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RADIOACTIVITY SURVEY DATA in Japan

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Contents

Environmental and Dietary Materials*

(Japan Chemical Analysis Center)

1. Collection and pretreatment of samples

(1) Rain and dry fallout

Rain and dry fallout was collected monthly on a sampling tray, approximately 5000 cm^2 in area, which was filled with water to a depth of 1 cm at the beginning of every month.

The sample was filtered after strontium and cesium carriers were added. The tray was washed with 5ℓ of distilled water and the washing was combined to the filtrate.

The sample was passed through a cation exchange column (500 mℓ of Dowex 50W X8, 50~100 mesh, Na form) at a rate of 80 mℓ/min.

(2) Airborne dust

Airborne dust was collected by an electrostatic precipitator or a filter air sampler for every three months at a rate of more than 3000 m^3 per month. The sampling was done 1 to 1.5 meters above the ground.

(3) Service water and freshwater

Service water, 100 ℓ each, was collected at an intake of the water-treatment plant and at the tap after water was left running for five minutes. Water, to which added carriers of strontium and cesium immediately after sampling, was vigorously stirred and filtered. The subsequent process was the same as that described in the section (1). Freshwater was treated in the same way as the service water.

(4) Soil

Soil was collected from the location in the spacious and flat area without past disturbance on the surface caused by duststorms, inflow and outflow due to precipitation, and so on. Any places located under trees in a forest, in a stony area or inside of river banks were avoided. Soil was taken from two layers of different depths, 0~5 cm and 5~20 cm. In the course of air-drying, lumps were crushed by hand, and roots of plants and pebbles were removed. The soil was then passed through a 2 mm sieve to remove small gravels.

(5) Sea water

Sea water was collected at the fixed stations where the effect of terrestrial fresh water from rivers was expected to be negligibly small. A special consideration was also given to weather conditions. The sampling was carried out when there was no rainfall for the last few davs. To prevent contamination, water samples were collected at the bow of a sampling boat just before she stood still by scooping surface water using a polyethylene bucket. Immediately after the collection, the samples were acidified to a pH lower than 3 by adding concentrated hydrochloric acid in a ratio of 1 mℓ to 1ℓ of sea water, and then stored in 20-ℓ polyethylene containers. The sampling equipments as well as containers were thoroughly rinsed with dilute hydrochloric acid and then with distilled water before use. Two hundred milliliters of sea water was also collected at the same stations for the determination of chlorinity.

(6) Sea sediments

Sediment was collected in the same area as that for the sea water sample, taking the following criteria into account:

a. The depth of water exceeds 1 m at low tide.
b. No significant sedimental movement is observed in the vicinity of concern.
c. Mud, silt and fine sand are preferable.

A conventional sediment sampling device was used for collecting the top few centimeters of surface sediment. Approximately 4 kg of the sample in wet weight was spread on a large porcelain dish and dried in an electric oven at 105 to 110°C to a costant weight.

(7) Total diet

A full one day ordinary diet including three meals, water, tea and other in-between snacks for five persons was collected as a sample of "total diet". The sample in a large stainless steel pan was carbonized carefully by direct application of gas flame, and was transfered to a porcelain dish and then ashed at 500 °C in an electric muffle furnace.

(8) Rice

Polished rice was collected in producing districts at the harvest and in consuming areas when new crops were first put on sale. The sample was carbonized and ashed in a porcelain dish.

* Samples were sent to the Center from 32 contracted prefectures.

(9) Milk

Raw milk was collected in producing districts and commercial milk was purchased in consuming districts. Milk in a stainless steel pan or a porcelain dish was evaporated to dryness followed by carbonization and ashing.

(10) Vegetables

Spinach and Japanese radish were selected as the representatives for leaf vegetables and for non-starch roots, respectively. After removing soil, the edible part of vegetable sample was dried and carbonized in a stainless ateel pan or a porcelain dish.

(11) Tea

Five hundred grams of manufactured green tea was collected, carbonized and ashed in a stainless steel pan or a porcelain dish.

(12) Fish, shellfish and seaweeds

a. Sea fish and freshwater fish

Fish was rinsed with water and blotted with a filter paper. Only the edible part was used in case of larger sized fish, and the whole part was used in case of smaller ones. Each sample was weighed and placed in a stainless steel pan or a porcelain dish. After carbonized, the sample was ashed in an electric muffle furnace.

b. Shellfish

Approximately 4 kg of shellfish including the shells was collected or purchased. After removing the shells, it was treated in the same way as that for the sea fish.

c. Seaweeds

Edible seaweeds were collected and rinsed with water to remove sand and other adhering matters on the surface. These were removed of excess water, weighed dried and ashed.

Table 1 shows detailes of sample collection.

Table 1 Details of sample collection

Sample	Frequency of sampling	Quantity of sample
=Environmental materials=		
(1) Rain and dry fallout		
1 for domestic program	monthly	
2 for WHO program	monthly	
(2) Airborne dust	quarterly	>3000 m^3/month
(3) Service water and freshwater		
1 Service water (sourse water)	semiyearly (June and December)	100 ℓ
2 Service water (tap water)	semiyearly (June and December)	100 ℓ
3 Freshwater	yearly (fishing season)	100 ℓ
(4) Soil		
1 0~5 cm	yearly (June or July)	4 kg
2 5~20 cm	yearly (June or July)	4 kg
(5) Sea water	yearly (July or August)	40 ℓ
(6) Sea sediments	yearly (July or August)	4 kg
=Dietary materials=		
(7) Total diet	semiyearly (June, November or December)	daily amount for 5 person
(8) Rice		
1 Producing districts	Yearly (harvesting season)	5 kg (polished rice)
2 consuming districts	yearly (harvesting season)	5 kg (polished rice)
(9) Milk		
1 producing districts for WHO program	quarterly (February, May, August and November)	3 ℓ
2 producing districts for domestic program	semiyearly (February and August)	3 ℓ

Sample	Frequency of sampling	Quantity of sample
3 consuming districts	semiyearly (February and August)	3 ℓ
4 powdered milk	semiyearly (April and October)	2~3 kg
(10) Vegetables		
1 producing districts	yearly (hervesting season)	4 kg
2 consuming districts	yearly (harvesting season)	4 kg
(11) Tea	yearly (the first harvesting season)	500 g (manufactured tea)
(12) Fish, shellfish, and seaweeds		
1 Sea fish	yearly (fishing season)	4 kg
2 Freshwater fish	yearly (fishing season)	4 kg
3 Shellfish	yearly (fishing season)	4 kg
4 Seaweeds	yearly (fishing season)	2~3 kg

2. Preparation of samples for analysis

(1) Rain, service water and freshwater

Strontium and cesium were eluted with hydrochloric acid from the cation exchange column. The residue of rain sample on the filter paper was ashed in an electric muffle furnace and the ash was dissolved in hydrochlbric acid. The insoluble part was filtered and washed. The filtrate and the washings were combined to the previous eluate and used for radiochemical analysis.

(2) Soil

Air-dried soil was passed through a 20 mesh sieve. The sieved sample was heated, in the presence of strontium and cesium carriers, together with sodium hydroxide. The sample was then heated with hydrochloric acid and the insoluble part was filtered and washed. The combined solution of the filtrate and washings was used for radiochemical analysis.

(3) Sea sedments

After removal of pebbles, shells and other foreign matters, the sediment sample was dried in a hot-air oven and ground finely with a mortar. The sample was passed through a 20 mesh sieve. The further preparation of the sample was the same as that described in the section 2-(2).

(4) Rice

The ashed sample was pulverlized with a porcelain mortar and passed through a 42 mesh sieve. The sieved sample to which both strontium and cesium carriers were added, was digested with hydrochloric acid by heating. After the sample was heated again with nitric acid to dryness, strontium and cesium were extracted with hydrochloric acid and water. The insoluble part was filtered and washed. The filtrate and washings were combined for subsequent radiochemical analysis.

(5) Airborne dust, diet, milk, vegetable, fish and shellfish, seaweeds, tea, and others.

These ashed samples were treated with the same procedure as that described in the section 2-(4).

3. Separation of strontiunm-90 and cesium-137

(1) Strontium-90

Sample solutions, prepared as in the foregoing sections 2-(1) through 2-(5), were neutralized with sodium hydroxide. After sodium carbonate was added, the precipitate of strontium and calcium carbonates was separated. The supernatant solution was retained for cesium-137 determination. The carbonates were dissolved in hydrochloric acid and calcium and strontium were precipitated as oxalates. The precipitate was dissolved in nitric acid and strontium was separated from calcium by successive fuming nitric acid separations. Iron scavenge was made after addition of ferric iron carrier followed by barium chromate separation after addition of barium carrier to remove radium, its daughters and lead. Strontium was recovered as carbonate, and the precipitate was dried and weighed to determine strontium recovery. The strontium carbonate was dissolved in hydrochloric acid and the iron carrier was added. The solution was allowed to stand for two weeks for strontium-90 and yttrium-90 to attain equilibrium. The yttrium-90 was coprecipitated with ferric hydroxide and the precipitate was filtered off, washed and counted.

(2) Cesium-137

The supernatant separated from the strontium fraction in the solution was acidified with hydrochloric acid.

While stirring the solution, cesium was adsorbed on ammonium molybdophosphate.

After filtered off and washed with dilute nitric acid, the precipitate was dissolved in 2.5N sodium hydroxide solution. Ammonia was removed completely from the solution by boiling. The solution was adjusted to pH 8.2 with hydrochloric acid and allowed to cool. Molybdenum hydroxide which came out in the solution, was filtered off and washed with water. In such circumstance that contamination by rubidium-87 was not negligible for the measurement of cesium-137, the follwing ion-exchange procedure was applied. A fixed amount of ferric chloride solution was added to the solution dissolved with 2.5N sodium hydroxide. Ammonia and molybdenum hydroxide were removed as described above. Ethylenediaminetetraaceticacid tetrasodium salt was added to the filtrate and washings. Cesium and rubidium were adsorbed on a cation exchange resin. Cesium was separated from rubidium by eluting with hydrochloric acid.

To this eluate or the filtrate and washings after removing molybdenum hydroxide, chloroplatinic acid solution was added to precipitate cesium. The precipitate was filtered onto a tared paper in a demountable filter and washed with water and then ethanol.
After fixing the filter paper on a tared planchette and drying it, the chemical yield of cesium was determined by weighing the precipitate with the planchette. Radioactivity from cesium-137 was measured for this precipitate.

4. Determination of stable strontium, calcium and potassium

A weighed amount of soil or sea sediment was treated under heating with sodium hydroxide and then with hydrochloric acid for extraction. A weighed aliquot of ashed samples of total diet, vegetables, milk, fish, shellfish or seeweeds was digested using hydrochloric acid or nitric acid, hydrofluoric acid being used when necessary. The extract was made up to an appropriate volume with dilute hydrochloric acid. The sample solution was analyzed for calcium by titration with standard potassium permanganate solution after separating calcium as oxalate. Atomic absorption spectroscopy was applied when appropriate. Stable strontium and potassium were determined by atomic absorption and flame emission spectrometry, respectively.

5. Counting

After the radiochemical separation, the mounted precipitates were counted for activity using low background beta counters normally for 60 min. Net sample counting rates were corrected for counter efficeiency, recovery, self-absorption and decay to obtain the content of strontium-90 and cesium-137 radioactivity per sample aliquot. From the results, concentrations of these nuclides in the original samples were calculated.

6. Results

(1)-1 Strontium-90 and Cesium-137 in Rain and dry fallout (for domestic program) (from Jun. 1984 to Dec. 1984)

—continued from No. 68 of this publication—

Table (1)-1: Strontium-90 and Cesium-137 Rain and dry fallout

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
June, 1984				
Onagawa-machi, MIYAGI	31	117.8	0.006±0.0008	0.002±0.0006
Shizuoka, SHIZUOKA	32	167.5	0.004±0.0008	0.003±0.0005
Matsue, SHIMANE	31	275.0	0.002±0.0006	0.001±0.0005
July, 1984				
Sapporo, HOKKAIDO	31	44.5	0.002±0.0006	0.001±0.0005
Aomori, AOMORI	31	98.4	0.012±0.0010	0.003±0.0006
Onagawa-machi, MIYAGI	32	129.7	0.004±0.0007	0.000±0.0004
Mito, IBARAGI	31	90.5	0.004±0.0007	0.003±0.0005
Shinjuku, TOKYO	31	81.8	0.001±0.0006	0.001±0.0004
Yokohama, KANAGAWA	32	109.7	0.001±0.0006	0.000±0.0004
Fukui, FUKUI	31	169.7	0.003±0.0007	0.001±0.0005
Shizuoka, SHIZUOKA	31	52.0	0.004±0.0007	0.000±0.0004
Kyoto, KYOTO	32	126.6	0.004±0.0007	0.001±0.0004
Wakayama, WAKAYAMA	31	178.8	0.005±0.0008	0.002±0.0005
Tottori, TOTTORI	30	111.1	0.006±0.0008	0.001±0.0005
Matsue, SHIMANE	32	77.8	0.002±0.0006	0.001±0.0004
Hiroshima, HIROSHIMA	31	71.7	0.008±0.0009	0.002±0.0005
Matsuyama, EHIME	31	78.5	0.004±0.0007	0.000±0.0004
Dazaifu, FUKUOKA	31	52.7	0.009±0.0016	0.002±0.0009
Saga, SAGA	32	35.8	0.004±0.0008	0.000±0.0004
Nagasaki, NAGASAKI	31	64.0	0.001±0.0006	0.001±0.0005
Yonagusuku-mura, OKINAWA	31	99.0	0.000±0.0008	0.001±0.0004
August, 1984				
Sapporo, HOKKAIDO	31	39.0	0.005±0.0007	0.001±0.0005
Aomori, AOMORI	32	41.9	0.013±0.0010	0.002±0.0005
Onagawa-machi, MIYAGI	32	23.0	0.008±0.0008	0.002±0.0005
Yamagata, YAMAGATA	32	7.7	0.004±0.0007	0.002±0.0005
Ookuma-machi, FUKUSHIMA	32	31.0	0.002±0.0006	0.000±0.0004
Mito, IBARAGI	32	4.5	0.004±0.0007	0.000±0.0004
Shinjuku, TOKYO	32	41.3	0.004±0.0007	0.003±0.0006
Yokohama, KANAGAWA	32	87.6	0.001±0.0006	0.001±0.0004
Fukui, FUKUI	31	44.9	0.000±0.0005	0.000±0.0004
Shizuoka, SHIZUOKA	34	213.0	0.002±0.0006	0.001±0.0005
Nagoya, AICHI	32	23.0	0.004±0.0007	0.001±0.0005
Kyoto, KYOTO	33	75.1	0.004±0.0007	0.001±0.0004
Kobe, HYOGO	33	21.5	0.001±0.0006	0.000±0.0004
Wakayama, WAKAYAMA	32	55.9	0.003±0.0007	0.001±0.0005
Tottori, TOTTORI	34	26.9	0.014±0.0011	0.002±0.0005

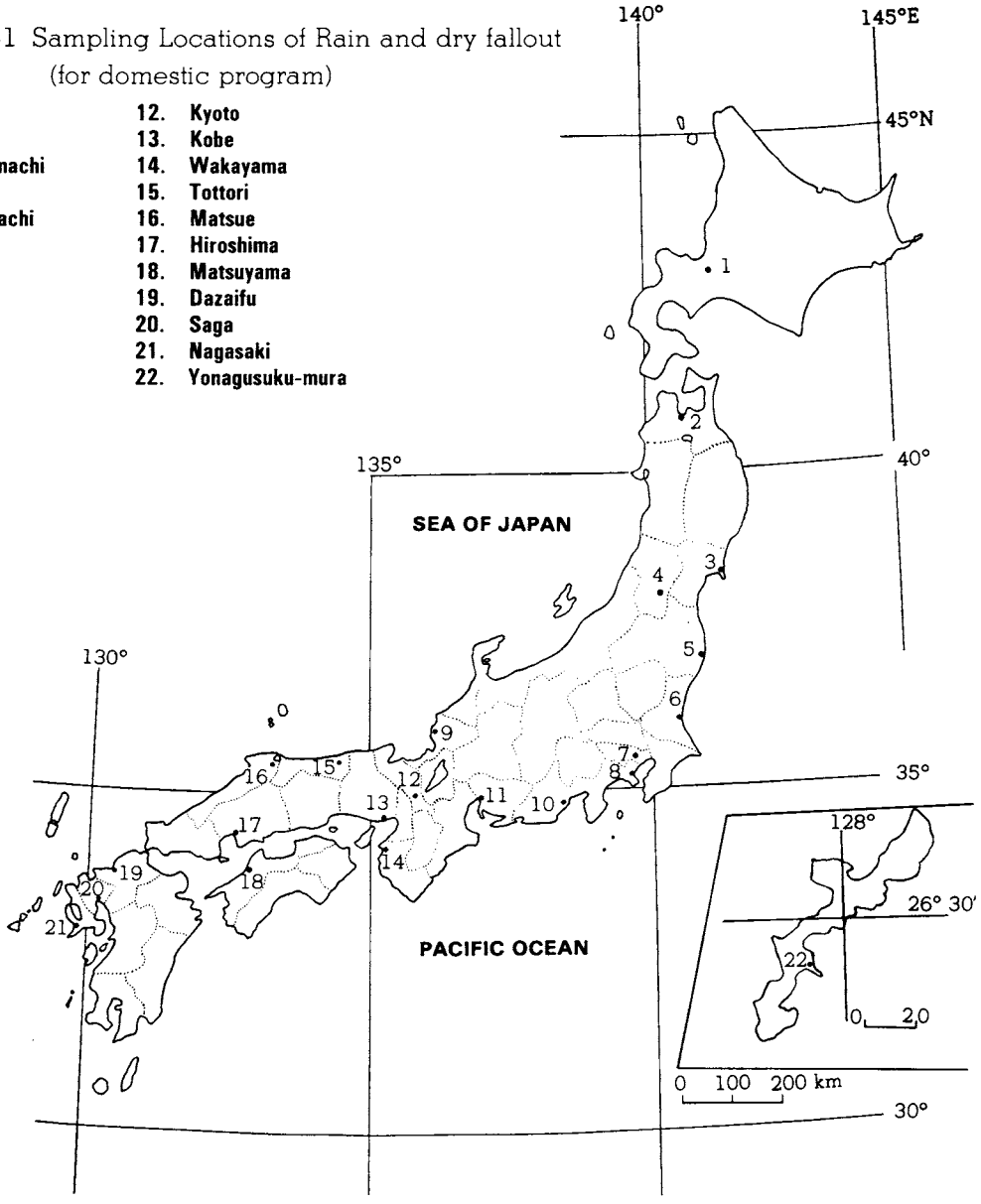
Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Matsue, SHIMANE	32	37.2	0.004±0.0007	0.001±0.0004
Hiroshima, HIROSHIMA	32	50.8	0.013±0.0010	0.001±0.0005
Matsuyama, EHIME	31	55.5	0.001±0.0006	0.002±0.0006
Dazaifu, FUKUOKA	32	187.3	0.003±0.0007	0.001±0.0005
Saga, SAGA	33	227.5	0.001±0.0005	0.000±0.0004
Nagasaki, NAGASAKI	32	245.0	0.001±0.0005	0.001±0.0005
Yonagusuku-mura, OKINAWA	35	369.5	0.003±0.0006	0.001±0.0005
September, 1984				
Sapporo, HOKKAIDO	32	54.0	0.002±0.0006	0.001±0.0005
Aomori, AOMORI	31	112.9	0.008±0.0009	0.004±0.0006
Onagawa-machi, MIYAGI	30	200.9	0.006±0.0007	0.001±0.0004
Yamagata, YAMAGATA	31	174.0	0.005±0.0007	0.000±0.0004
Ookuma-machi, FUKUSHIMA	33	79.3	0.001±0.0005	0.000±0.0004
Mito, IBARAGI	31	29.0	0.000±0.0005	0.001±0.0004
Shinjuku, TOKYO	31	60.8	0.005±0.0008	0.001±0.0005
Yokohama, KANAGAWA	30	69.0	0.001±0.0006	0.001±0.0005
Fukui, FUKUI	32	63.1	0.002±0.0007	0.003±0.0006
Shizuoka, SHIZUOKA	29	86.5	0.002±0.0006	0.000±0.0004
Nagoya, AICHI	31	82.0	0.002±0.0006	0.001±0.0005
Kyoto, KYOTO	32	99.2	0.001±0.0006	0.001±0.0004
Kobe, HYOGO	30	111.7	0.005±0.0008	0.002±0.0005
Wakayama, WAKAYAMA	28	66.1	0.001±0.0006	0.001±0.0005
Tottori, TOTTORI	29	103.5	0.005±0.0008	0.002±0.0005
Matsue, SHIMANE	32	89.8	0.004±0.0007	0.001±0.0004
Hiroshima, HIROSHIMA	31	117.7	0.004±0.0008	0.001±0.0005
Matsuyama, EHIME	32	67.0	0.001±0.0006	0.001±0.0005
Dazaifu, FUKUOKA	31	163.2	0.002±0.0006	0.000±0.0004
Saga, SAGA	30	70.9	0.001±0.0006	0.000±0.0004
Nagasaki, NAGASAKI	31	130.0	0.001±0.0006	0.002±0.0004
Yonagusuku-mura, OKINAWA	28	86.5	0.001±0.0006	0.001±0.0005
October, 1984				
Sapporo, HOKKAIDO	32	76.5	0.001±0.0006	0.003±0.0006
Aomori, AOMORI	32	102.0	0.008±0.0009	0.002±0.0005
Onagawa-machi, MIYAGI	33	136.5	0.008±0.0009	0.002±0.0005
Yamagata, YAMAGATA	32	60.8	0.002±0.0006	0.001±0.0004
Ookuma-machi, FUKUSHIMA	30	189.3	0.003±0.0006	0.001±0.0004
Mito, IBARAGI	32	70.5	0.002±0.0006	0.001±0.0004
Shinjuku, TOKYO	32	91.7	0.003±0.0007	0.002±0.0005
Yokohama, KANAGAWA	33	86.6	0.002±0.0006	0.001±0.0005
Fukui, FUKUI	32	89.3	0.002±0.0006	0.002±0.0005
Shizuoka, SHIZUOKA	32	34.0	0.001±0.0009	0.001±0.0006
Nagoya, AICHI	32	42.0	0.002±0.0006	0.000±0.0004
Kyoto, KYOTO	32	60.7	0.002±0.0006	0.000±0.0004
Kobe, HYOGO	33	38.8	0.003±0.0007	0.002±0.0006

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Wakayama, WAKAYAMA	34	30.0	0.002±0.0007	0.000±0.0004
Tottori, TOTTORI	32	98.9	0.005±0.0008	0.003±0.0006
Matsue, SHIMANE	31	49.5	0.001±0.0006	0.000±0.0004
Hiroshima, HIROSHIMA	32	75.9	0.004±0.0007	0.001±0.0005
Matsuyama, EHIME	32	50.5	0.000±0.0005	0.000±0.0005
Dazaifu, FUKUOKA	32	71.1	0.000±0.0008	0.001±0.0006
Saga, SAGA	31	0.0	0.001±0.0007	0.000±0.0004
Nagasaki, NAGASAKI	32	16.0	0.002±0.0007	0.002±0.0005
Yonagusuku-mura, OKINAWA	31	125.0	0.000±0.0006	0.000±0.0004
Novenber, 1984				
Sapporo, HOKKAIDO	30	43.0	0.001±0.0006	0.004±0.0006
Aomori, AOMORI	31	57.8	0.006±0.0008	0.002±0.0005
Onagawa-machi, MIYAGI	31	48.0	0.007±0.0008	0.002±0.0005
Yamagata, YAMAGATA	31	51.4	0.001±0.0006	0.001±0.0004
Ookuma-machi, FUKUSHIMA	31	76.9	0.001±0.0006	0.000±0.0004
Mito, IBARAGI	31	46.5	0.001±0.0006	0.001±0.0005
Shinjuku, TOKYO	31	55.0	0.004±0.0007	0.001±0.0005
Yokohama, KANAGAWA	32	64.1	0.002±0.0006	0.001±0.0005
Fukui, FUKUI	31	145.5	0.001±0.0006	0.001±0.0005
Shizuoka, SHIZUOKA	31	78.0	0.002±0.0007	0.001±0.0004
Nagoya, AICHI	31	62.8	0.001±0.0006	0.000±0.0004
Kyoto, KYOTO	30	36.5	0.001±0.0006	0.001±0.0005
Kobe, HYOGO	31	37.4	0.001±0.0006	0.002±0.0005
Wakayama, WAKAYAMA	34	49.7	0.000±0.0005	0.001±0.0005
Tottori, TOTTORI	31	138.7	0.003±0.0007	0.002±0.0005
Matsue, SHIMANE	31	96.5	0.003±0.0007	0.001±0.0005
Hiroshima, HIROSHIMA	31	42.2	0.003±0.0008	0.001±0.0005
Matsuyama, EHIME	30	25.5	0.001±0.0006	0.000±0.0004
Dazaifu, FUKUOKA	31	54.3	0.001±0.0006	0.000±0.0005
Saga, SAGA	29	71.0	0.001±0.0006	0.000±0.0004
Nagasaki, NAGASAKI	31	59.5	0.002±0.0006	0.000±0.0004
Yonagusuku-mura, OKINAWA	34	119.0	0.001±0.0007	0.001±0.0004
December, 1984				
Sapporo, HOKKAIDO	28	63.5	0.001±0.0006	0.001±0.0006
Aomori,AOMORI	38	149.2	0.005±0.0007	0.003±0.0006
Onagawa-machi, MIYAGI	28	53.0	0.005±0.0007	0.002±0.0005
Yamagata, YAMAGATA	35	64.5	0.002±0.0007	0.003±0.0006
Ookuma-machi, FUKUSHIMA	28	66.5	0.002±0.0006	0.000±0.0006
Mito, IBARAGI	36	63.0	0.001±0.0006	0.001±0.0006
Shinjuku, TOKYO	35	76.0	0.002±0.0006	0.002±0.0006
Yokohama, KANAGAWA	35	86.0	0.002±0.0006	0.002±0.0005
Fukui, FUKUI	36	451.9	0.004±0.0007	0.006±0.0008
Shizuoka, SHIZUOKA	35	49.0	0.000±0.0006	0.000±0.0004
Nagoya, AICHI	38	43.0	0.002±0.0006	0.001±0.0006
Kyoto, KYOTO	38	58.3	0.002±0.0006	0.001±0.0006
Kobe, HYOGO	28	37.4	0.002±0.0006	0.001±0.0005

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Wakayama, WAKAYAMA	36	40.1	0.002±0.0007	0.001±0.0005
Tottori, TOTTORI	36	1035.5	0.006±0.0008	0.008±0.0008
Matsue, SHIMANE	31	159.3	0.003±0.0007	0.006±0.0008
Hiroshima, HIROSHIMA	38	25.7	0.004±0.0007	0.002±0.0005
Matsuyama, EHIME	29	34.0	0.001±0.0006	0.002±0.0005
Dazaifu, FUKUOKA	35	88.1	0.001±0.0006	0.003±0.0006
Saga, SAGA	36	70.4	0.001±0.0006	0.001±0.0004
Nagasaki, NAGASAKI	35	57.5	0.001±0.0006	0.000±0.0004
Yonagusuku-mura, OKINAWA	36	73.0	0.000±0.0010	0.003±0.0009

Figure (1)-1 Sampling Locations of Rain and dry fallout (for domestic program)

1. **Sapporo**
2. **Aomori**
3. **Onagawa-machi**
4. **Yamagata**
5. **Ookuma-machi**
6. **Mito**
7. **Shinjuku**
8. **Yokohama**
9. **Fukui**
10. **Shizuoka**
11. **Nagoya**
12. **Kyoto**
13. **Kobe**
14. **Wakayama**
15. **Tottori**
16. **Matsue**
17. **Hiroshima**
18. **Matsuyama**
19. **Dazaifu**
20. **Saga**
21. **Nagasaki**
22. **Yonagusuku-mura**



(1)-2 Strontium-90 and Cesium-137 in Rain and dry fallout (for WHO program) (from Jul. 1984 to Jan. 1985)

—continued from No. 68 of this publication—

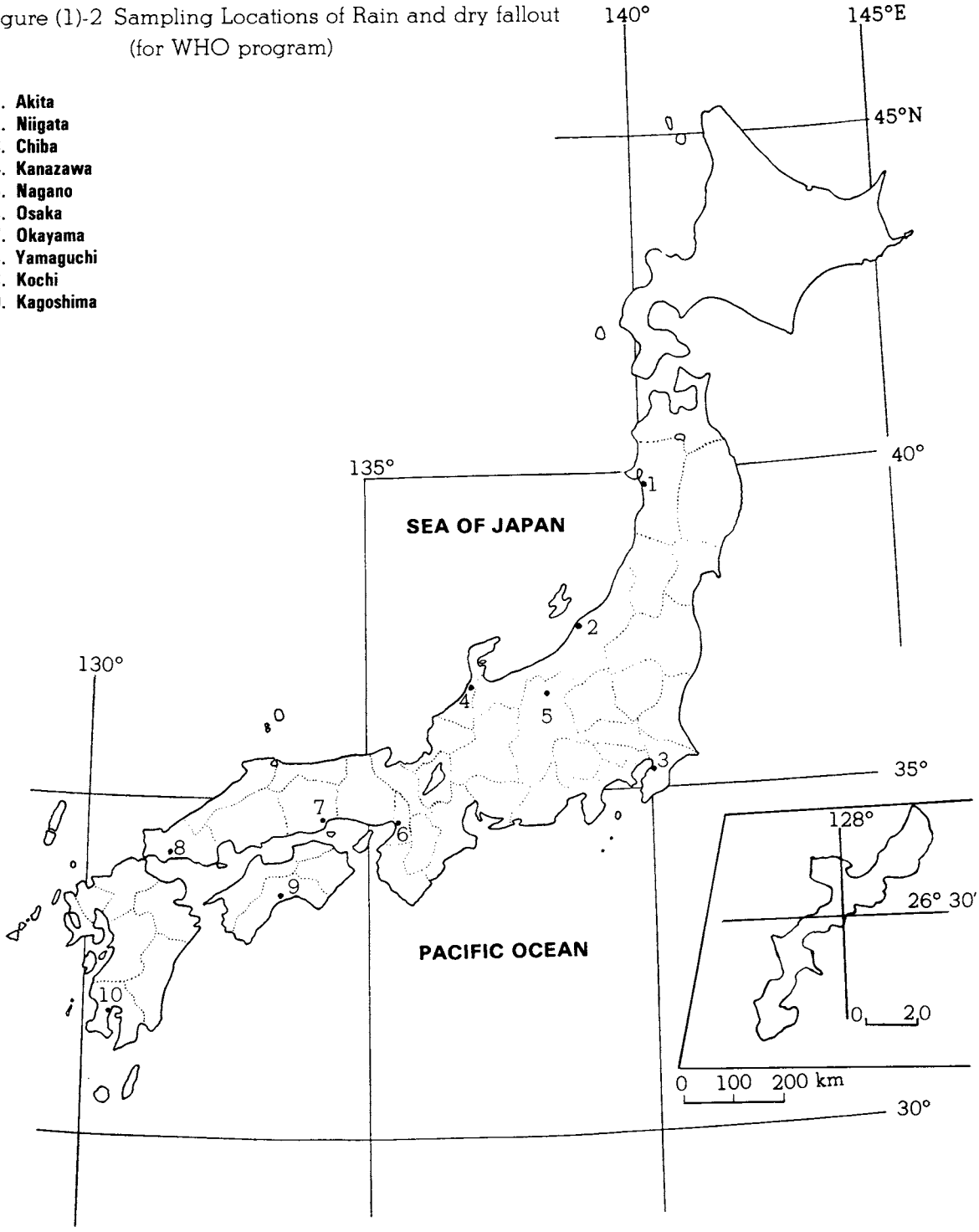
Table (1)-2: Strontium-90 and Cesium-137 Rain and dry fallout

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
July, 1984				
Niigata, NIIGATA	31	230.9	0.003±0.0007	0.002±0.0005
Kanazawa, ISHIKAWA	30	225.0	0.002±0.0006	0.001±0.0004
Nagano, NAGANO	31	231.1	0.002±0.0006	0.000±0.0004
Osaka, OSAKA	31	140.1	0.004±0.0007	0.001±0.0004
Okayama, OKAYAMA	31	47.1	0.000±0.0005	0.000±0.0004
Yamaguchi, YAMAGUCHI	31	127.5	0.001±0.0006	0.002±0.0005
Kochi, KOCHI	32	217.9	0.007±0.0008	0.001±0.0005
Kagoshima, KAGOSHIMA	31	87.5	0.000±0.0005	0.002±0.0005
August, 1984				
Akita, AKITA	32	95.3	0.001±0.0006	0.000±0.0004
Niigata, NIIGATA	32	31.2	0.003±0.0007	0.004±0.0007
Chiba, CHIBA	31	3.5	0.000±0.0005	0.002±0.0006
Kanazawa, ISHIKAWA	32	99.0	0.004±0.0007	0.002±0.0005
Nagano, NAGANO	32	16.4	0.002±0.0006	0.000±0.0004
Osaka, OSAKA	32	44.3	0.004±0.0007	0.001±0.0005
Okayama, OKAYAMA	32	51.0	0.003±0.0006	0.000±0.0004
Yamaguchi, YAMAGUCHI	32	123.5	0.004±0.0007	0.002±0.0005
Kochi, KOCHI	32	330.1	0.004±0.0007	0.001±0.0005
Kagoshima, KAGOSHIMA	32	332.5	0.004±0.0009	0.002±0.0006
September, 1984				
Akita, AKITA	31	184.8	0.002±0.0007	0.002±0.0005
Niigata, NIIGATA	31	188.0	0.003±0.0006	0.001±0.0005
Chiba, CHIBA	32	67.7	0.002±0.0007	0.001±0.0004
Kanazawa, ISHIKAWA	30	122.5	0.005±0.0007	0.001±0.0004
Nagano, NAGANO	31	100.6	0.002±0.0006	0.001±0.0004
Osaka, OSAKA	31	105.2	0.002±0.0007	0.002±0.0005
Okayama, OKAYAMA	31	85.6	0.004±0.0007	0.000±0.0005
Yamaguchi, YAMAGUCHI	31	113.0	0.003±0.0006	0.001±0.0004
Kochi, KOCHI	31	89.9	0.004±0.0007	0.001±0.0005
Kagoshima, KAGOSHIMA	31	157.5	0.003±0.0009	0.001±0.0006
October, 1984				
Akita, AKITA	32	193.3	0.001±0.0005	0.001±0.0005
Niigata, NIIGATA	32	92.7	0.001±0.0005	0.001±0.0005
Chiba, CHIBA	32	60.3	0.000±0.0007	0.001±0.0004
Kanazawa, ISHIKAWA	33	122.0	0.005±0.0007	0.002±0.0005
Nagano, NAGANO	32	48.3	0.002±0.0006	0.000±0.0004
Osaka, OSAKA	32	50.6	0.001±0.0006	0.000±0.0004
Okayama, OKAYAMA	32	60.0	0.000±0.0005	0.000±0.0004
Yamaguchi, YAMAGUCHI	32	42.0	0.005±0.0008	0.001±0.0005

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Kochi, KOCHI	32	130.9	0.003±0.0006	0.001±0.0004
Kagoshima, KAGOSHIMA	32	29.0	0.002±0.0007	0.002±0.0005
Novenber, 1984				
Akita, AKITA	31	130.9	0.002±0.0006	0.003±0.0006
Niigata, NIIGATA	31	92.3	0.002±0.0006	0.002±0.0005
Chiba, CHIBA	33	65.2	0.000±0.0006	0.001±0.0004
Kanazawa, ISHIKAWA	31	204.0	0.002±0.0006	0.002±0.0005
Nagano, NAGANO	31	41.0	0.002±0.0006	0.000±0.0004
Osaka, OSAKA	31	27.3	0.001±0.0006	0.000±0.0004
Okayama, OKAYAMA	31	31.9	0.000±0.0005	0.000±0.0004
Yamaguchi, YAMAGUCHI	30	63.5	0.001±0.0006	0.000±0.0004
Kochi, KOCHI	31	108.7	0.004±0.0007	0.001±0.0005
Kagoshima, KAGOSHIMA	30	27.0	0.002±0.0007	0.001±0.0005
December, 1984				
Akita, AKITA	35	103.8	0.002±0.0006	0.002±0.0007
Niigata, NIIGATA	35	239.3	0.003±0.0007	0.003±0.0005
Chiba, CHIBA	33	68.6	0.000±0.0006	0.001±0.0005
Kanazawa, ISHIKAWA	29	294.0	0.003±0.0007	0.005±0.0007
Nagano, NAGANO	35	43.9	0.002±0.0006	0.001±0.0004
Osaka, OSAKA	35	55.0	0.003±0.0007	0.003±0.0006
Okayama, OKAYAMA	36	43.6	0.001±0.0006	0.002±0.0005
Yamaguchi, YAMAGUCHI	32	106.0	0.002±0.0006	0.003±0.0005
Kochi, KOCHI	36	89.0	0.003±0.0007	0.001±0.0004
Kagoshima, KAGOSHIMA	39	58.0	0.007±0.0008	0.003±0.0005
January, 1985				
Chiba, CHIBA	29	9.7	0.001±0.0007	0.003±0.0006

Figure (1)-2 Sampling Locations of Rain and dry fallout (for WHO program)

1. Akita
2. Niigata
3. Chiba
4. Kanazawa
5. Nagano
6. Osaka
7. Okayama
8. Yamaguchi
9. Kochi
10. Kagoshima



(2) Strontium-90 and Cesium-137 in Airborne dust (from Apr. 1984 to Sep. 1984)

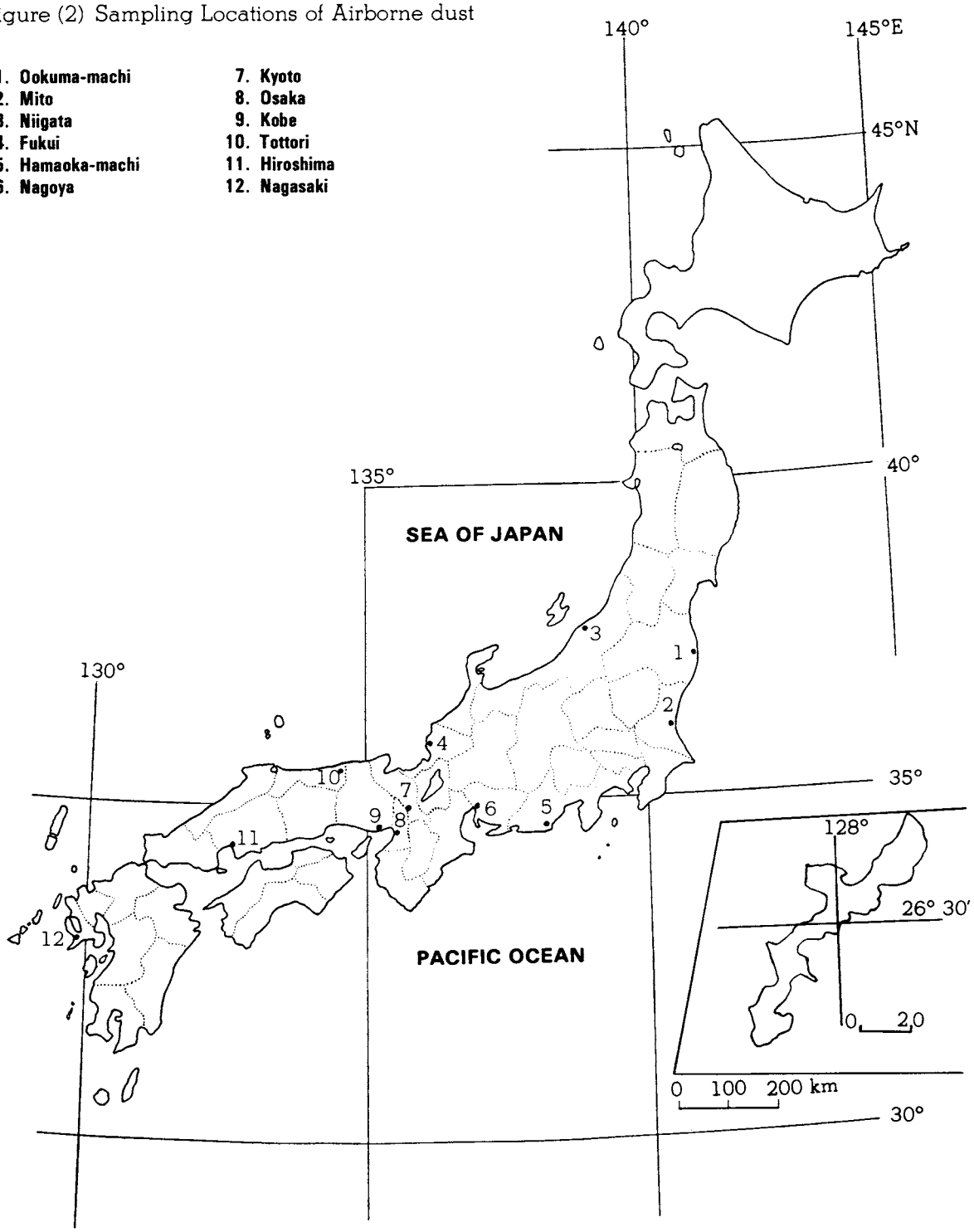
—continued from No. 68 of this publication—

Table (2): Strontium-90 and Cesium-137 in Airborne dust

Location	Sampling Period	Absorption volume(m^3)	^{90}Sr ($10^{-3}pCi/m^3$)	^{137}Cs ($10^{-3}pCi/m^3$)
April~June, 1984				
Mito, IBARAGI	4~6	12,677	0.02±0.02	0.01±0.01
July~September, 1984				
Ookuma-machi, FUKUSHIMA	7~9	10,642	0.0 ±0.02	0.03±0.02
Mito, IBARAGI	7~9	12,246	0.0 ±0.02	0.0 ±0.02
Nigata, NIGAYA	7~9	14,069	0.03±0.02	0.01±0.01
Fukui, FUKUI	7~9	20,643	0.0 ±0.01	0.0 ±0.01
Hamaoka-machi, SHIZUOKA	7~9	11,723	0.0 ±0.02	0.0 ±0.01
Nagoya, AICHI	7~9	9,904	0.0 ±0.03	0.01±0.01
Kyoto, KYOTO	7~9	12,030	0.03±0.02	0.0 ±0.01
Osaka, OSAKA	7~9	8,289	0.0 ±0.03	0.01±0.02
Kobe, HYOGO	7~9	10,140	0.0 ±0.02	0.01±0.01
Tottori, TOTTORI	7~9	8,508	0.05±0.03	0.0 ±0.02
Hiroshima, HIROSHIMA	7~9	10,538	0.02±0.03	0.01±0.02
Nagasaki, NAGASAKI	7~9	13,670	0.01±0.02	0.01±0.02

Figure (2) Sampling Locations of Airborne dust

1. Ookuma-machi
2. Mito
3. Niigata
4. Fukui
5. Hamaoka-machi
6. Nagoya
7. Kyoto
8. Osaka
9. Kobe
10. Tottori
11. Hiroshima
12. Nagasaki



(3) Strontium-90 and Cesium-137 in Service water (from Jun. 1984 to Dec. 1984)

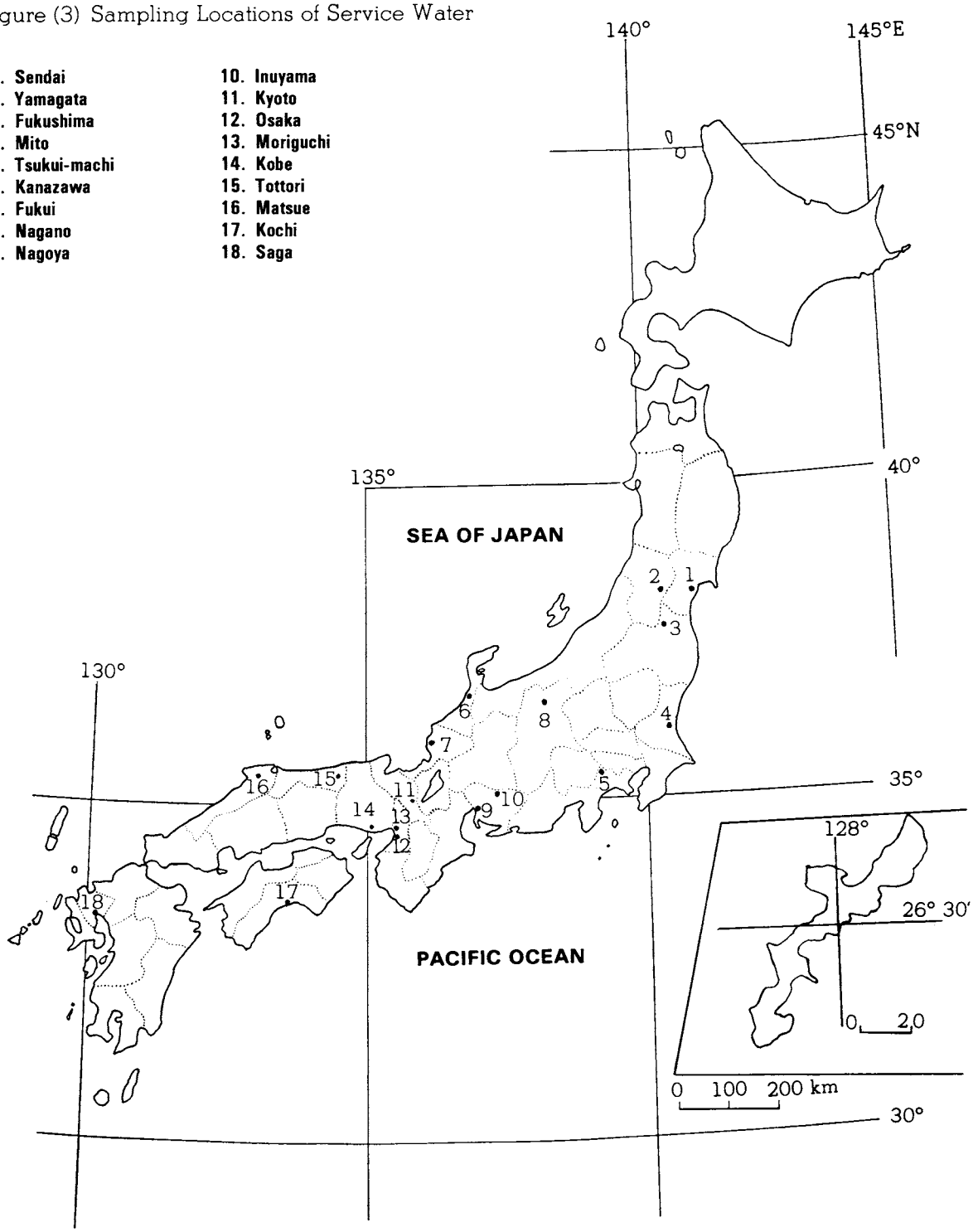
—continued from No. 68 of this publication—

Table (3): Strontium-90 and Cesium-137 in Service water

Location	pH	^{90}Sr (pCi/ℓ)	^{137}Cs (pCi/ℓ)
(Source Water)			
August, 1984			
Kyoto, KYOTO	7.7	0.18±0.007	0.01 ±0.003
December, 1984			
Tsukui-machi, KANAGAWA	8.9	0.02±0.003	0.001±0.002
Inuyama, AICHI	6.9	0.07±0.005	0.01 ±0.002
Moriguchi, OSAKA	7.0	0.16±0.007	0.01 ±0.002
(Tap Water)			
June, 1984			
Matsue, SHIMANE	7.3	0.22±0.007	0.001±0.002
July, 1984			
Sendai, MIYAGI	7.8	0.06±0.005	0.001±0.002
August, 1984			
Fukushima, HUKUSHIMA	7.2	0.15±0.007	0.003±0.002
Kyoto, KYOTO	6.9	0.17±0.007	0.01 ±0.002
October, 1984			
Sendai, MIYAGI	7.7	0.09±0.005	0.004±0.002
November, 1984			
Fukui, FUKUI	7.0	0.01±0.003	0.001±0.002
December, 1984			
Yamagata, YAMAGATA	7.1	0.07±0.005	0.01 ±0.002
Mito, IBARAGI	7.8	0.04±0.005	0.004±0.002
Kanazawa, ISHIKAWA	7.0	0.13±0.006	0.003±0.002
Nagano, NAGANO	7.1	0.04±0.004	0.00 ±0.002
Nagoya, AICHI	5.7	0.12±0.006	0.01 ±0.002
Osaka, OSAKA	6.8	0.14±0.007	0.003±0.002
Kobe, HYOGO	7.2	0.15±0.007	0.00 ±0.002
Tottori, TOTTORI	7.5	0.08±0.006	0.00 ±0.002
Kochi, KOCHI	7.3	0.07±0.005	0.001±0.002
Saga, SAGA	7.1	0.06±0.005	0.004±0.002

Figure (3) Sampling Locations of Service Water

1. Sendai
2. Yamagata
3. Fukushima
4. Mito
5. Tsukui-machi
6. Kanazawa
7. Fukui
8. Nagano
9. Nagoya
10. Inuyama
11. Kyoto
12. Osaka
13. Moriguchi
14. Kobe
15. Tottori
16. Matsue
17. Kochi
18. Saga



(4) Strontium-90 and Cesium-137 in Freshwater (from Jul. 1984 to Dec. 1984)

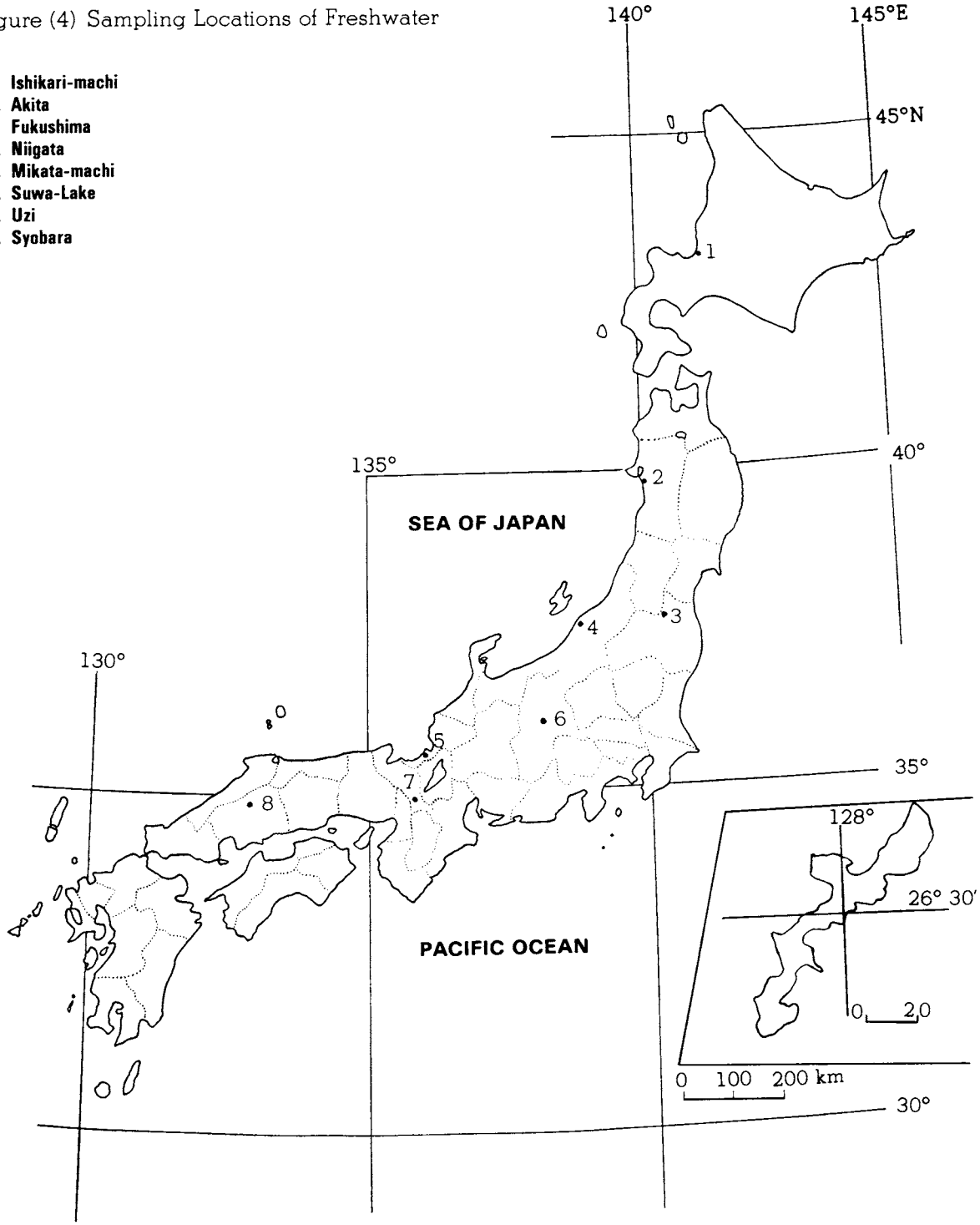
—continued from No. 68 of this publication—

Table (4): Strontium-90 and Cesium-137 Freshwater

Location	pH	^{90}Sr (pCi/ℓ)	^{137}Cs (pCi/ℓ)
(Freshwater)			
July, 1984			
Ishikari-machi, HOKKAIDOA	7.3	0.14 ±0.008	0.02 ±0.003
Akita, AKITA	7.2	0.10 ±0.006	0.02 ±0.003
September, 1984			
Fukushima, FUKUSHIMA	6.6	0.04 ±0.004	0.003±0.002
Mikata-machi, FUKUI	7.4	0.15 ±0.009	0.04 ±0.004
November, 1984			
Niigata, NIIGATA	7.2	0.19 ±0.008	0.02 ±0.003
Shobara, HIROSHIMA	6.9	0.07 ±0.005	0.002±0.002
December, 1984			
Suwa-lake, NAGANO	8.6	0.05 ±0.005	0.01 ±0.002
Uji, KYOTO	6.4	0.001±0.002	0.004±0.002

Figure (4) Sampling Locations of Freshwater

1. Ishikari-machi
2. Akita
3. Fukushima
4. Niigata
5. Mikata-machi
6. Suwa-Lake
7. Uzi
8. Syobara



(5) Strontium-90 and Cesium-137 in Soil (from Jun. 1984 to Dec. 1984)

—continued from No. 68 of this publication—

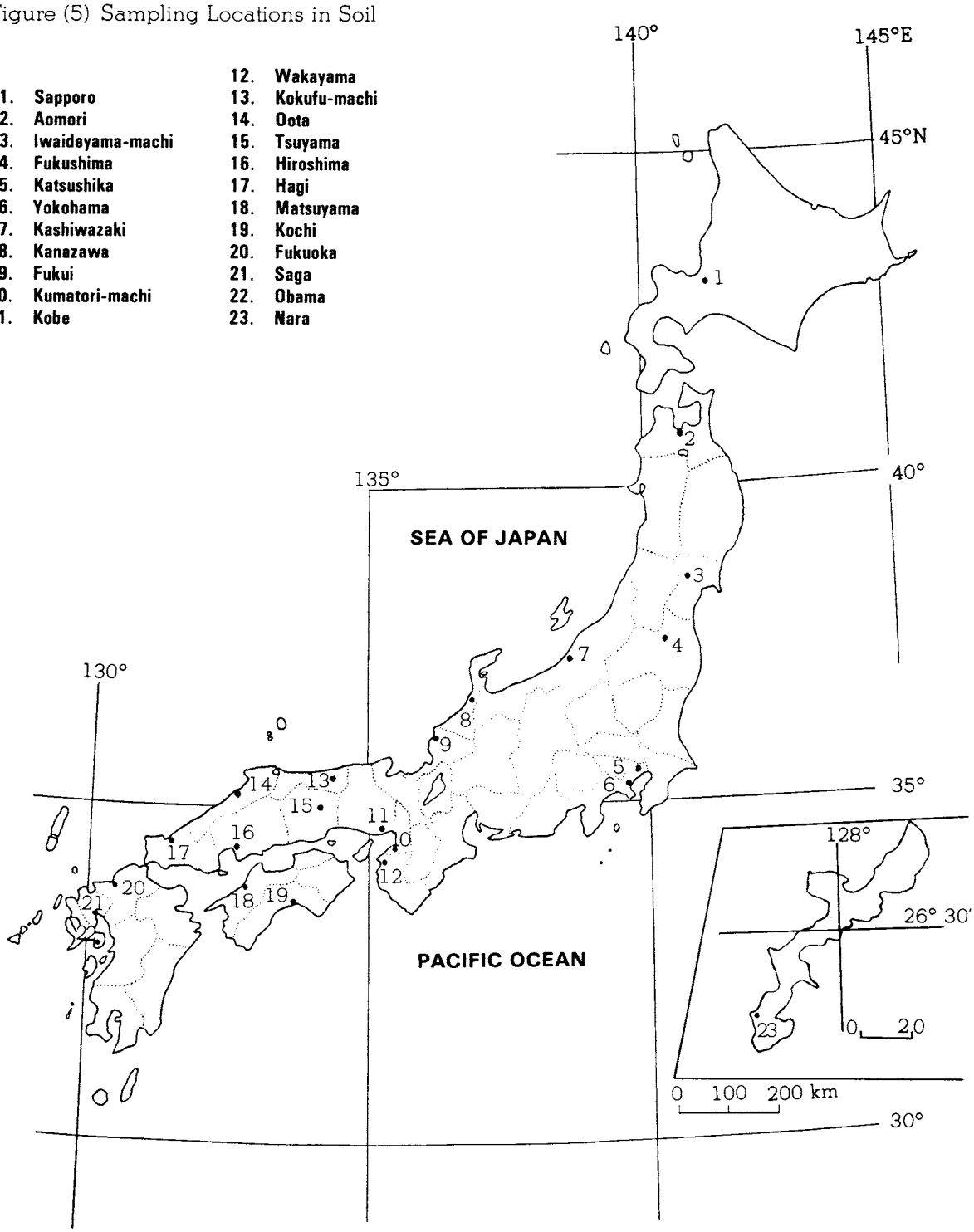
Table (5): Strontium-90 and Cesium-137 in Soil

Location	Sampling Depth(cm)	^{90}Sr		^{137}Cs	
		(pCi/kg)	(mCi/km^2)	(pCi/kg)	(mCi/km^2)
June, 1984					
Tsuyama, OKAYAMA	0~5	26± 3.6	2.0±0.28	83± 5.4	6.5±0.42
"	5~20	36± 4.0	4.4±0.49	96± 5.7	12 ±0.7
July, 1984					
Aomori, AOMORI	0~5	59± 5.3	2.1±0.19	35± 4.4	1.2±0.15
"	5~20	9± 2.9	1 ±0.31	0± 3	0 ±0.33
Katsushika, TOKYO	0~5	27± 3.7	1.5±0.21	62± 4.6	3.4±0.25
"	5~20	12± 3.1	2.4±0.61	29± 3.4	5.6±0.66
Kashiwazaki, NIIGATA	0~5	130± 7	10 ±0.5	260± 9	20 ±0.7
"	5~20	200± 8	31 ±1.2	780±15	120 ±2
Kanazawa, ISHIKAWA	0~5	240± 9	8.1±0.29	660±13	22 ±0.4
"	5~20	190± 8	29 ±1.2	360±10	54 ±1.5
Kumatori-machi, OSAKA	0~5	98± 6.4	5.6±0.36	71± 5	4 ±0.28
"	5~20	46± 4.6	7.7±0.78	31± 3.6	5.3±0.61
Kobe, HYOGO	0~5	46± 5.2	2.9±0.33	94± 5.9	5.9±0.37
"	5~20	45± 5.4	10 ±1.2	63± 5.1	14 ±1.1
Kokufu-machi, TOTTORI	0~5	4± 2.8	0.2±0.15	29± 3.5	1.5±0.18
"	5~20	10± 3.2	1.1±0.35	14± 2.8	1.5±0.31
Oota, SHIMANE	0~5	2100±30	19 ±0.2	5200±40	47 ±0.3
"	5~20	630±14	37 ±0.8	1600±20	92 ±1.2
Hiroshima, HIROSHIMA	0~5	6± 2.7	0.6±0.29	4± 2.2	0.4±0.23
"	5~20	27± 3.6	5.8±0.76	68± 4.7	14 ±1.0
Kochi, KOCHI	0~5	270± 9	14 ±0.5	830±16	42 ±0.8
"	5~20	180± 8	26 ±1.1	230± 9	33 ±1.2
Fukuoka, FUKUOKA	0~5	260± 9	10 ±0.4	820±15	33 ±0.6
"	5~20	170± 7	32 ±1.4	58± 4.9	11 ±1.0
Obama-machi, NAGASAKI	0~5	240± 9	3.3±0.12	4400±40	60 ±0.5
"	5~20	170± 7	15 ±0.7	740±15	66 ±1.3

Location	Sampling Depth(cm)	^{90}Sr		^{137}Cs	
		(pCi/kg)	(mCi/km^2)	(pCi/kg)	(mCi/km^2)
August, 1984					
Sapporo, HOKKAIDO	0~5	310± 9	13 ±0.4	810±16	33 ±0.6
"	5~20	170± 7	31 ±1.3	180± 8	33 ±1.4
Iwaide-machi, MIYAGI	0~5	88± 5.8	3.4±0.22	130± 7	4.8±0.25
"	5~20	49± 4.7	6 ±0.58	47± 4.2	5.8±0.52
Yokohama, KANAGAWA	0~5	180± 9	8 ±0.4	410±12	18 ±0.5
"	5~20	280±10	47 ±1.8	650±14	110 ±2
Fukui, FUKUI	0~5	46± 4.5	2.1±0.21	110± 6	5.1±0.3
"	5~20	26± 3.9	4.2±0.64	30± 4.2	4.8±0.68
Wakayama, WAKAYAMA	0~5	51± 4.3	1.7±0.14	200± 8	6.8±0.27
"	5~20	74± 5.1	7.9±0.54	210± 8	22 ±0.9
Hagi, YAMAGUCHI	0~5	190± 8	11 ±0.4	220± 8	12 ±0.5
"	5~20	100± 6	27 ±1.6	69± 5	18 ±1.3
Matsuyama, EHIME	0~5	26± 3.6	1.3±0.18	650±14	33 ±0.7
"	5~20	5± 2.7	0.7±0.39	39± 4	5.7±0.58
Saga, SAGA	0~5	13± 3.1	0.7±0.17	34± 3.7	1.9±0.21
"	5~20	13± 3.2	2.2±0.56	27± 3.4	4.7±0.61
Naha, OKINAWA	0~5	72± 5.2	3.9±0.28	240± 9	13 ±0.5
"	5~20	73± 5.1	14 ±1.0	120± 6	20 ±1.2
December, 1984					
Fukushima, FUKUSHIMA	0~5	320±10	4.6±0.14	2100±20	30 ±0.3
"	5~20	130± 6	4.6±0.22	660±13	23 ±0.5

Figure (5) Sampling Locations in Soil

1. Sapporo
2. Aomori
3. Iwaideyama-machi
4. Fukushima
5. Katsushika
6. Yokohama
7. Kashiwazaki
8. Kanazawa
9. Fukui
10. Kumatori-machi
11. Kobe
12. Wakayama
13. Kokufu-machi
14. Oota
15. Tsuyama
16. Hiroshima
17. Hagi
18. Matsuyama
19. Kochi
20. Fukuoka
21. Saga
22. Obama
23. Nara



(6) Strontium-90 and Cesium-137 in Sea water (from Jul. 1984 to Sep. 1984)

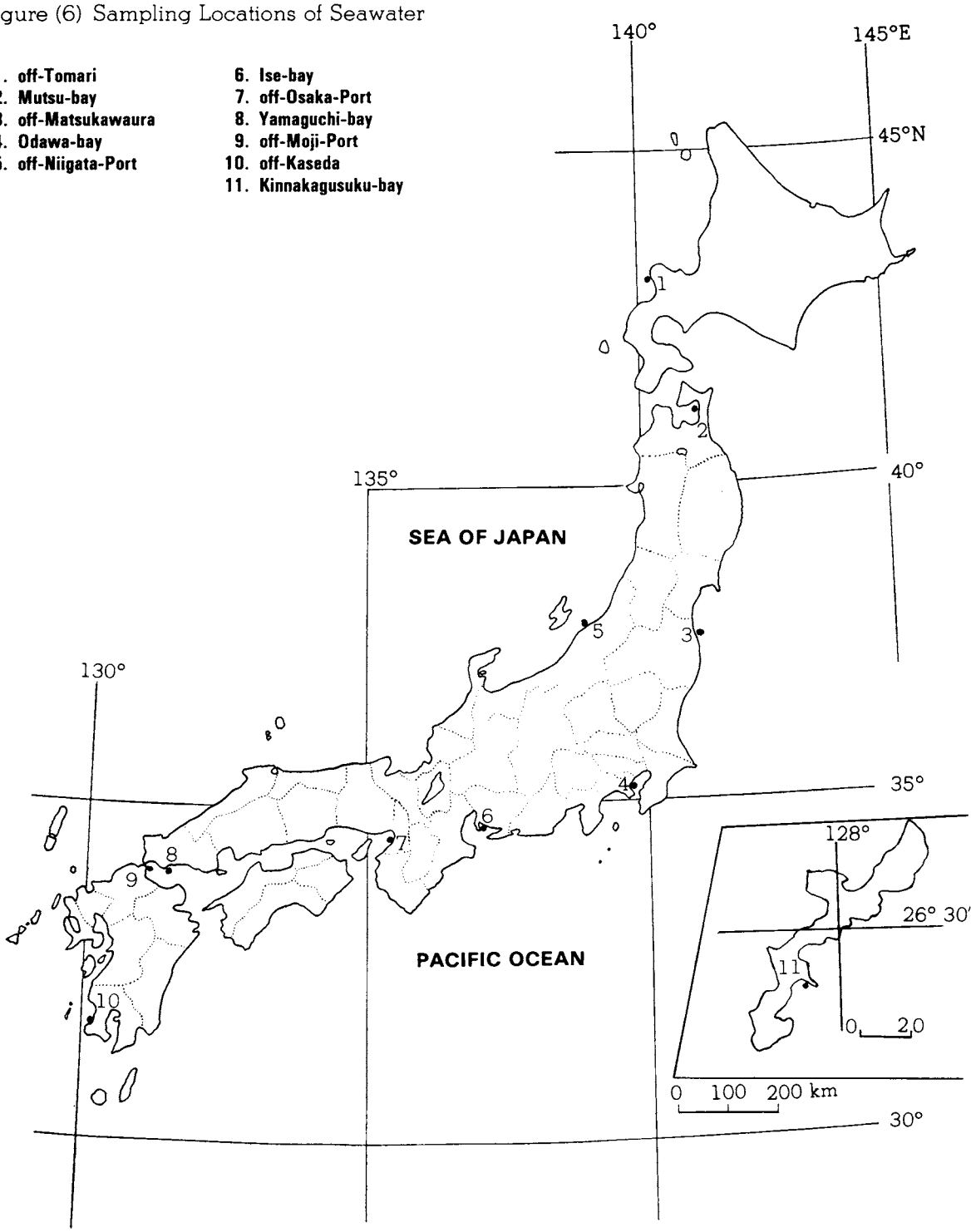
—continued from No. 66 of this publication—

Table (6): Strontium-90 and Cesium-137 in Sea water

Location	Sample volume analyzed(ℓ)	Cl (0/00)	^{90}Sr (pCi/ℓ)	^{137}Cs (pCi/ℓ)
July, 1984				
Odawa-bay, KANAGAWA	40	16.1	0.08±0.010	0.1 ±0.011
Off-Niigata-port, NIIGATA	41.7	18.57	0.11±0.012	0.1 ±0.011
Ise-bay, AICHI	40	10.6	0.1 ±0.010	0.08±0.011
Moji-port, FUKUOKA	40	18.28	0.1 ±0.011	0.12±0.011
Off-Kaseda, KAGOSHIMA	40	14.12	0.08±0.010	0.09±0.010
Aogust, 1984				
Off-Tomari, HOKKAIDO	40	18.25	0.09±0.011	0.14±0.012
Mutsu-bay, AOMORI	40	18.03	0.07±0.010	0.11±0.011
Off-Matsukawaura, FUKUSHIMA	43.2	17.78	0.09±0.011	0.12±0.012
Yamaguchi-bay, YAMAGUCHI	40	20.1	0.09±0.010	0.14±0.012
Kinnakagusuku-bay, OKINAWA	40	13.6	0.08±0.009	0.09±0.010
September, 1984				
Off-Osaka-port, OSAKA	40	11.63	0.11±0.011	0.08±0.01

Figure (6) Sampling Locations of Seawater

1. off-Tomari
2. Mutsu-bay
3. off-Matsukawaura
4. Odawa-bay
5. off-Niigata-Port
6. Ise-bay
7. off-Osaka-Port
8. Yamaguchi-bay
9. off-Moji-Port
10. off-Kaseda
11. Kinnakagusuku-bay



(7) Strontium-90 and Cesium-137 in Sea sediments (from May. 1984 to Sep. 1984)

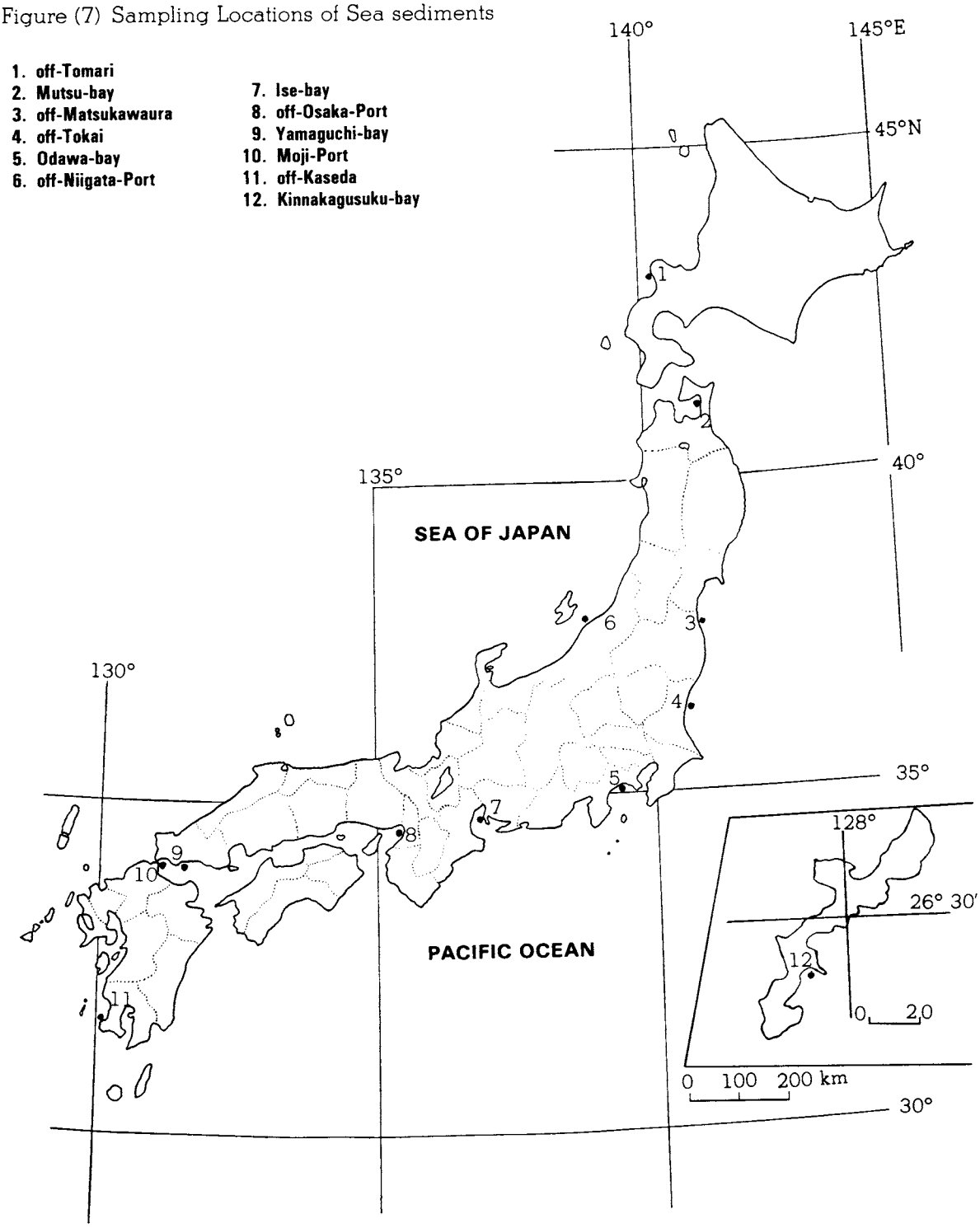
—continued from No. 66 of this publication—

Table (7): Strontium-90 and Cesium-137 in Sea sediments

Location	depth (m)	^{90}Sr (pCi/kg)	^{137}Cs (pCi/kg)
May, 1984			
Mutsu-bay, AOMORI	10	0±2.7	9±3.5
July, 1984			
Off-Tokai, IBARAGI	7	0±2.3	12±3.4
Odawa-bay, KANAGAWA	7	0±2.4	82±5.6
Off-Niigata-port, NIIGATA	52	9±2.9	250±9
Ise-bay, AICHI	18	1±2.5	72±5.1
Moji-port, FUKUOKA	10	3±2.7	78±5.5
Off-Kaseda, KAGOSHIMA	14.5	4±2.8	10±3.4
August, 1984			
Off-Tomari, HOKKAIDO	7	1±2.4	25±4.0
Matsu-bay, AOMORI	13	14±3.2	200±8
Off-Matsukawaura, FUKUSHIMA	5	0±2.4	12±3.3
Yamaguchi-bay, YAMAGUCHI	10	0±2.7	120±6
Kinnakagusuku-bay, OKINAWA	14.4	6±3.1	18±3.7
September, 1984			
Osaka-port, OSAKA	11.5	5±3.3	150±7

Figure (7) Sampling Locations of Sea sediments

1. off-Tomari
2. Mutsu-bay
3. off-Matsukawaura
4. off-Tokai
5. Odawa-bay
6. off-Niigata-Port
7. Ise-bay
8. off-Osaka-Port
9. Yamaguchi-bay
10. Moji-Port
11. off-Kaseda
12. Kinnakagusuku-bay



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