FY2012 Radioactive Material Monitoring of Aquatic Organisms (Summer Term)

1. Survey Overview

Samples of aquatic organisms (aquatic insects, algae, crustaceans, shellfish, and fish, etc.) were collected mainly in Fukushima Prefecture and concentrations of radioactive cesium and radioactive strontium in the samples were measured (survey period: August 7, 2012, to September 21, 2012).

In order to clarify the environment of the water areas where aquatic organisms live, surveys were also conducted on general items concerning water and sediments (COD, TOC, SS, and turbidity, etc. for water samples and TOC, ignition loss, and grain size distribution, etc. for sediment samples) and activity concentrations in these water areas.

The following water areas were selected based on the results of the past Radioactive Material Monitoring of Aquatic Organisms and Radioactive Material Monitoring in the Water Environment in and around Fukushima Prefecture, as well as the results of the measurement of radioactive materials in fisheries products conducted by other relevant organizations and interviews with local fishermen.

(i) Rivers: Abukuma River, Niida River, Mano River

(ii) Lakes: Lake Hayama, Lake Akimoto, Lake Inawashiro

(iii) Sea areas: Off Iwaki City, off Soma City, off the mouth of the Abukuma River

○ Survey locations and dates

Area		Targeted water areas		Item	Survey dates	Remarks
River area	A	Abukumagawa River	Shinfuna Bridgedownstream ,Harasegawa River (a tributary)	Aquatic organisms sampling	August 8, 2012	Aquatic insects, fish , etc. (Harasegawa River)
				Water/sediment sampling	August 21, 2012	(Water/sediment) A1
	B		Confluence with the Matsukawa River, confluence with the Surikami River, Surikami River (tributary)	Aquatic organisms sampling	August 7, 2012	Fish, amphibians, aquatic insects, etc.(Sumikarigawa River)
					August 9, 2012	Fish
					August 29, 2012	Fish
				Water/sediment sampling	August 21, 2012	(Water) B2, (Sediment) B1, B2
	C	Nittagawa River	Kayagi Bridge to Shin-Sakurai Bridge	Aquatic organisms sampling	September 21, 2012	Fish
				Water/sediment sampling	August 22, 2012	(Water) C1, C3, (Sediment) C1, C2, C3
	D	Mano River	Oyama Bridge to Motebashi Bridge	Aquatic organisms sampling	August 22, 2012	Aquatic insects, fish , etc. (Miyama Bridge)
					August 29, 2012	Fish (Kagitori Bridge and Motebashi Bridge)
				Water/sediment sampling	August 22, 2012	(Water) D1, D2, (Sediment) D1, D2, D3
Lake area	E	Hayamako Lake		Aquatic organisms sampling	August 22, 2012	Aquatic insects, algae, litter
					August 29, 2012	Fish
				Water/sediment sampling	August 23, 2012	(Water) E1, (Sediment) E1, E2, E3
	F	Akimotoko Lake		Aquatic organisms sampling	August 20, 2011	Fish, amphibians, crustaceans , etc.
				Water/sediment sampling	August 20, 2012	(Water) F3, (Sediment) F1, F2, F3
	G	Inawashiroko Lake	North bank	Aquatic organisms sampling	August 10, 2012	Fish
					August 20, 2012	Algae, litter
				Water/sediment sampling	August 21, 2012	(Water) G1, (Sediment) G1, G2
	H		South bank	Aquatic organisms sampling	August 21, 2012	Fish, amphibians, angiosperm
				Water/sediment sampling	August 21, 2012	(Water) None , (Sediment) H1
Sea area	I	Offshore of Iwakishi	Sea area around Hisanohama	Aquatic organisms sampling	August 31, 2012	Fish, shellfish , etc.
				Water/sediment sampling	August 31, 2012	(Water) I2, (Sediment) I1, I2, I3
	J	Offshore of Somashi	Matsukawaura	Aquatic organisms sampling	August 28, 2012	Fish, shellfish , etc.
				Water/sediment sampling	August 28, 2012	(Water) J2, J3, (Sediment) J1, J2, J3
	K	Off the mouth of the Abukumagawa River	Sea area in front of the mouth of the Abukumagawa River	Aquatic organisms sampling	August 29, 2012	Fish, crustaceans, etc.
				Water/sediment sampling	August 29, 2012	(Water) K2, (Sediment) K1, K2, K3

2. Survey Items and Locations, etc.

2.1 Survey Items

Targeted aquatic organisms, measurement items for water samples and sediment samples, and analyzed samples are as shown in the table below.

For all samples of aquatic organisms, analysis of radioactive cesium was conducted. Additionally, for samples of large fish higher on the food chain, organisms with structure (shellfish, etc.), and other samples for which a sufficient amount could be collected, analysis of Sr-90 was also conducted.

The analysis of radioactive materials and general survey items was conducted with regard to water samples collected at the locations where aquatic organism samples are scheduled to be collected or other locations where clay particles and coarse particulate organic matters (CPOMs) are supposed to accumulate due to inflows from the surrounding environment, etc. (two locations in each water area for the analysis of radioactive cesium and general survey items, and one location in each water area for the analysis of radioactive strontium). In the same manner, the analysis of radioactive cesium and general survey items was conducted with regard to sediment samples collected at three locations in each water area, and the analysis of radioactive strontium was conducted with regard to samples collected at one location in each water area.

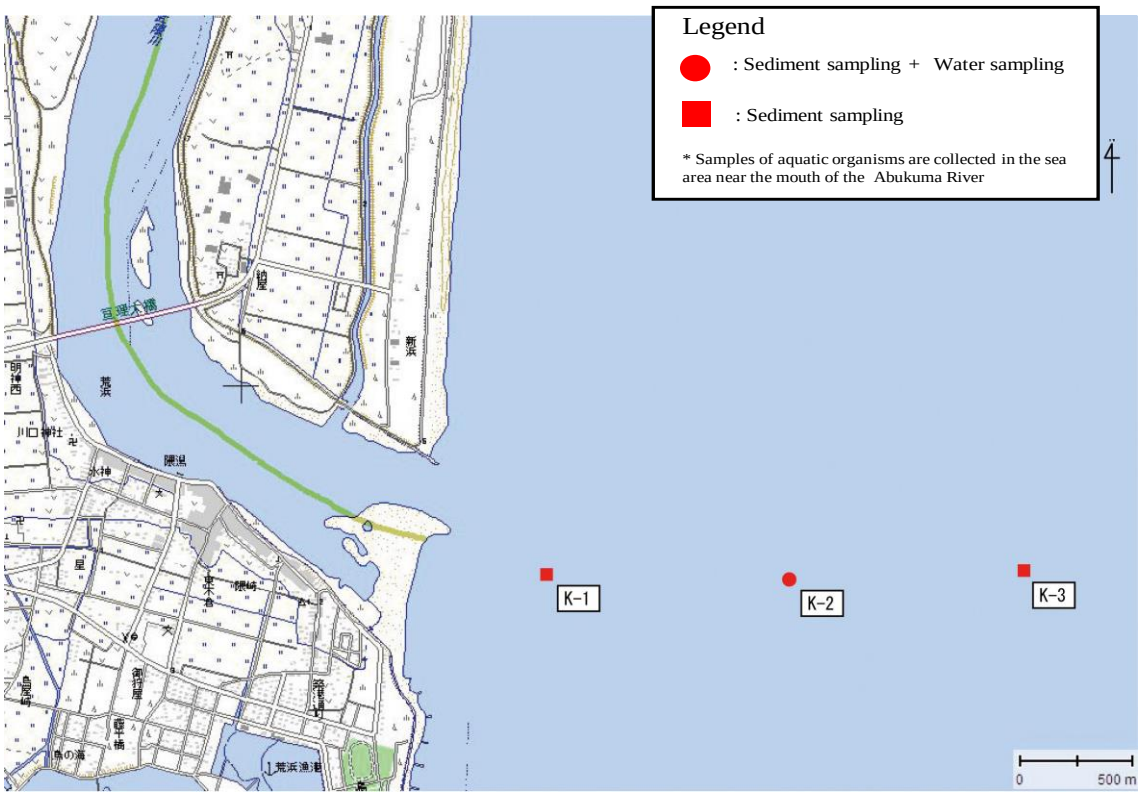
○ Survey targets and items

Target	Measurement item		Analyzed samples
Aquatic Organisms	Radioactive materials	Radioactive cesium (Cs-134,Cs-137)	All samples
		Radioactive strontium (Sr-90)	Large fish, Shellfish, and other samples for which a sufficient amount could be collected
Water	Radioactive materials	Radioactive cesium (Cs-134,Cs-137)	Samples collected at two locations for each water area
		Radioactive strontium (Sr-90)	Samples collected at one location for each water area
	General items	pH	Samples collected at two locations for each water area
		BPD	
		COD	
		DO	
		Electrical conductivity	
		Salinity	
		TOC	
		SS	
		Turbidity	
Sediments	Radioactive materials	Radioactive cesium (Cs-134,Cs-137)	Samples collected at three locations for each water area
		Radioactive strontium (Sr-90)	Samples collected at one location for each water area
	General items	pH	Samples collected at three locations for each water area
		Oxidation-reduction potential	
		Water content ratio	
		TOC	
		Ignition loss	
		Soil particle density	
		Mechanical composition	

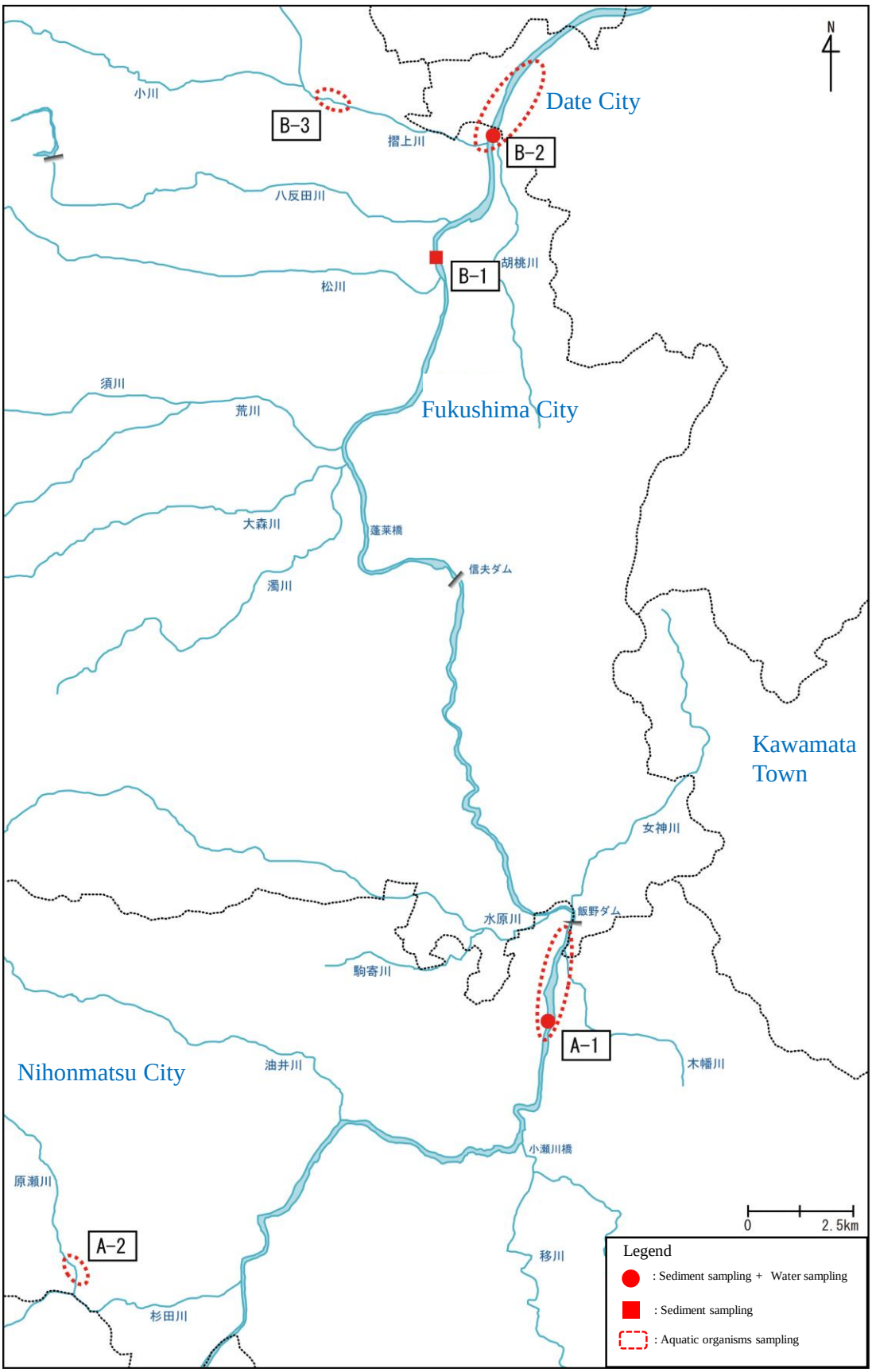
2.2 Survey Locations at Respective Water Areas

(1) Tributaries to the Abukuma River (Location A along the Abukuma River; Location B along the Abukuma River; Location K off the mouth of the Abukuma River)

As water areas where clay particles and CPOMs are supposed to accumulate topographically, Location A along the Abukuma River was set from the Chieko-ohashi Bridge (Nihonmatsu City, Fukushima Prefecture) to the Iinoentei Dam (Horai Dam), and Location B along the Abukuma River was set from the Iinoentei Dam to Taisho Bridge (Date City, Fukushima Prefecture) as water areas containing the zone where the Nigori River, Arakawa River, Matsukawa River, Surikami River, and other tributaries inflow. Additionally, the sea area in front of the mouth of the Abukuma River was set as Location K off the mouth of the Abukuma River as water areas where the outflow of radioactive materials through the Abukuma River is suspected.

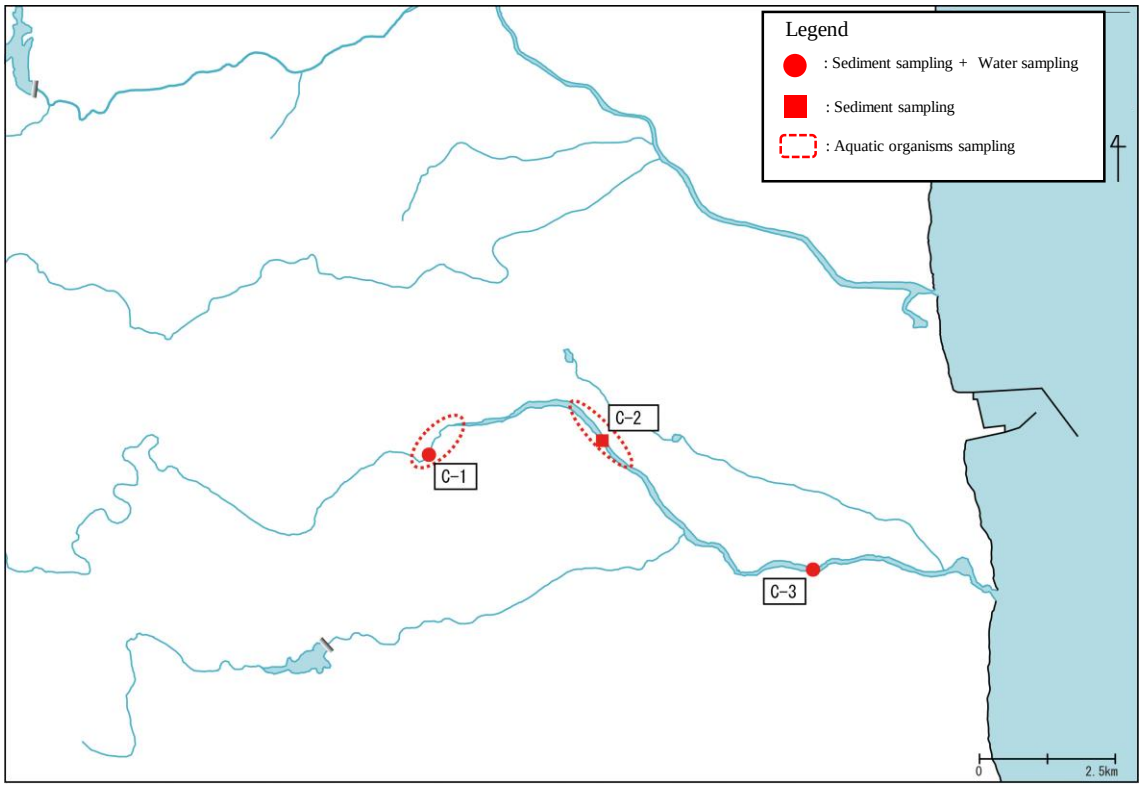


Detailed map showing Location K off the mouth of the Abukuma River



Map showing Location A and Location B along the Abukuma River

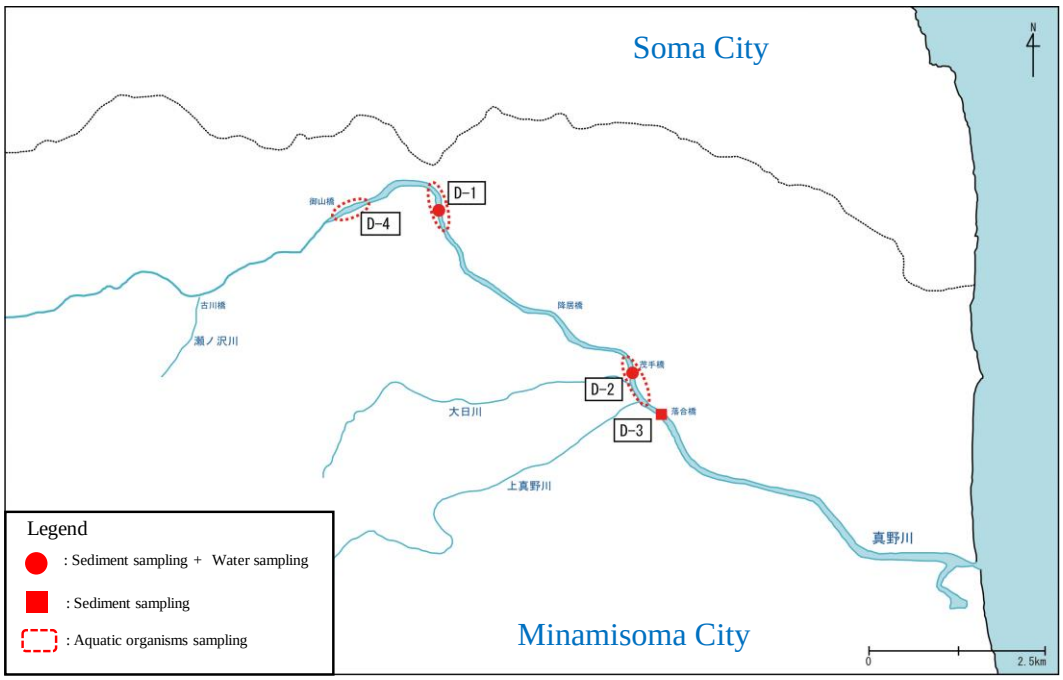
(2) Location C along the Niida River



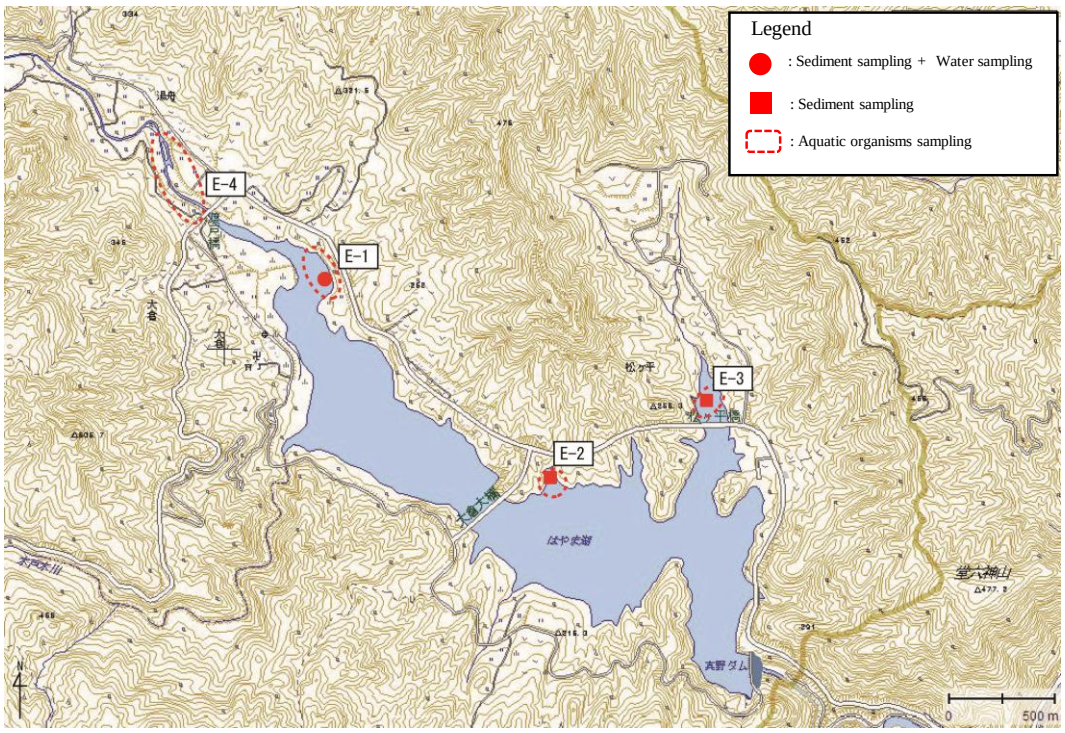
Map showing Location C along the Niida River

(3) Tributaries to the Mano River (Location D along the Mano River; Location E in Lake Hayama)

Surveys were conducted at Location E in Lake Hayama, which covers the lake (Mano Dam) as a whole, and at Location D along the Mano River, which covers from Yoshinami Bridge to Ochiai Bridge (Kashima Ward, Minamisoma City, Fukushima Prefecture) (downstream area of Lake Hayama).

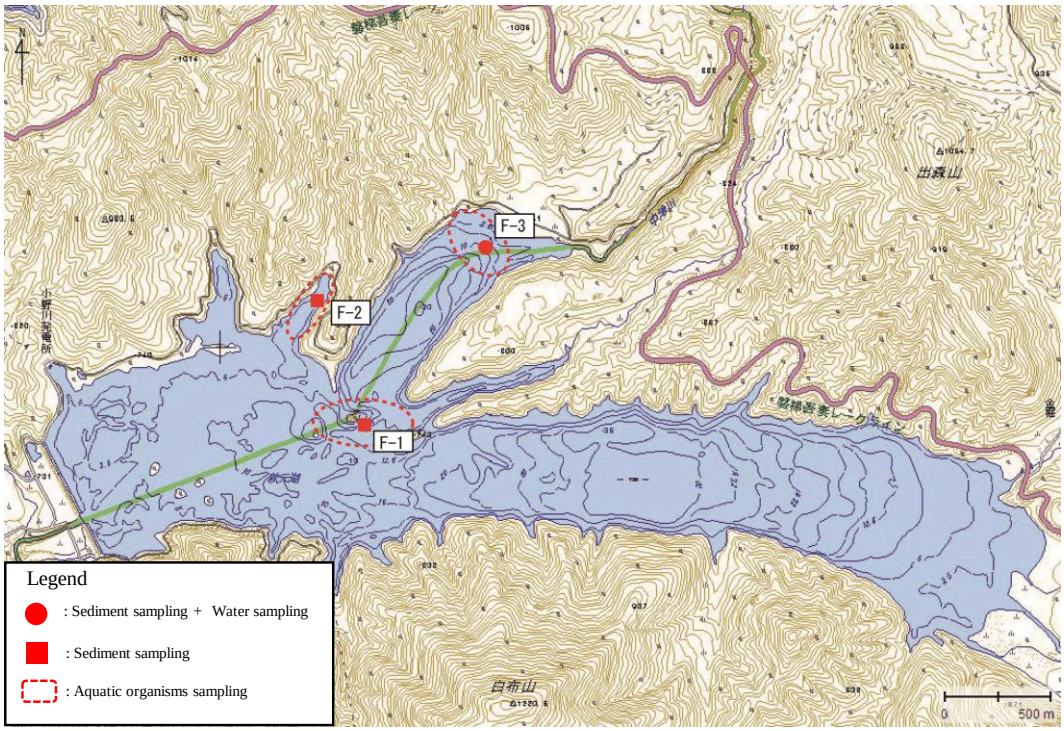


Detailed map showing Location D along the Mano River



Detailed map showing Location E in Lake Hayama (Mano Dam)

(4) Lake Akimoto (Location F in Lake Akimoto)

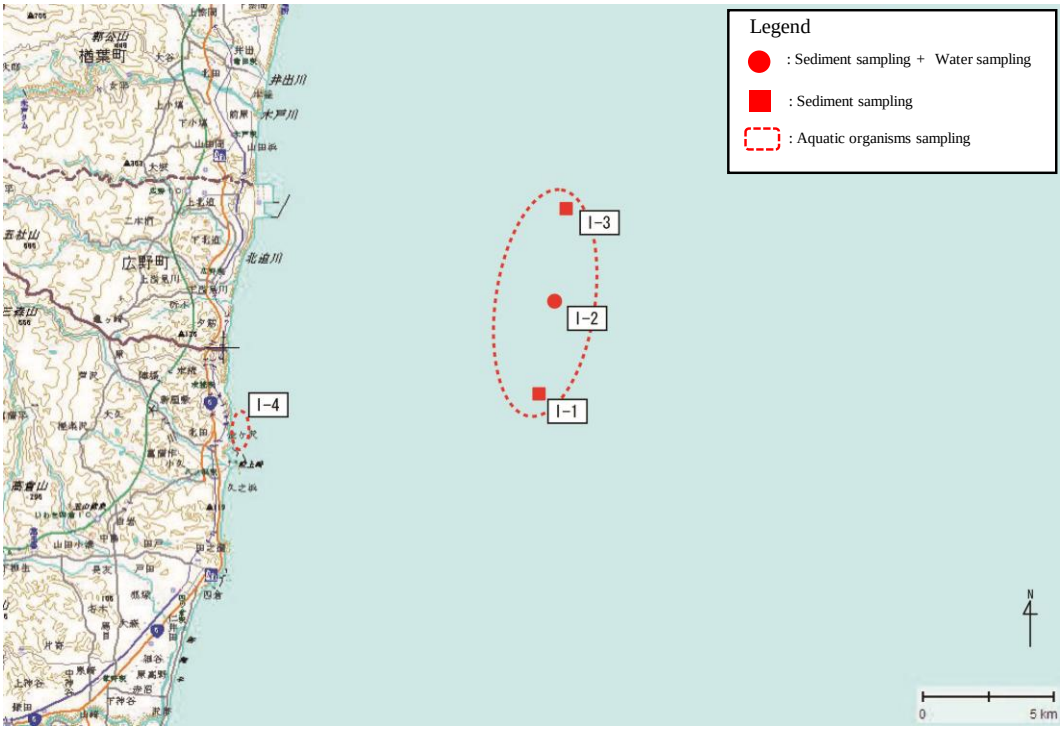


Detailed map showing Location F in Lake Akimoto

(5) Locations G and H in Lake Inawashiro

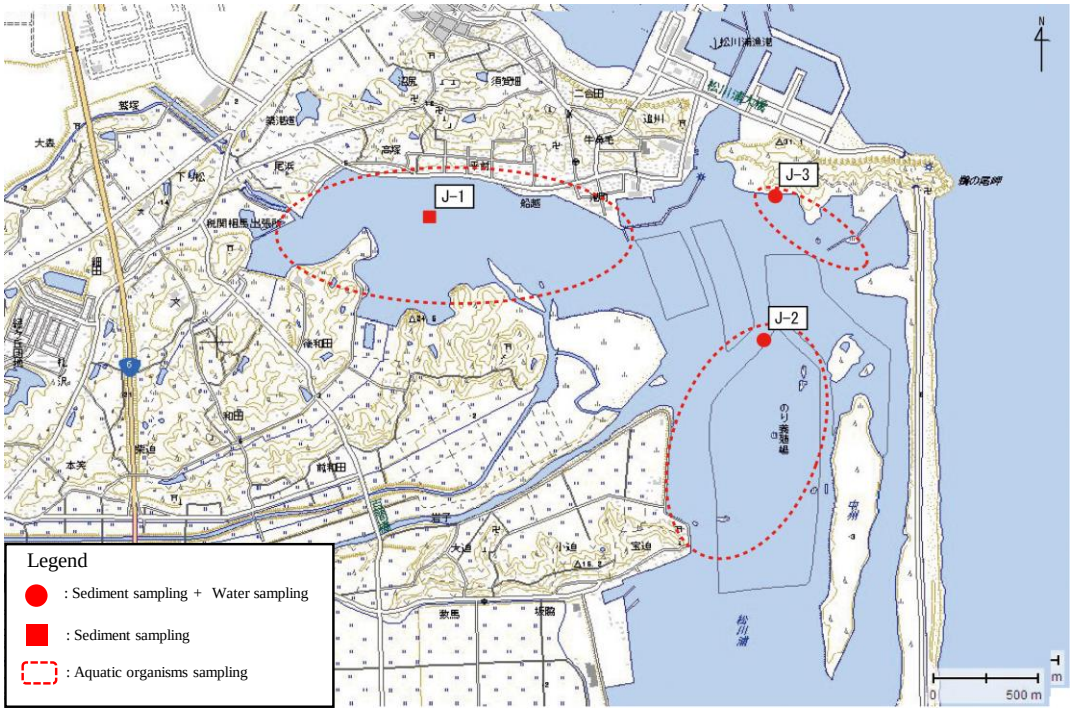
Detailed map showing Locations G and H (north lakeside and south lakeside) in Lake Inawashiro

(6) Location I off Iwaki City



Detailed map showing Location I off Iwaki City (sea area around Hisanohama)

(7) Location J off Soma City



Detailed map showing Location J off Soma City (Matsukawaura Bay)

3. Results

Comparing concentrations of radioactive cesium in aquatic organisms in freshwater areas and seawater areas, aquatic organisms in freshwater areas showed relatively higher concentrations than those in seawater areas.

Concentrations of radioactive cesium in sediment samples collected from the same river system tend to be higher for those collected at zones where water stalls (dams, etc.), and such tendency was especially notable for samples collected at points where water inflows into such zones, as was observed in the spring term monitoring survey

Concentrations of radioactive strontium in sediment samples were higher for those collected in freshwater areas, as in the case of concentrations of radioactive cesium. However, no difference was observed between water samples collected in freshwater areas and those collected in seawater areas. This tendency was unchanged from the time of the spring term monitoring survey.

○ Outline of the measurement results of radioactive cesium (Cs-134 + Cs-137)

(i) Rivers and lakes

Unit: Bq/kg-wet

			Flora (algae, etc.)	Aquatic insects	Crustaceans	Shellfish	Fish	Amphibia	CPOMs (dead leaves, etc.)
Abukuma River System	Abukuma River A	FY2012 Summer	94	199 (8-species mixture)	107, 156 (2 species)	39	34-75 (3 species)	104	1,330
		FY2012 Spring	740	52 (4-species mixture)	181	170	50-167 (7 species)	290-420 (3 species)	—
	Abukuma River B	FY2012 Summer	360	139 (8-species mixture)	139	—	56-600 (13 species)	87; 750 (2 species)	270
		FY2012 Spring	550	—	—	—	76-650 (10 species)	280; 370 (2 species)	—
Mano River System	Lake Hayama E (Mano Dam)	FY2012 Summer	132	450 (10-species mixture)	—	—	232-4,300 (9 species)	—	740
		FY2012 Spring	1,870	510 (7-species mixture)	—	—	280-4,400 (4 species)	—	3,200
	Mano River D	FY2012 Summer	23-570 (3 species)	460 (10-species mixture)	147-660 (3 species)	480	111-760 (7 species)	—	420
		FY2012 Spring	260	198 (14-species mixture)	223	182	202-970 (4 species)	—	1,410
Niida River C		FY2012 Summer	—	—	—	—	199-1,620 (6 species)	—	—
		FY2012 Spring	—	—	—	—	440-11,400 (5 species)	—	—
Lake Akimoto F		FY2012 Summer	7.1-44 (3 species)	—	156	—	63-310 (12 species)	71-136 (3 species)	156
		FY2012 Spring	46	—	183	—	94-470 (7 species)	540	250
Lake Inawashiro	Lake Inawashiro G (north lakeside)	FY2012 Summer	42	—	—	—	9.1-330 (7 species)	—	172
		FY2012 Spring	500	—	—	—	77-380 (6 species)	—	—
	Lake Inawashiro H (south lakeside)	FY2012 Summer	4.8-12 (3 species)	—	—	62	11-178 (9 species)	68	—
		FY2012 Spring	9	—	—	—	46-430 (6 species)	—	—

* As the number of aquatic insect samples was small, measurement was conducted by mixing samples for each water area and each location.

(ii) Sea areas

Unit: Bq/kg-wet

		Flora (algae, etc.)	Sea urchin, starfish, trepang	Crustaceans	Sandworm	Shellfish		Squid, octopus	Fish
						Molluscan body	Shell		
Location I off Iwaki City (Hisanohama)	FY2012 Summer	25	26; 50 (2 species)	—	—	6.1	49	7.4	14-126 (10 species)
	FY2012 Spring	22, 33 (2 species)	21; 97 (2 species)	—	—	13	24	—	7.6-290 (8 species)
Location J off Soma City (Matsukawaura Bay)	FY2012 Summer	2.9; 3.1 (2 species)	—	3.0-300 (4 species)	107	5.3; 8.9 (2 species)	4.7; 29 (2 species)	—	5.9-36 (7 species)
	FY2012 Spring	13-102 (3 species)	—	12-87 (4 species)	—	4.1; 5.7 (2 species)	9; 56 (2 species)	—	11-166 (5 species)
Location K off the mouth of the Abukuma River	FY2012 Summer	—	—	0.95	—	—	—	—	ND-19 (7 species)
	FY2012 Spring	—	—	8.4; 21 (2 species)	—	—	—	—	11-42 (5 species)