings, Inc.(TEPCO) Fukushima Daiichi Nuclear Power Station (NPS) (hereinafter referred to as “TEPCO’s Fukushima Daiichi NPS”) and in Tokyo Bay.

- (1) Nearshore sea area: Sea area that needs to be monitored near the TEPCO’s Fukushima Daiichi NPS

* Sea area in an approximately 3 km radius from the point midway between the No. 2 and No. 3 exhaust stacks

- (2) Coastal sea area: Sea area within approximately 30 km from the coastline extending from Aomori (part)/Iwate prefectures to Miyagi Prefecture and the coastline of Fukushima and Ibaraki prefectures (including estuaries and excluding the nearshore sea

area)

- (3) Offshore sea area: Sea area within approximately 30 to 90 km from the coastline
- (4) Open sea: Sea area beyond approximately 90 km from the coastline
- (5) Tokyo Bay: Tokyo Bay is a closed sea area where the inflow and accumulation of radioactive materials from rivers is of particular concern.

4 Implementation plan

Cs-134 and Cs-137 will be analyzed, and other radionuclides as required.

4-1 Seawater

Where there are leaks from TEPCO's Fukushima Daiichi NPS, TEPCO and relevant government ministries will collaborate and conduct appropriate monitoring in accordance with circumstances where needed.

(1) Nearshore sea area

Monitoring will be conducted in accordance with Table 2.

In addition, TEPCO will install equipment to continuously measure seawater and review the implementation plan.

Table 2: Monitoring of seawater in the nearshore sea area

Sampling points	Radionuclide	Minimum detectable activity (Bq/L)	Frequency of sampling	Sampling depth ^{*1}	Implementing entity
T-1、 T-2 (See Fig. 3)	Cs-134	1	Once per day	Surface layer	TEPCO
	Cs-137	1×10^{-3}	Once per week		
	H-3	1	Once per week		
	Sr-90	1×10^{-3}	Once per month		
	Pu-238 ^{*2} Pu-239+240 ^{*3}	1×10^{-5}	Once every six months		
T-0-1、 T-0-2 T-0-3、 T-0-1A T-0-3A (See Fig. 3)	Cs-134	1	Once per week	Surface layer	TEPCO
	Cs-137				
	H-3	1	Once per week	Surface layer	
M-101、 M-102、 M-103、 M-104 (See Fig. 3)	Cs-134	1×10^{-3}	Once per month	Surface layer	Nuclear Regulation Authority
	Cs-137				
	H-3	4×10^{-1}	Once per month	Surface layer	
	Sr-90	1×10^{-3}	Once per month	Surface layer	

F-P01、F-P02、 F-P03、F-P04 (See Fig. 3)	Cs-134 Cs-137	1×10^{-3}	Once month	per	Surface layer	Fukushima Prefectural Government
	H-3	1				
	Sr-90	1×10^{-3}				
	Pu-238 Pu-239+240	1×10^{-5}				

*1... Surface layer:From sea level to depth of about 2 m

*2... Where Pu-238 is detected, U-234, U-235, U-238, Am-241, Cm-242, and Cm-243+244*4 will also be analyzed.

*3... Pu-239+240 means $^{239+240}\text{Pu}$; same for notations appearing hereinafter.

*4... Cm-243+244 means $^{243+244}\text{Cm}$; same for notations appearing hereinafter.

* ... Total beta will be measured as needed in order to survey indications of concentrations of radioactive materials in seawater.

(2) Coastal sea area

Monitoring will be conducted in accordance with Table 3.

Table 3:Monitoring of seawater in the coastal sea area

Areas and sampling points		Radionuclide	Minimum detectable activity (Bq/L)	Frequency of analysis	Sampling depth*1	Implementing entity
Iwate Prefecture	E-31、E-32 (See Fig. 1)	Cs-134 Cs-137	1	Once every six months	Surface layer and bottom layer	Ministry of the Environment
Miyagi Prefecture	T-MG0、T-MG1、 T-MG2、T-MG3、 T-MG4、T-MG5、 T-MG6 (See Fig. 1)	Cs-134 Cs-137	1×10^{-3}	Once per month	Surface layer and bottom layer	TEPCO
	E-41、E-42、 E-43、E-44、 E-45、E-46、 E-47、E-48、 E-49、E-4A、 E-4B、E-4C (See Fig. 1)	Cs-134 Cs-137	1	Once every one-six months	Surface layer and bottom layer	Ministry of the Environment
Fukushima Prefectural Government	T-3、T-6 (See Fig. 4)	Cs-134 Cs-137	1×10^{-3}	Once per week	Surface layer	TEPCO
		H-3	4×10^{-1}	Twice per month	Surface layer	
	T-5、T-D1、T-D5、	Cs-134	1×10^{-3}	Once per week	Surface	TEPCO

T-D9 (See Fig. 4)	Cs-137			layer and bottom layer	
	H-3	4×10^{-1}	Twice per month	Surface layer	
	Sr-90	1×10^{-3}	Once per month		
	Pu-238 Pu-239+240	1×10^{-5}	Once every six months		
T-4*2, T-11, T-14 (See Fig. 4)	Cs-134 Cs-137	1×10^{-3}	Once per week	Surface layer and bottom layer	TEPCO
T-S1, T-S3, T-S4, T-S5, T-S7, T-S8, T-B1, T-B2, T-B3, T-B4, T-13-1, T-7, T-18, T-12, T-17-1, T-20, T-22, T-MA, T-M10 (See Figs. 2 and 4)	Cs-134 Cs-137	1×10^{-3}	Once per month	Surface layer and bottom layer	TEPCO
E-71, E-72, E-73, E-74, E-75, E-76, E-77, E-78, E-79, E-7A, E-7B, E-7F, E-7G, E-7H, E-7I (See Figs. 2 and 4)	Cs-134 Cs-137	1	Once every one to two months	Surface layer and bottom layer	Ministry of the Environment
F-P05, F-P06 (See Fig. 4)	Cs-134 Cs-137	1×10^{-3}	Once per month	Surface layer	Fukushima Prefectural Government
	H-3	1			
	Sr-90	1×10^{-3}			
	Pu-238 Pu-239+240	1×10^{-5}			
20 locations on the Fukushima coast (fishery harbors and shallow-water fishing grounds) (See Fig. 2)	Cs-134 Cs-137*3	1	Once per month	Range from sea level to depth of about 7 m	

Ibaraki Prefecture	T-A, T-B, T-C, T-D, T-E, T-Z (See Figs. 5 and 6)	Cs-134 Cs-137	1*4	Once per month	Surface layer and bottom layer	TEPCO
	E-81, E-82, E-83, E-84, E-85 (See Figs. 5 and 6)	Cs-134 Cs-137	1	Once every three to four months	Surface layer and bottom layer	Ministry of the Environment

- *1 ... Surface layer: Sea level to depth of about 3 m; bottom layer: ocean floor to depth of about 5 m
- *2 ... Monitoring at T-4 will only be conducted at the surface layer due to the shallow water.
- *3 ... H-3 will be measured at certain locations.
- *4 ... Slated to be changed to 1×10^{-3} Bq/L.
- * ... Total beta will be measured as needed in order to survey indications of concentrations of radioactive materials in seawater.

(3) Offshore sea area

Monitoring will be conducted in accordance with Table 4.

Table 4: Monitoring of seawater in the offshore sea area

Sampling points	Radionuclide	Minimum detectable activity (Bq/L)	Frequency of analysis	Sampling depth	Implementing entity
M-A1, M-A3, M-MI4, M-B1, M-B3, M-B5, M-C1, M-C3, M-D1, M-D3, M-E1, M-E3, M-E5, M-F1, M-F3, M-G0, M-G1, M-G3, M-G4, M-H1, M-H3, M-I0, M-I1, M-I3, M-J1, M-IB2, M-J3, M-K1, M-IB4, M-L1, M-L3, M-M1 (See Figs, 1, 2, 5, and 6)	Cs-134 Cs-137*1	1×10^{-3}	Once every three months	Surface layer (sea level to depth of about 2 m) • Middle layer*2, bottom layer (ocean floor to depth of about 40 m)	Nuclear Regulation Authority

- *1 ... At some locations, Sr-90 and H-3 will also be measured upon taking the continuity of actions taken to date into account.
- *2 ... At some locations, samples will be obtained at a depth of 100 or 50 m in accordance with the depth of the water.
- * ... Total beta will be measured as needed in order to survey indications of concentrations of radioactive materials in seawater.

(4) Open sea

Monitoring will be conducted in accordance with Table 5.

Table 5: Monitoring of seawater in the open sea

Sampling points	Radionuclide	Minimum detectable activity (Bq/L)	Frequency of analysis	Sampling depth	Implementing entity
M-10、M-11、M-14、 M-15、M-19、M-20、 M-21、M-25、M-26、 M-27 (See Fig. 7)	Cs-134 Cs-137	1×10^{-3}	Once every six months	Surface layer (sea level to depth of about 2 m) and from sea level to depths of about 100, 200, 300, and 500 m	Nuclear Regulation Authority
K-1、K-2、K-3、K-4 (See Fig. 8)	Cs-134 Cs-137 Sr-90	1×10^{-3}	Once per year	Surface layer (sea level to depth of about 2 m) and from sea level to depth of about 800 m	Japan Coast Guard

(5) Tokyo Bay

Monitoring will be conducted in accordance with Table 6.

Table 6: Monitoring of seawater in Tokyo Bay

Sampling points	Radionuclide	Minimum detectable activity (Bq/L)	Frequency of analysis	Sampling depth ^{*1}	Implementing entity ^{*2}	
Estuaries	E-T1、E-T2、 E-T3、E-T4、 E-T5、E-T6、 E-T7、E-T8 (See Fig. 9)	Cs-134 Cs-137	1	Four to seven times per year	Surface layer and bottom layer	Ministry of the Environment
	E-T1、E-T2、 E-T3、E-T4 (See Fig. 9)	Cs-134 Cs-137	1×10^{-3}	Once per year	Surface layer	Nuclear Regulation Authority
Middle of the bay	K-T1、K-T2 (See Fig. 9)	Cs-134 Cs-137	1×10^{-3}	Six times per year	Surface layer	Nuclear Regulation Authority
	M-C6、M-C9 (See Fig. 9)	Cs-134 Cs-137	1×10^{-3}	Once per year	Surface layer	Nuclear Regulation Authority
Near the center of the	KK-U1 (See Fig. 9)	Cs-134 Cs-137	5	Once per month	Surface layer	Ministry of Land, Infrastructure,

mouth of the bay						Transport and Tourism
	Cs-134 Cs-137	1×10^{-3}	Once per year	Surface layer	Nuclear Regulation Authority	

- *1 ... Surface layer: Sea level to depth of about 2 m; bottom layer: ocean floor to depth of about 2 m
- *2 ... Monitoring shall be conducted as much as possible with the cooperation of relevant local governments.

4-2 Sea sediment

(1) Nearshore sea area

Monitoring will be conducted in accordance with Table 7.

Table 7: Monitoring of sea sediment in the nearshore sea area

Sampling points	Radionuclide	Minimum detectable activity (Bq/kg dry soil)	Frequency of analysis	Implementing entity
T-1、 T-2 (See Fig. 3)	Cs-134 Cs-137	1	Once per month	TEPCO
	Sr-90	2	Once every two months	
	Pu-238 ^{*1} Pu-239+240	3×10^{-2}	Once every six months	
F-P01、 F-P02、 F-P03、 F-P04 (See Fig. 3)	Cs-134 Cs-137	1	Once every three months	Fukushima Prefectural Government
	Sr-90	2×10^{-1}		
	Pu-238 Pu-239+240	2×10^{-2}		

- *1 ... Where Pu-238 is detected, U-234, U-235, U-238, Am-241, Cm-242, and Cm-243+244 will also be analyzed.

(2) Coastal sea area

Monitoring will be conducted in accordance with Table 8.

Table 8: Monitoring of sea sediment in the coastal sea area

Areas and sampling points		Radionuclide	Minimum detectable activity (Bq/kg dry soil)	Frequency of analysis	Implementing entity
Iwate Prefecture	E-37、E-38、E-39、E-3A (See Fig. 1)	Cs-134 Cs-137	1	Once per year	Ministry of the Environment
	E-31、E-32 (See Fig. 1)	Cs-134 Cs-137* ¹	1×10^{-1}	Once every six months	Ministry of the Environment
Miyagi Prefecture	E-4F、E-4G、E-4H、E-4I、 E-4J、E-4K、E-4L、E-4M (See Fig. 1)	Cs-134 Cs-137	1	Once per year	Ministry of the Environment
	E-41、E-42、E-43、E-44、 E-45、E-46、E-47、E-48、 E-49、E-4A、E-4B、E-4C (See Fig. 1)	Cs-134 Cs-137* ¹	1×10^{-1}	Once every one-six months	Ministry of the Environment
Fukushima Prefectural Government	T-3、T-4、T-5、T-11、 T-14、T-B1、T-B2、T-B3、 T-B4、T-D1、T-D5、T-D9、 T-S1、T-S3、T-S4、T-S5、 T-S7、T-S8、T-①、T-②、 T-③、T-④、T-⑤、T-⑥、 T-⑦、T-⑧、T-⑨、T-⑩、 T-⑪、T-⑫、T-⑬ (See Figs. 2 and 4)	Cs-134 Cs-137	1	Once per month	TEPCO
	T-7、T-12、T-13-1、 T-17-1、T-18、T-20、T-22、 T-M10、T-MA (See Figs. 2 and 4)	Cs-134 Cs-137	1	Once every two months	TEPCO
	E-7C、E-7D、E-7E、E-7F、 E-7G、E-7H (See Fig. 2)	Cs-134 Cs-137	1	Once per year	Ministry of the Environment
	E-71、E-72、E-73、E-74、 E-75、E-76、E-77、E-78、 E-79、E-7A、E-7B、E-7F、 E-7G、E-7H、E-7I (See Figs. 2 and 4)	Cs-134 Cs-137* ¹	1×10^{-1}	Once every one to two months	Ministry of the Environment
	F-P05、F-P06 (See Fig. 4)	Cs-134 Cs-137	1	Once every three months	Fukushima Prefectural Government
	Sr-90	2×10^{-1}			

		Pu-238 Pu-239+240	2×10^{-2}		
	42 locations on the Fukushima coast (ocean floor) (see Fig. 2)	Cs-134 Cs-137	1×10^{-1}	Between once per month and twice per year	
Ibaraki Prefecture	E-81, E-82, E-83, E-84, E-85 (See Figs. 5 and 6)	Cs-134 Cs-137*1	1×10^{-1}	Once every three to four months	Ministry of the Environment

*1 ... Sr-90 will be analyzed as needed at some locations, including locations with high concentrations of Cs-134 and Cs-137.

(3) Offshore sea area

Monitoring will be conducted in accordance with Table 9.

Table 9: Monitoring of sea sediment in the offshore sea area

Sampling points	Radionuclide	Minimum detectable activity (Bq/kg dry soil)	Frequency of analysis	Implementing entity
M-A1, M-A3, M-MI4, M-B1, M-B3, M-B5, M-C1, M-C3, M-D1, M-D3, M-E1, M-E3, M-E5, M-F1, M-F3, M-G0, M-G1, M-G3, M-G4, M-H1, M-H3, M-I0, M-I1, M-I3, M-J1, M-IB2, M-J3, M-K1, M-IB4, M-L1, M-L3, M-M1 (See Figs. 1, 2, 5, 6)	Cs-134 Cs-137*1	1	Once every three months	Nuclear Regulation Authority

*1 ... Sr-90, Pu-238, Pu-239+240, Am-241, Cm-242, and Cm-243+244 will also be analyzed at some locations, including locations with relatively high concentrations of Cs-134 and Cs-137 as ascertained in past surveys. (The minimum detectable activity in each case is as follows: 1×10^{-1} Bq/kg dry soil for Sr-90; 1×10^{-2} Bq/kg dry soil for Pu-238 and Pu-239+240; 2×10^{-2} Bq/kg dry soil for Am-241; and 1×10^{-2} Bq/kg dry soil for Cm-242 and Cm-243+244.)

(4) Open sea

Sampling of sea sediment will not be performed.

(5) Tokyo Bay

Monitoring will be conducted in accordance with Table 10.

Table 10: Monitoring of sea sediment in Tokyo Bay

Sampling points		Radionuclide	Minimum detectable activity (Bq/kg dry soil)	Frequency of analysis	Implementing entity
Estuaries	E-T1, E-T2, E-T3, E-T4, E-T5, E-T6, E-T7, E-T8 (See Fig. 9)	Cs-134 Cs-137	1×10^{-1}	Four to seven times per year	Ministry of the Environment
	M-C1, M-C3, M-C4, M-C7, M-C8, M-C10, C-P1, C-P2, C-P3, C-P4, C-P5, C-P8 (See Fig. 9)	Cs-134 Cs-137	1	Once every three months	Nuclear Regulation Authority
Middle of the bay	K-T1, K-T2 (See Fig. 9)	Cs-134 Cs-137	1	Six times per year	Nuclear Regulation Authority
	M-C2, M-C5, M-C6, M-C9 (See Fig. 9)	Cs-134 Cs-137	1	Once every three months	Nuclear Regulation Authority

4-3 Monitoring of marine biota

The monitoring of marine biota primarily in sea areas in Fukushima Prefecture will be conducted in accordance with Table 11 upon taking the results of monitoring conducted to date into account.

Table 11: Monitoring of marine biota

Applicable sea area	Target	Radionuclide	Minimum detectable activity (Bq/kg wet weight)	Frequency of analysis	Implementing entity
Coastal sea area	Fish and shellfish	Cs-134 Cs-137*1	1×10^{-1}	Once per month	TEPCO
Coastal sea area Offshore sea area Open sea	Fishery products	Cs-134 Cs-137	1×10^{-1}	Once per week*2	Fisheries Agency*3
Coastal sea area	Fish and shellfish, prey species, and another marine biota*4	Cs-134 Cs-137*1	1×10^{-3} – 1×10^{-2}	Once every three to four months	Ministry of the Environment

*1 ... Sr-90 will also be measured as needed (minimum detectable activity is 2×10^{-2} Bq/kg (wet weight)).

*2 ... Depending on the target item and local government, the frequency of inspections can be set upon taking the results of past inspections into account.

*3 ... While the Fisheries Agency is engaged in the monitoring of fishery products from

the standpoint of ensuring the safety of foodstuff, monitoring data that have been gathered is included here since they can also be used as data for environmental monitoring.

- *4 ... Prey species will be monitored to enable their use in the investigation of the mechanisms by which radioactive materials bioaccumulate in fish and shellfish through the food chain.
- * ... Applicable measurement sites of the target shown in Table 11 will be entrusted to a measurement institution.

5 Other matters

- Seawater will be monitored in particular to monitor leaks of contaminated water from TEPCO's Fukushima Daiichi NPS.
- Each implementing entity will measure concentrations of radioactive materials with targets consisting of the minimum detectable activity values as set forth in Tables 2 through 11.

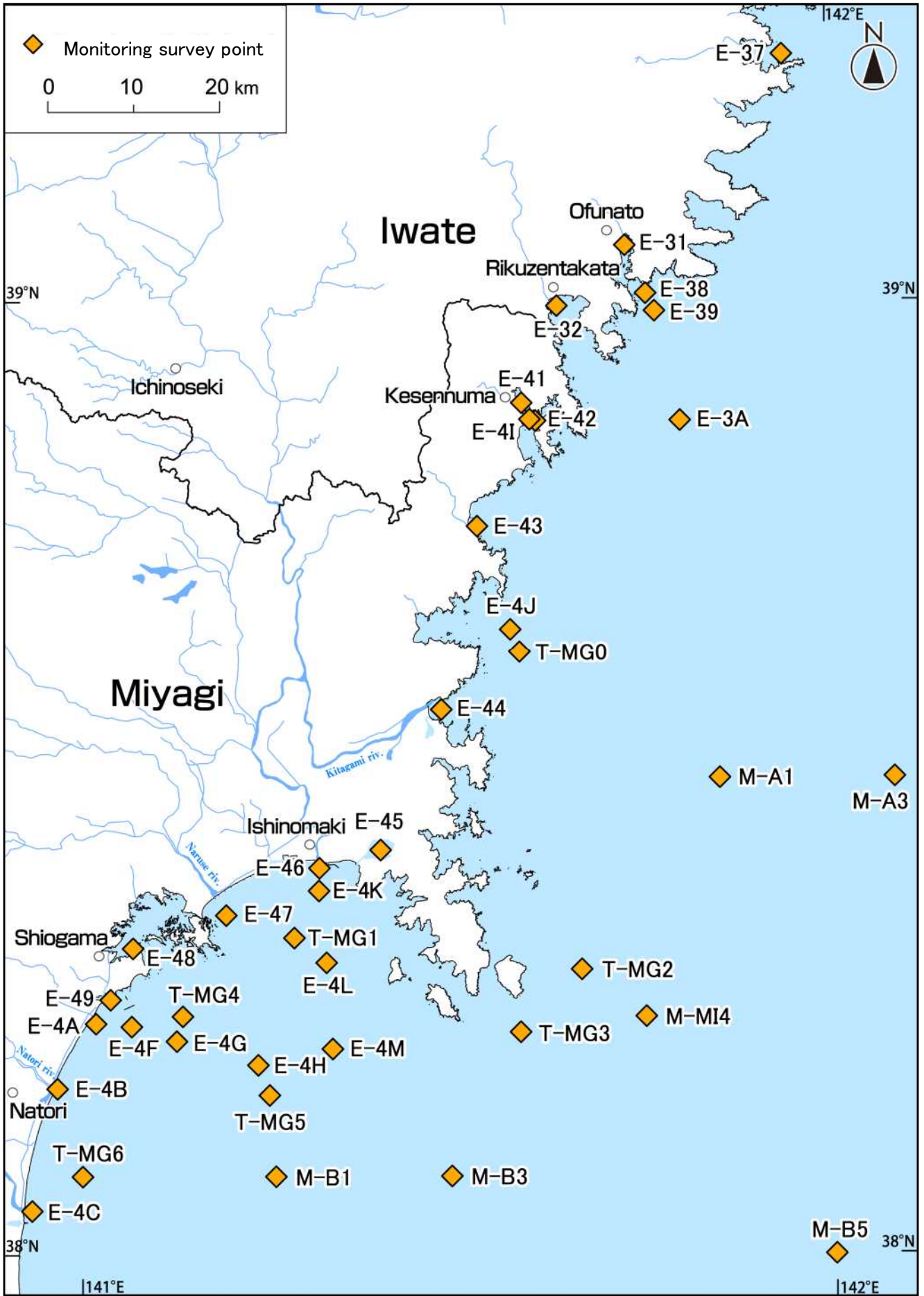


Fig. 1

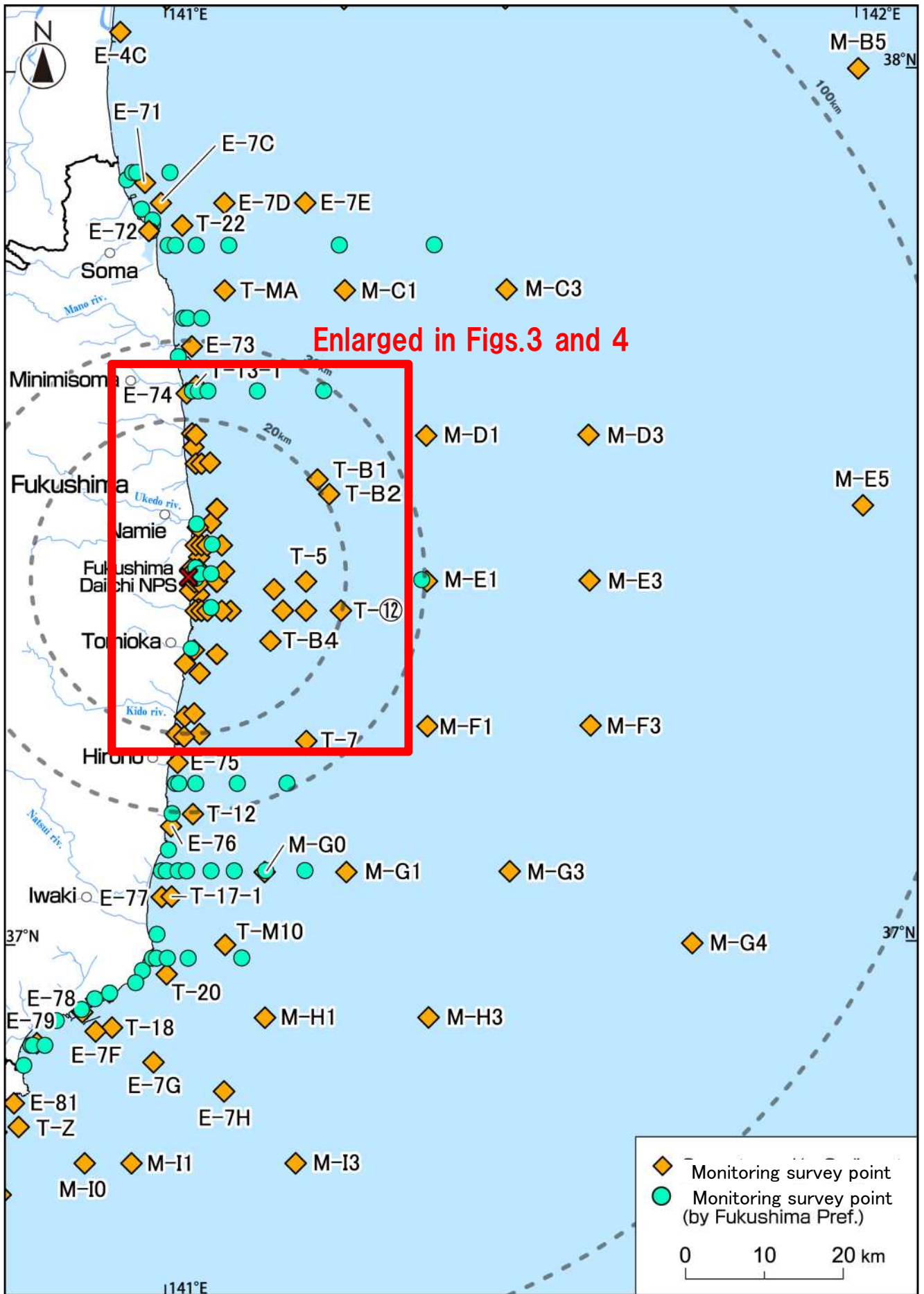


Fig.2

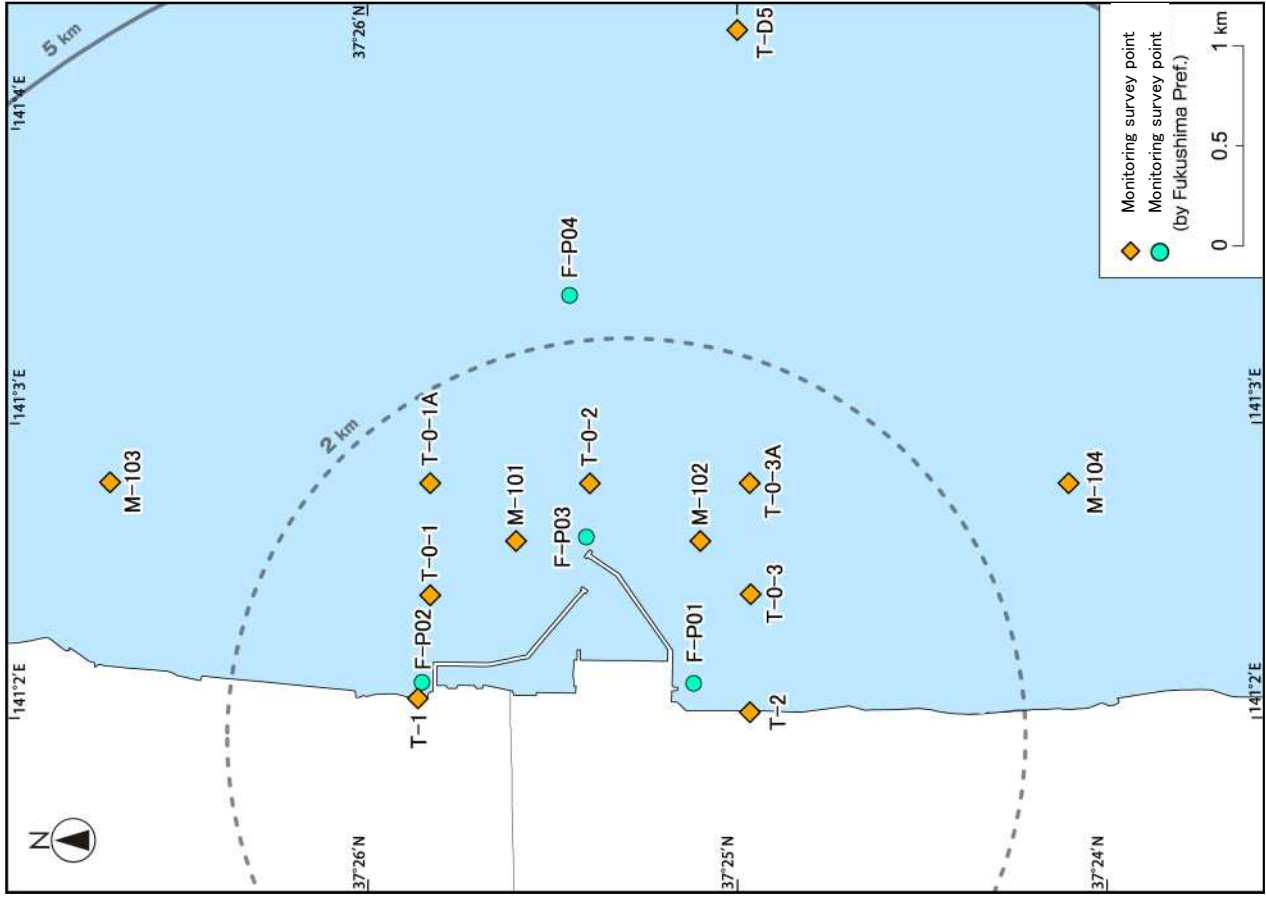


Fig.3

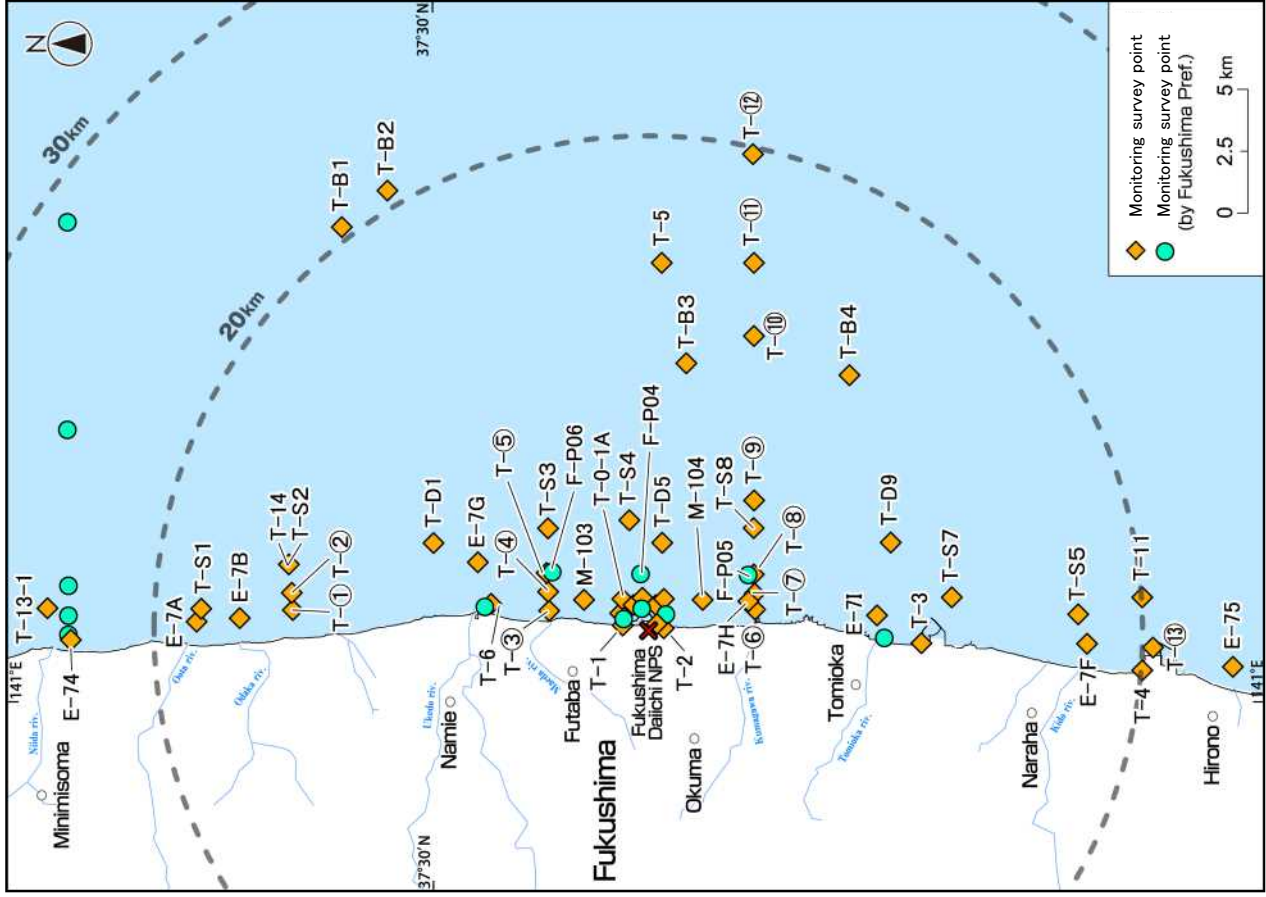


Fig.4

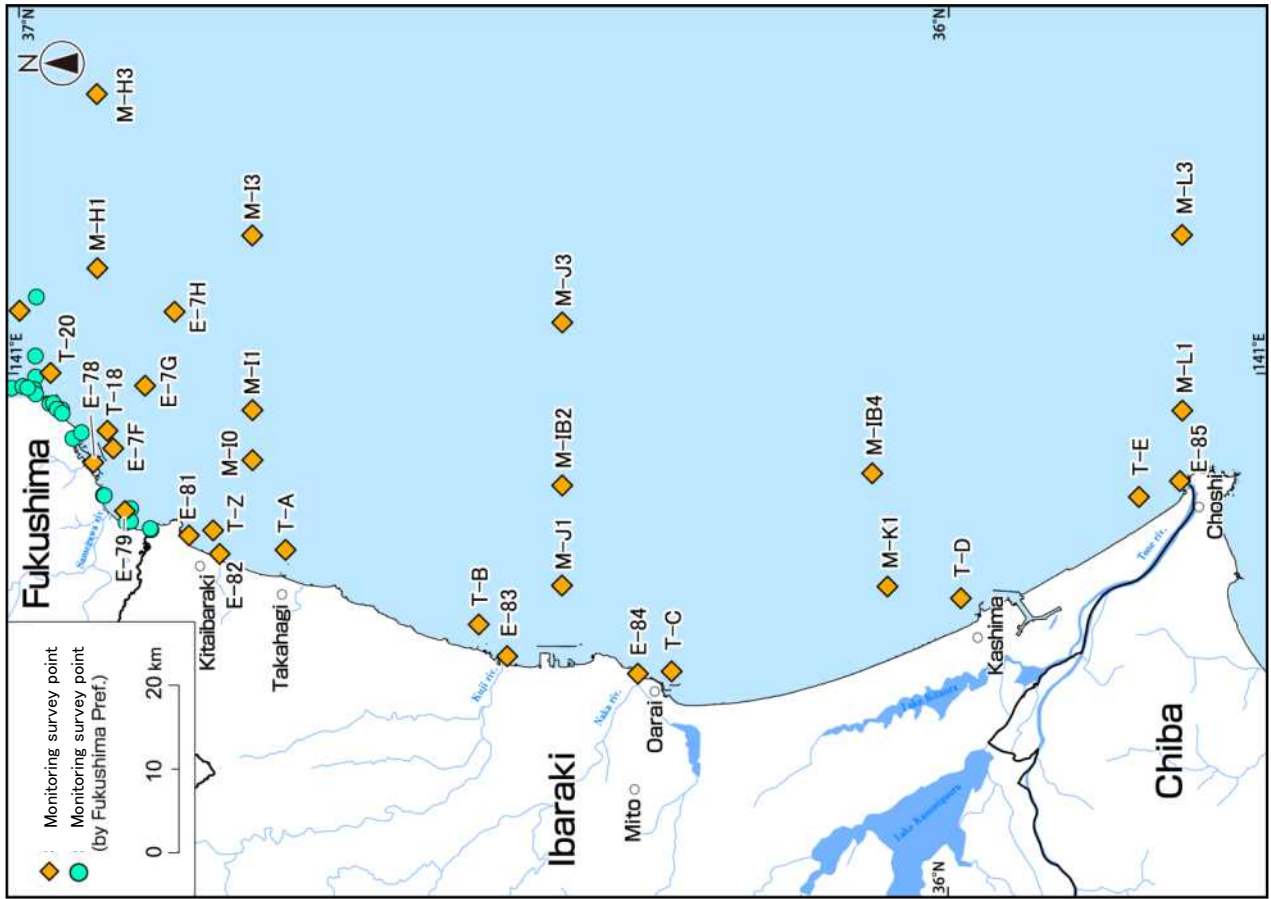


Fig.5

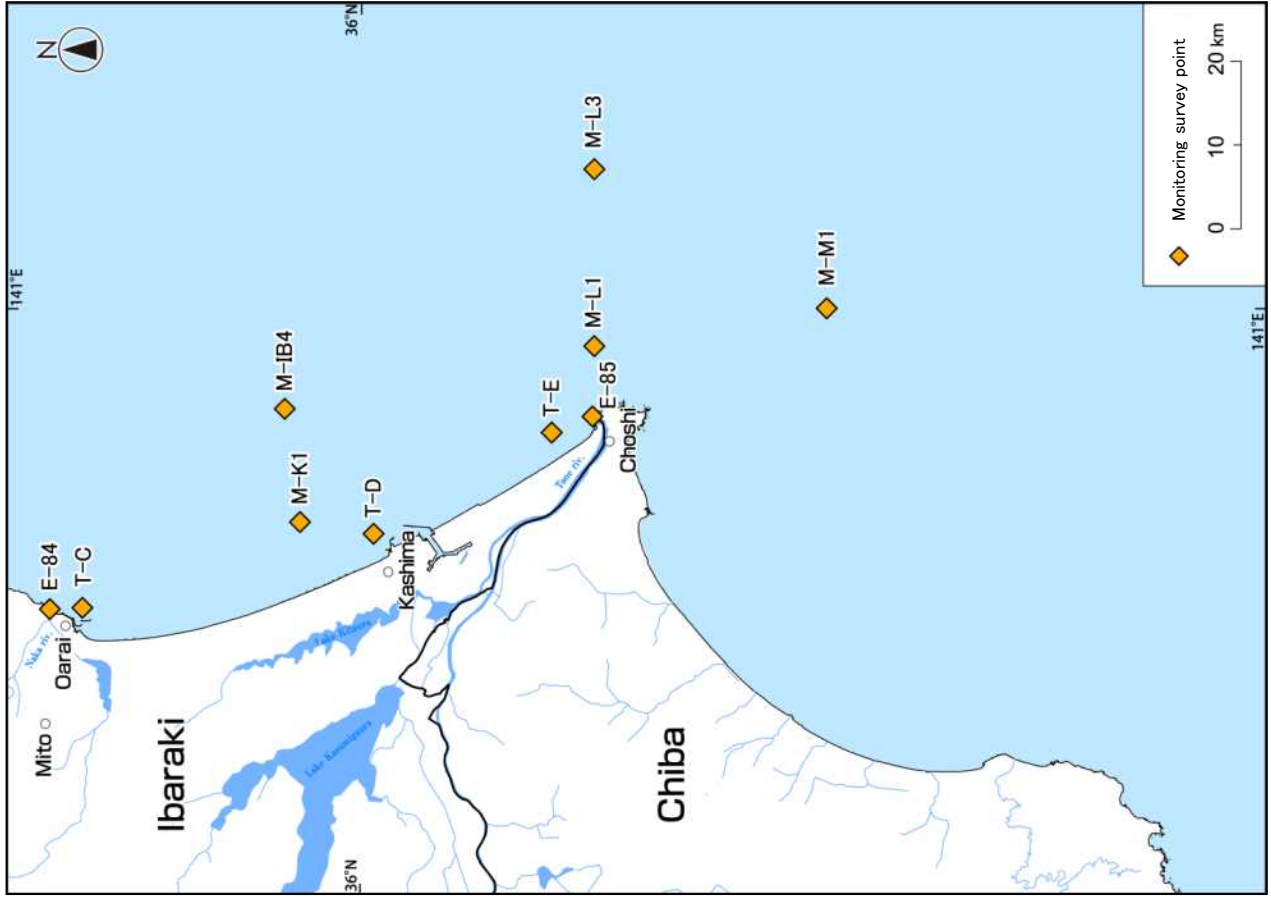


Fig.6

Sampling points in outer sea area

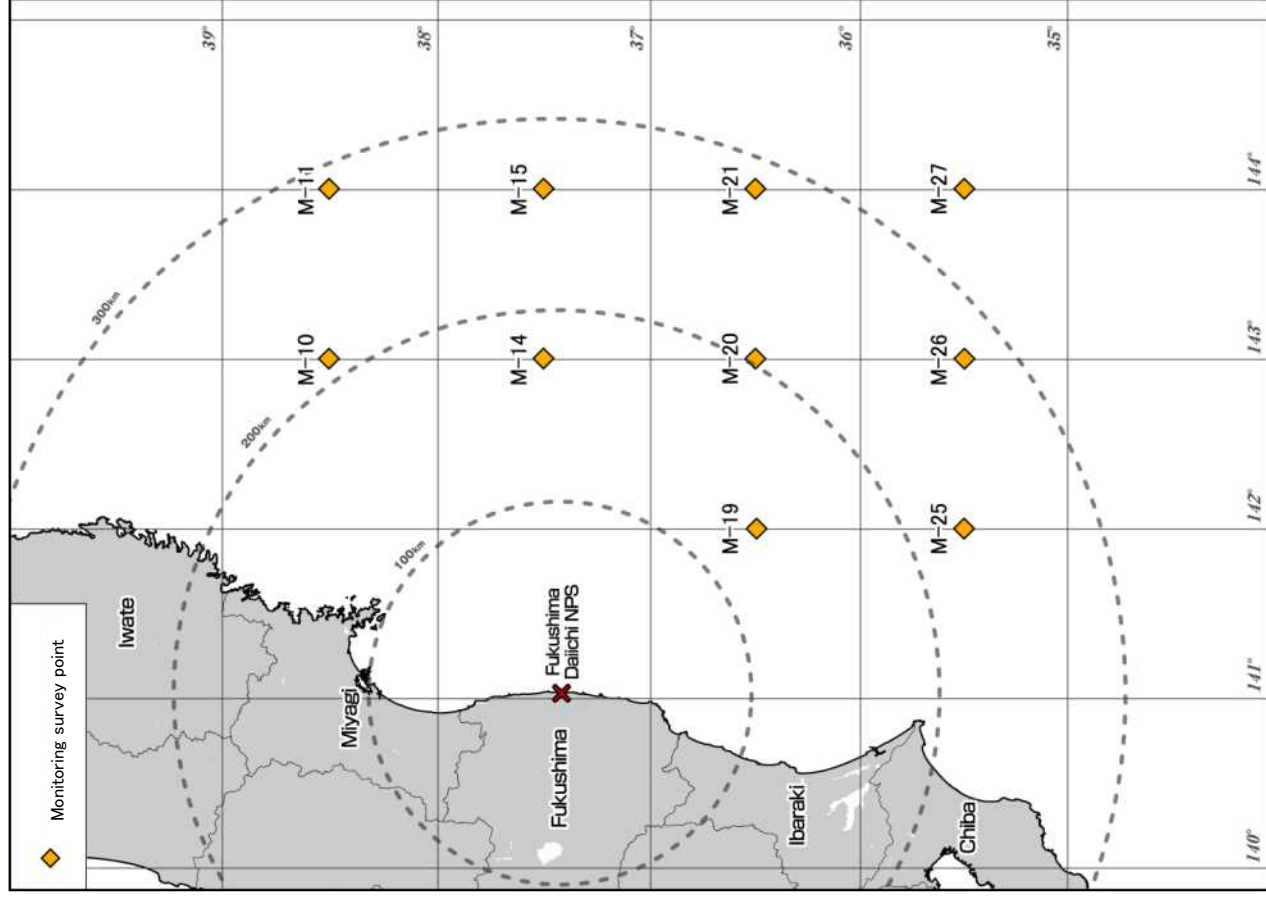


Fig. 7

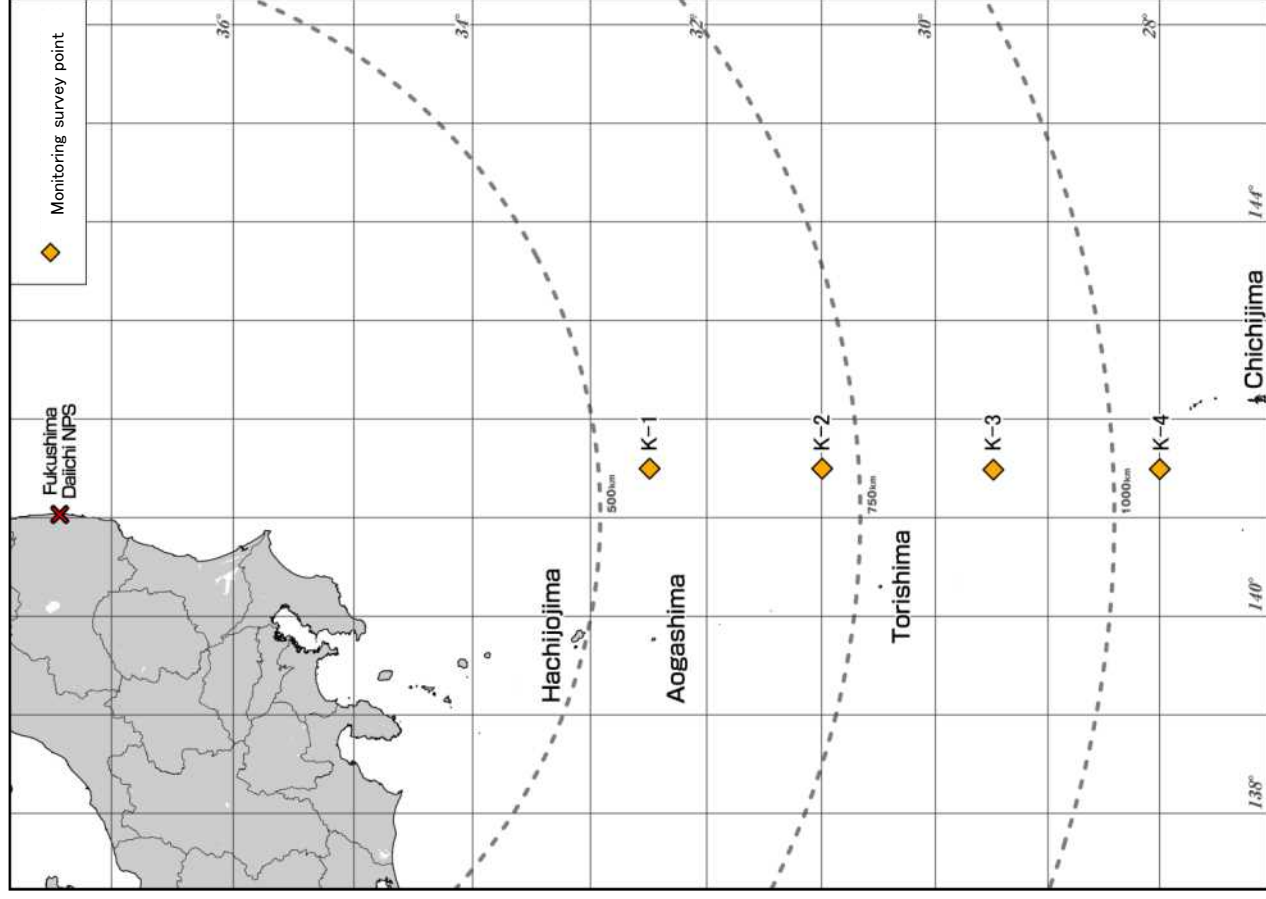


Fig. 8

Reference: Overall view of sea area monitoring

