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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 5 ℓ 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 days. 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 1 ℓ 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.

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* 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 steel 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 (source 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 May 1985 to Dec. 1985)

—continued from No. 72 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)
May, 1985				
Matsue, SHIMANE	31	157.1	0.002±0.0006	0.002±0.0005
June, 1985				
Aomori, AOMORI	31	39.5	0.011±0.0009	0.003±0.0007
Matsue, SHIMANE	32	285.1	0.001±0.0006	0.001±0.0005
July, 1985				
Sapporo, HOKKAIDO	32	99.5	0.001±0.0005	0.002±0.0006
Aomori, AOMORI	32	122.0	0.014±0.0009	0.001±0.0006
Onagawa-machi, MIYAGI	33	141.2	0.005±0.0007	0.002±0.0006
Ookuma-machi, FUKUSHIMA	32	172.6	0.002±0.0006	0.002±0.0006
Mito, IBARAGI	32	83.0	0.003±0.0006	0.000±0.0006
Shinjuku, TOKYO	32	79.2	0.003±0.0006	0.001±0.0005
Yokohama, KANAGAWA	31	75.4	0.003±0.0006	0.002±0.0005
Fukui, FUKUI	32	365.7	0.002±0.0006	0.001±0.0005
Shizuoka, SHIZUOKA	32	89.0	0.001±0.0006	0.000±0.0005
Kyoto, KYOTO	33	175.0	0.001±0.0005	0.000±0.0004
Wakayama, WAKAYAMA	31	46.9	0.000±0.0005	0.000±0.0005
Tottori, TOTTORI	32	176.5	0.002±0.0006	0.001±0.0005
Matsue, SHIMANE	31	240.7	0.002±0.0006	0.000±0.0005
Matsuyama, EHIME	32	120.0	0.001±0.0005	0.001±0.0006
Dazaifi, FUKUOKA	32	206.4	0.000±0.0005	0.002±0.0006
Saga, SAGA	34	222.1	0.000±0.0005	0.000±0.0005
Nagasaki, NAGASAKI	32	293.0	0.002±0.0006	0.001±0.0006
Yonagusuku-mura, OKINAWA	29	53.0	0.001±0.0007	0.001±0.0007
August, 1985				
Sapporo, HOKKAIDO	33	137.5	0.002±0.0005	0.001±0.0005
Aomori, AOMORI	33	77.0	0.010±0.0009	0.003±0.0006
Onagawa-machi, MIYAGI	31	1.9	0.004±0.0007	0.003±0.0006
Yamagata, YAMAGATA	33	15.5	0.000±0.0005	0.001±0.0006
Ookuma-machi, FUKUSHIMA	34	66.8	0.001±0.0006	0.000±0.0005
Mito, IBARAGI	32	128.5	0.002±0.0006	0.000±0.0006
Shinjuku, TOKYO	33	173.2	0.001±0.0005	0.001±0.0004
Yokohama, KANAGAWA	32	227.2	0.002±0.0006	0.001±0.0005
Fukui, FUKUI	33	30.7	0.002±0.0006	0.001±0.0005
Shizuoka, SHIZUOKA	33	277.0	0.001±0.0006	0.001±0.0004
Nagoya,AICHI	33	114.1	0.000±0.0006	0.001±0.0005
Kyoto, KYOTO	30	9.3	0.001±0.0005	0.001±0.0005

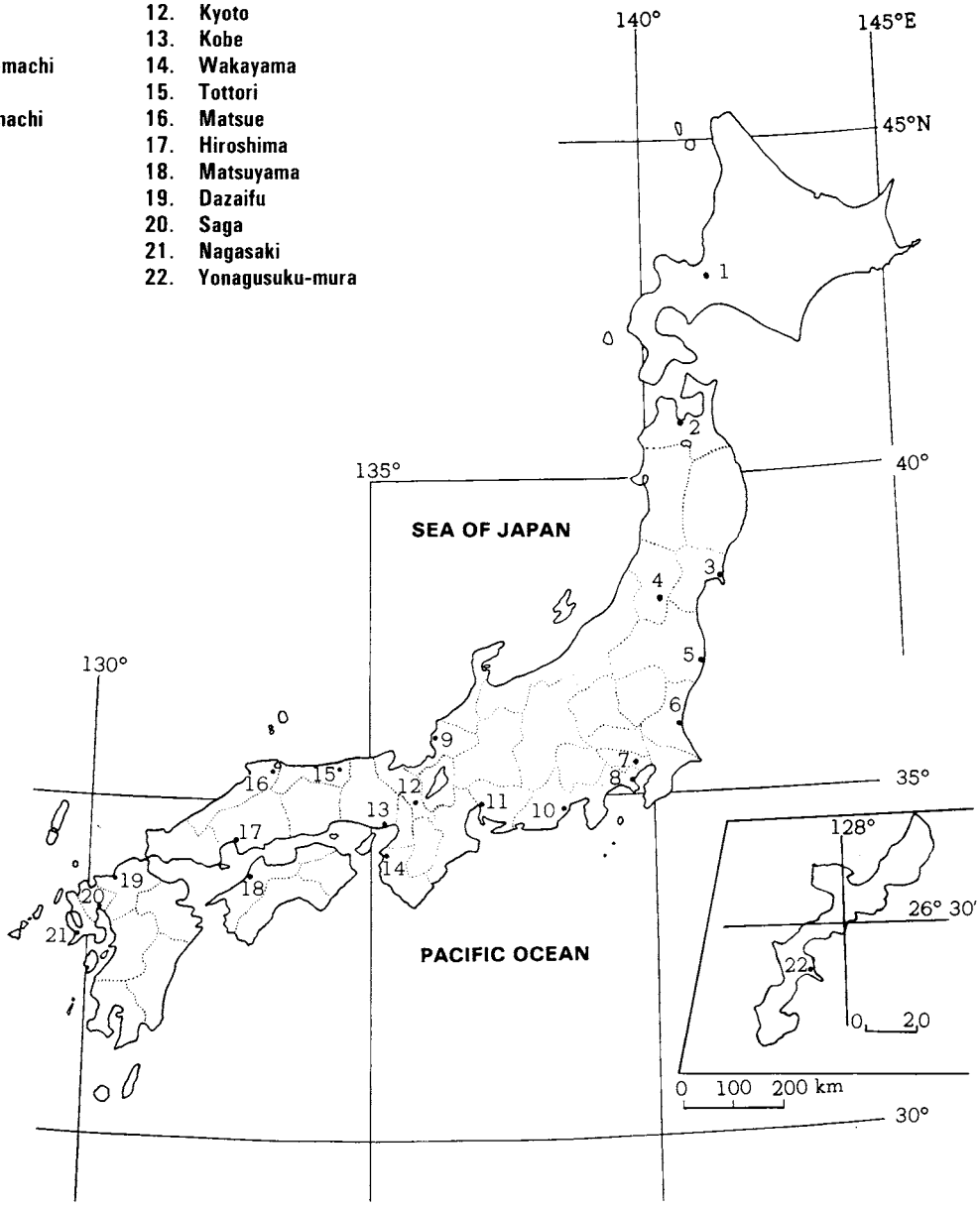
Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Kobe, HYOGO	32	32.1	0.001±0.0005	0.000±0.0005
Wakayama, WAKAYAMA	33	71.1	0.002±0.0006	0.001±0.0005
Tottori, TOTTORI	32	20.6	0.018±0.0011	0.002±0.0006
Matsue, SHIMANE	32	6.0	0.000±0.0006	0.001±0.0006
Hiroshima, HIROSHIMA	33	30.6	0.014±0.0010	0.000±0.0005
Matsuyama, EHIME	33	51.5	0.001±0.0005	0.002±0.0005
Dazaifu, FUKUOKA	33	84.5	0.002±0.0006	0.001±0.0005
Saga, SAGA	33	93.6	0.001±0.0005	0.000±0.0005
Nagasaki, NAGASAKI	33	183.5	0.002±0.0005	0.000±0.0005
Yonagusuku-mura, OKINAWA	35	404.5	0.001±0.0005	0.000±0.0005
September, 1985				
Sapporo, HOKKAIDO	30	85.5	0.002±0.0006	0.001±0.0004
Aomori, AOMORI	30	48.0	0.008±0.0008	0.002±0.0005
Onagawa-machi, MIYAGI	33	297.2	0.002±0.0006	0.001±0.0005
Yamagata, YAMAGATA	30	167.1	0.002±0.0006	0.001±0.0004
Ookuma-machi, FUKUSHIMA	29	293.8	0.002±0.0006	0.001±0.0005
Mito, IBARAGI	31	101.0	0.001±0.0006	0.001±0.0005
Shinjuku, TOKYO	30	127.4	0.002±0.0006	0.001±0.0005
Yokohama, KANAGAWA	31	102.2	0.002±0.0006	0.000±0.0004
Fukui, FUKUI	29	355.7	0.001±0.0005	0.000±0.0004
Shizuoka, SHIZUOKA	30	209.5	0.001±0.0006	0.001±0.0004
Nagoya, AICHI	30	137.6	0.001±0.0005	0.001±0.0005
Kyoto, KYOTO	31	157.2	0.004±0.0007	0.002±0.0005
Kobe, HYOGO	31	60.9	0.001±0.0005	0.002±0.0006
Wakayama, WAKAYAMA	29	164.0	0.003±0.0007	0.000±0.0005
Tottori, TOTTORI	31	308.2	0.007±0.0008	0.001±0.0005
Matsue, SHIMANE	31	278.0	0.001±0.0005	0.001±0.0005
Hiroshima, HIROSHIMA	30	164.3	0.006±0.0008	0.001±0.0004
Matsuyama, EHIME	30	64.5	0.002±0.0006	0.001±0.0004
Dazaifu, FUKUOKA	30	314.5	0.001±0.0005	0.000±0.0005
Saga, SAGA	30	249.7	0.002±0.0005	0.000±0.0004
Nagasaki, NAGASAKI	30	364.5	0.001±0.0005	0.000±0.0004
Yonagusuku-mura, OKINAWA	29	155.0	0.001±0.0005	0.000±0.0004
October, 1985				
Sapporo, HOKKAIDO	32	135.0	0.002±0.0006	0.002±0.0005
Aomori, AOMORI	32	105.0	0.008±0.0008	0.002±0.0005
Onogawa-machi, MIYAGI	31	91.7	0.003±0.0006	0.000±0.0005
Yamagata, YAMAGATA	32	68.0	0.002±0.0006	0.001±0.0006
Ookuma-machi, FUKUSHIMA	32	136.2	0.003±0.0007	0.002±0.0006
Mito, IBARAKI	32	91.0	0.001±0.0006	0.001±0.0006
Shinjuku, TOKYO	32	99.5	0.002±0.0007	0.002±0.0006
Yokohama, KANAGAWA	32	114.9	0.003±0.0007	0.002±0.0005
Fukui, FUKUI	34	138.6	0.001±0.0005	0.002±0.0006
Shizuoka, SHIZUOKA	31	101.0	0.003±0.0006	0.001±0.0004
Nagoya, AICHI	32	47.0	0.001±0.0005	0.002±0.0006
Kyoto, KYOTO	33	38.2	0.002±0.0006	0.001±0.0005

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Kobe, HYOGO	32	40.0	0.002±0.0006	0.002±0.0006
Wakayama, WAKAYAMA	32	113.2	0.002±0.0006	0.001±0.0006
Tottori, TOTORI	32	93.2	0.004±0.0007	0.002±0.0006
Matsue, SHIMANE	32	118.0	0.002±0.0006	0.001±0.0005
Hiroshima, HIROSHIMA	32	111.8	0.003±0.0006	0.000±0.0005
Matsuyama, EHIME	32	80.0	0.002±0.0008	0.001±0.0006
Dazaifu, FUKUOKA	32	124.5	0.001±0.0006	0.001±0.0004
Saga, SAGA	32	138.6	0.001±0.0005	0.000±0.0004
Nagasaki, NAGASAKI	32	174.5	0.002±0.0006	0.001±0.0005
Yonagusuku-mura, OKINAWA	32	67.0	0.001±0.0006	0.000±0.0004
November, 1985				
Sapporo, HIKKAIDO	29	50.5	0.001±0.0006	0.001±0.0005
Aomori, AOMORI	32	153.0	0.004±0.0007	0.001±0.0006
Onagawa-machi, MIYAGI	33	145.2	0.003±0.0006	0.001±0.0005
Yamagata, YAMAGATA	32	101.0	0.002±0.0006	0.001±0.0005
Ookuma-machi, FUKUSHIMA	31	90.8	0.002±0.0007	0.000±0.0004
Mito, IBARAGI	32	64.5	0.000±0.0006	0.000±0.0004
Shinjuku, TOKYO	32	94.4	0.003±0.0007	0.001±0.0005
Yokohama, KANAGAWA	31	118.2	0.001±0.0006	0.002±0.0005
Fukui, FUKUI	38	453.2	0.003±0.0006	0.001±0.0005
Shizuoka, SHIZUOKA	32	96.5	0.003±0.0006	0.001±0.0005
Nagoya, AICHI	32	117.4	0.002±0.0005	0.001±0.0005
Kyoto, KYOTO	32	58.3	0.002±0.0006	0.001±0.0005
Kobe, HYOGO	31	59.4	0.002±0.0006	0.003±0.0005
Wakayama, WAKAYAMA	33	81.2	0.001±0.0006	0.000±0.0004
Tottori, TOTTORI	32	128.3	0.004±0.0007	0.002±0.0005
Hiroshima, HIROSHIMA	32	35.0	0.004±0.0007	0.000±0.0004
Matsuyama, EHIME	32	46.0	0.001±0.0005	0.001±0.0005
Dazaifu, FUKUOKA	31	124.5	0.002±0.0006	0.001±0.0005
Saga, SAGA	32	47.8	0.001±0.0006	0.000±0.0004
Nagasaki, NAGASAKI	32	98.5	0.002±0.0006	0.001±0.0005
December, 1985				
Onagawa-machi, MIYAGI	36	27.3	0.004±0.0006	0.000±0.0005
Yamagata, YAMAGATA	34	34.0	0.002±0.0005	0.001±0.0006
Ookuma-machi, FUKUSHIMA	28	5.8	0.002±0.0005	0.001±0.0005
Mito, IBARAGI	36	36.0	0.002±0.0005	0.001±0.0005
Shinjuku, TOKYO	34	17.4	0.004±0.0008	0.001±0.0006
Yokohama, KANAGAWA	36	24.0	0.000±0.0005	0.002±0.0005
Fukui, FUKUI	29	403.0	0.002±0.0006	0.004±0.0006
Shizuoka, SHIZUOKA	36	13.5	0.001±0.0005	0.001±0.0004
Nagoya, AICHI	36	39.6	0.002±0.0005	0.001±0.0005
Kyoto, KYOTO	36	45.8	0.002±0.0006	0.001±0.0004
Kobe, HYOGO	28	25.4	0.000±0.0005	0.000±0.0004
Wakayama, WAKAYAMA	36	48.4	0.002±0.0006	0.001±0.0005
Tottori, TOTTORI	36	130.7	0.004±0.0008	0.004±0.0007
Hiroshima, HIROSHIMA	38	40.9	0.004±0.0007	0.002±0.0005
Matsuyama, EHIME	34	50.5	0.002±0.0006	0.001±0.0005

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
Dazaifu, FUKUOKA	37	52.0	0.001±0.0005	0.001±0.0005
Saga, SAGA	36	58.4	0.001±0.0005	0.001±0.0005
Nagasaki, NAGASAKI	34	57.5	0.001±0.0005	0.002±0.0005
Yonagusuku-mura, OKINAWA	41	271.5	0.000±0.0005	0.001±0.0004

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. 1985 to Jan. 1986)

—continued from No. 72 of this publication—

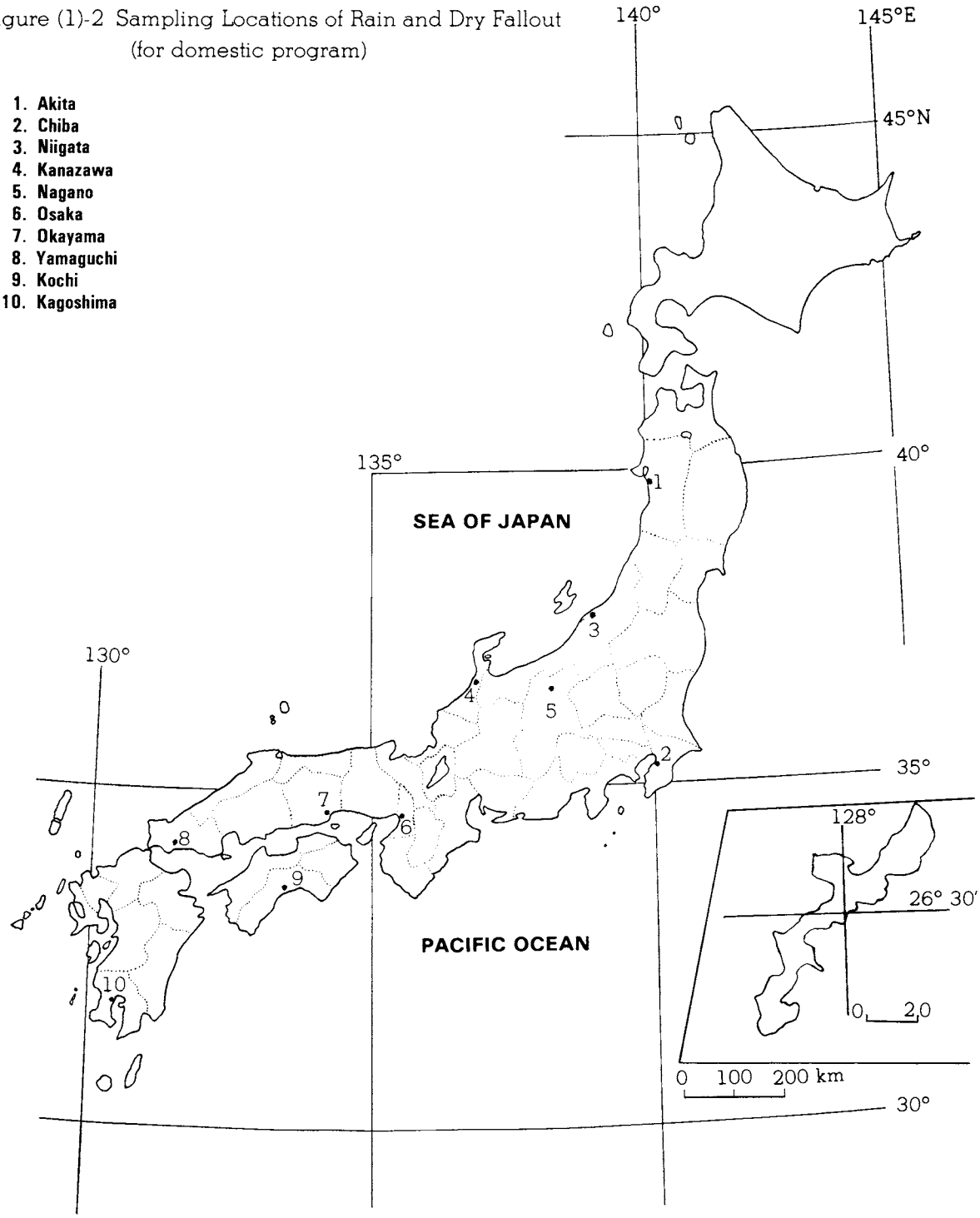
Table (1)-2: Strontium-90 and Cesium-137 Rain and Dry Fallout

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
July, 1985				
Niigata, NIIGATA	32	181.7	0.001±0.0005	0.002±0.0005
Kanazawa, ISHIKAWA	33	552.0	0.002±0.0006	0.002±0.0005
Nagano, NAGANO	32	228.4	0.002±0.0006	0.000±0.0004
Okayama, OKAYAMA	32	149.2	0.000±0.0005	0.000±0.0004
Yamaguchi, YAMAGUCHI	32	334.5	0.001±0.0006	0.001±0.0005
Kochi, KOCHI	32	106.5	0.002±0.0005	0.000±0.0005
August, 1985				
Chiba, CHIBA	33	121.8	0.000±0.0005	0.001±0.0005
Niigata, NIIGATA	33	12.8	0.002±0.0006	0.001±0.0004
Kanazawa, ISHIKAWA	32	4.5	0.002±0.0006	0.000±0.0004
Nagano, NAGANO	33	28.8	0.001±0.0006	0.001±0.0005
Osaka, OSAKA	31	23.1	0.000±0.0005	0.000±0.0005
Okayama, OKAYAMA	33	29.9	0.000±0.0005	0.000±0.0005
Yamaguchi, YAMAGUCHI	33	78.0	0.003±0.0007	0.004±0.0006
Kochi, KOCHI	33	430.6	0.003±0.0006	0.001±0.0006
Kagoshima, KAGOSHIMA	30	98.0	0.003±0.0007	0.001±0.0007
September, 1985				
Chiba, CHIBA	30	116.9	0.001±0.0006	0.001±0.0005
Niigata, NIIGATA	30	219.8	0.004±0.0006	0.001±0.0005
Kanazawa, ISHIKAWA	31	403.5	0.002±0.0006	0.001±0.0007
Nagano, NAGANO	30	174.2	0.001±0.0005	0.001±0.0004
Osaka, OSAKA	31	172.9	0.000±0.0005	0.001±0.0005
Okayama, OKAYAMA	30	100.3	0.001±0.0006	0.000±0.0005
Yamaguchi, YAMAGUCHI	30	320.0	0.003±0.0006	0.001±0.0005
Kochi, KOCHI	30	324.3	0.003±0.0006	0.001±0.0005
Kagoshima, KAGOSHIMA	33	182.0	0.005±0.0007	0.004±0.0007
October, 1985				
Chiba, CHIBA	32	72.1	0.001±0.0005	0.000±0.0004
Niigata, NIIGATA	32	151.9	0.002±0.0007	0.001±0.0005
Kanazawa, ISHIKAWA	32	256.0	0.002±0.0006	0.001±0.0005
Nagano, NAGANO	32	57.8	0.001±0.0005	0.001±0.0005
Osaka, OSAKA	33	72.8	0.001±0.0005	0.001±0.0005
Okayama, OKAYAMA	32	39.1	0.001±0.0006	0.000±0.0005
Yamaguchi, YAMAGUCHI	32	105.5	0.002±0.0007	0.001±0.0006
Kochi, KOCHI	32	260.9	0.004±0.0007	0.001±0.0004
Kagoshima, KAGOSHIMA	32	88.0	0.004±0.0007	0.002±0.0005

Location	Duration (days)	Precipitation (mm)	^{90}Sr (mCi/km^2)	^{137}Cs (mCi/km^2)
November, 1985				
Akita, AKITA	32	295.6	0.002±0.0006	0.002±0.0005
Chiba, CHIBA	32	81.6	0.002±0.0006	0.001±0.0005
Niigata, NIIGATA	32	337.2	0.003±0.0006	0.002±0.0006
Kanazawa, ISHIKAWA	30	529.5	0.003±0.0006	0.000±0.0005
Nagano, NAGANO	32	42.8	0.001±0.0005	0.001±0.0005
Osaka, OSAKA	30	78.7	0.001±0.0005	0.001±0.0004
Okayama, OKAYAMA	32	24.9	0.001±0.0005	0.000±0.0005
Yamaguchi, YAMAGUCHI	32	54.0	0.003±0.0006	0.001±0.0005
Kochi, KOCHI	32	28.2	0.001±0.0006	0.000±0.0005
Kagoshima, KAGOSHIMA	32	67.0	0.002±0.0006	0.002±0.0006
December, 1985				
Akita, AKITA	30	164.5	0.004±0.0006	0.001±0.0006
Chiba, CHIBA	36	51.1	0.001±0.0006	0.002±0.0005
Niigata, NIIGATA	36	265.3	0.002±0.0005	0.004±0.0006
Kanazawa, ISHIKAWA	30	494.0	0.002±0.0006	0.004±0.0006
Nagano, NAGANO	34	25.2	0.001±0.0005	0.000±0.0005
Osaka, OSAKA	28	27.1	0.002±0.0006	0.001±0.0005
Okayama, OKAYAMA	36	37.4	0.001±0.0006	0.000±0.0004
Yamaguchi, YAMAGUCHI	34	39.5	0.003±0.0007	0.002±0.0005
Kochi, KOCHI	36	59.1	0.004±0.0007	0.001±0.0005
Kagoshima, KAGOSHIMA	34	71.0	0.005±0.0007	0.001±0.0004
January, 1986				
Chiba, CHIBA	26	1.5	0.000±0.0005	0.001±0.0004

Figure (1)-2 Sampling Locations of Rain and Dry Fallout
(for domestic program)

1. Akita
2. Chiba
3. Niigata
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. 1985 to Dec. 1985)

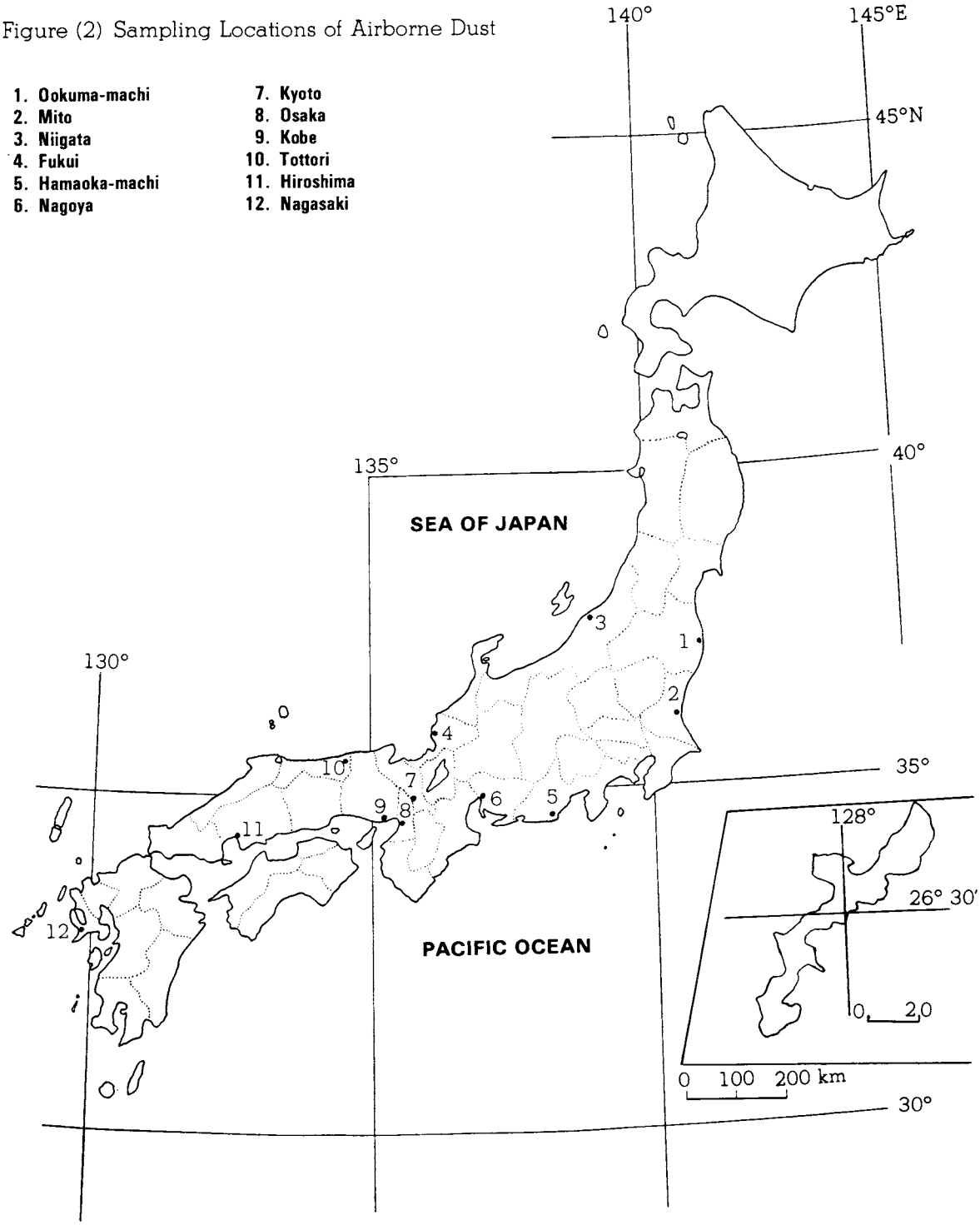
—continued from No. 72 of this publication—

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, 1985				
Mito, IBARAGI	4~6	11,421	0.0 ±0.02	0.05±0.02
Kyoto, KYOTO	4~6	8,409	0.1 ±0.03	0.04±0.02
Nagasaki, NAGASAKI	4~6	11,808	0.03±0.02	0.01±0.01
July~September, 1985				
Ookuma-machi, FUKUSHIMA	7~9	9,277	0.05±0.03	0.0 ±0.02
Mito, IBARAGI	7~9	12,306	0.01±0.02	0.01±0.02
Niigata,NIIGATA	7~9	15,752	0.02±0.02	0.01±0.01
Fukui, FUKUI	7~9	20,159	0.02±0.01	0.01±0.01
Hamaoka-machi, SHIZUOKA	7~9	11,659	0.01±0.02	0.03±0.01
Nagoya, AICHI	7~9	9,952	0.04±0.02	0.04±0.02
Kyoto, KYOTO	7~9	9,371	0.1 ±0.03	0.02±0.02
Osaka, OSAKA	7~9	13,322	0.0 ±0.02	0.02±0.01
Kobe, HYOGO	7~9	10,224	0.0 ±0.02	0.0 ±0.02
Tottori, TOTTORI	7~9	10,269	0.0 ±0.02	0.0 ±0.02
Hiroshima, HIROSHIMA	7~9	10,129	0.02±0.02	0.0 ±0.02
Nagasaki, NAGASAKI	7~9	12,260	0.03±0.02	0.02±0.02
October~December, 1985				
Fukui, FUKUI	10~12	18,741	0.01±0.01	0.01±0.01
Osaka, OSAKA	10~12	11,486	0.03±0.02	0.01±0.02
Kobe, HYOGO	10~12	10,669	0.03±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. 1985 to Dec. 1985)

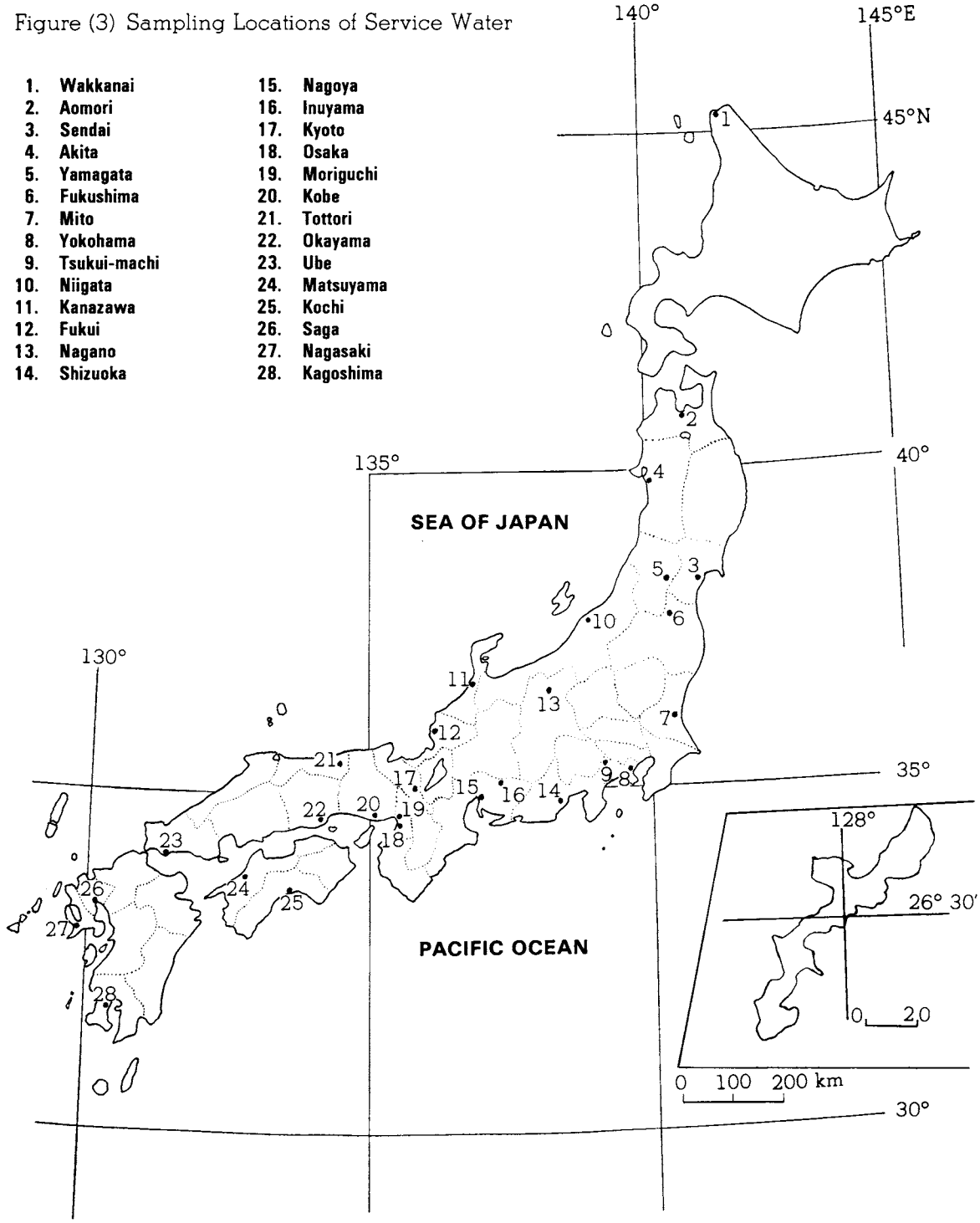
—continued from No. 72 of this publication—

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

Location	pH	^{90}Sr (pCi/ℓ)	^{137}Cs (pCi/ℓ)
(Source Water)			
August, 1985			
Kyoto, KYOTO	7.1	0.18±0.008	0.01 ±0.002
December, 1985			
Tsukui-machi, KANAGAWA	8.1	0.03±0.004	0.003±0.002
Inuyama, AICHI	7.0	0.06±0.005	0.004±0.003
Moriguchi, OSAKA	7.2	0.14±0.007	0.01 ±0.003
(Tap Water)			
June, 1985			
Nagsaki, NAGASAKI	7.0	0.05±0.005	0.001±0.002
August, 1985			
Fukushima, FUKUSHIMA	6.8	0.14±0.007	0.001±0.002
Kyoto, KYOTO	6.8	0.18±0.007	0.01 ±0.002
October, 1985			
Sendai, MIYAGI	6.4	0.09±0.005	0.003±0.002
December, 1985			
Wakkanai, HOKKAIDO	6.8	0.07±0.005	0.01 ±0.003
Aomori, AOMORI	7.3	0.04±0.004	0.01 ±0.003
Akita, AKITA	7.1	0.10±0.006	0.01 ±0.002
Yamagata, YAMAGATA	6.9	0.08±0.005	0.001±0.002
Mito, IBARAGI	7.2	0.04±0.004	0.004±0.002
Yokohama, KANAGAWA	7.7	0.03±0.004	0.001±0.002
Niigata, NIIGATA	6.8	0.11±0.006	0.003±0.002
Kanazawa, ISHIKAWA	7.3	0.10±0.006	0.004±0.002
Fukui, FUKUI	6.9	0.01±0.003	0.00 ±0.002
Nagano, NAGANO	7.3	0.03±0.004	0.002±0.002
Nagoya, AICHI	6.6	0.08±0.006	0.01 ±0.003
Osaka, OSAKA	6.8	0.11±0.006	0.00 ±0.002
Kobe, HYOGO	6.1	0.11±0.006	0.001±0.002
Tottori, TOTTORI	7.5	0.08±0.005	0.00 ±0.002
Okayama, OKAYAMA	6.8	0.08±0.006	0.001±0.002
Ube, YAMAGUCHI	6.7	0.07±0.005	0.004±0.002
Matsuyama, EHIME	7.7	0.05±0.005	0.00 ±0.002
Kochi, KOCHI	7.1	0.06±0.005	0.004±0.002
Saga, SAGA	7.2	0.05±0.005	0.002±0.002
Kagoshima, KAGOSHIMA	6.1	0.02±0.004	0.01 ±0.003

Figure (3) Sampling Locations of Service Water

1. Wakkanai
2. Aomori
3. Sendai
4. Akita
5. Yamagata
6. Fukushima
7. Mito
8. Yokohama
9. Tsukui-machi
10. Niigata
11. Kanazawa
12. Fukui
13. Nagano
14. Shizuoka
15. Nagoya
16. Inuyama
17. Kyoto
18. Osaka
19. Moriguchi
20. Kobe
21. Tottori
22. Okayama
23. Ube
24. Matsuyama
25. Kochi
26. Saga
27. Nagasaki
28. Kagoshima



(4) Strontium-90 and Cesium-137 in Freshwater (from Jul. 1985 to Jan. 1986)

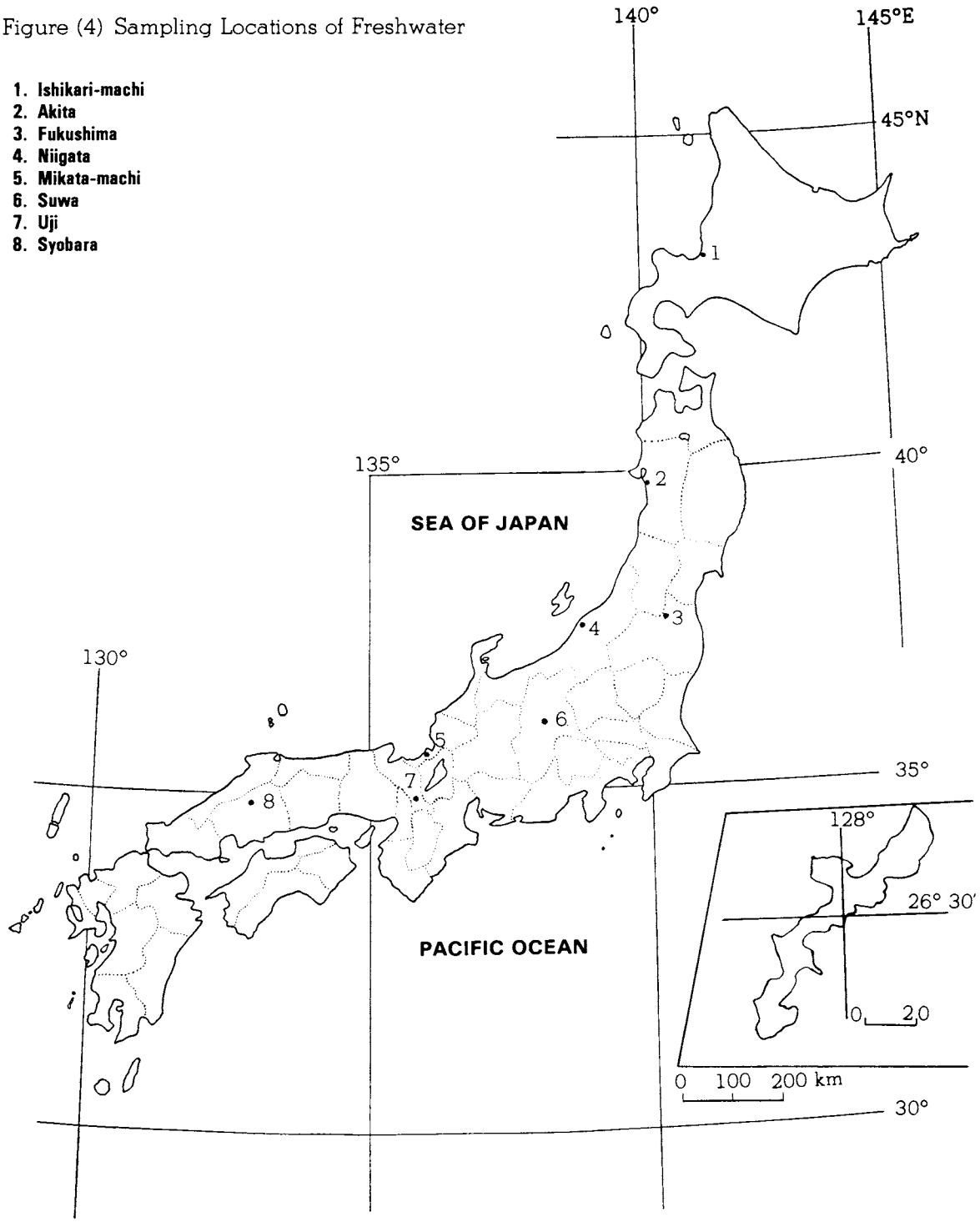
—continued from No. 72 of this publication—

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

Location	pH	^{90}Sr (pCi/ℓ)	^{137}Cs (pCi/ℓ)
(Freshwater)			
July, 1985			
Ishikari-machi, HOKKAIDO	7.4	0.09±0.005	0.01 ±0.003
August, 1985			
Akita, AKITA	7.0	0.13±0.006	0.01 ±0.004
Fukushima, FUKUSHIMA	6.6	0.06±0.005	0.01 ±0.002
October, 1985			
Shobara, HIROSHIMA	7.0	0.06±0.005	0.004±0.002
November, 1985			
Niigata, NIIGATA	6.6	0.17±0.008	0.03 ±0.004
December, 1985			
Suwa, NAGANO	7.8	0.04±0.004	0.01 ±0.003
Uji, KYOTO	6.5	0.01±0.003	0.003±0.002
January, 1986			
Mikata-machi, FUKUI	7.2	0.15±0.007	0.02 ±0.003

Figure (4) Sampling Locations of Freshwater

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



(5) Strontium-90 and Cesium-137 in Soil (from Jul. 1985 to Sep. 1985)

—continued from No. 72 of this publication—

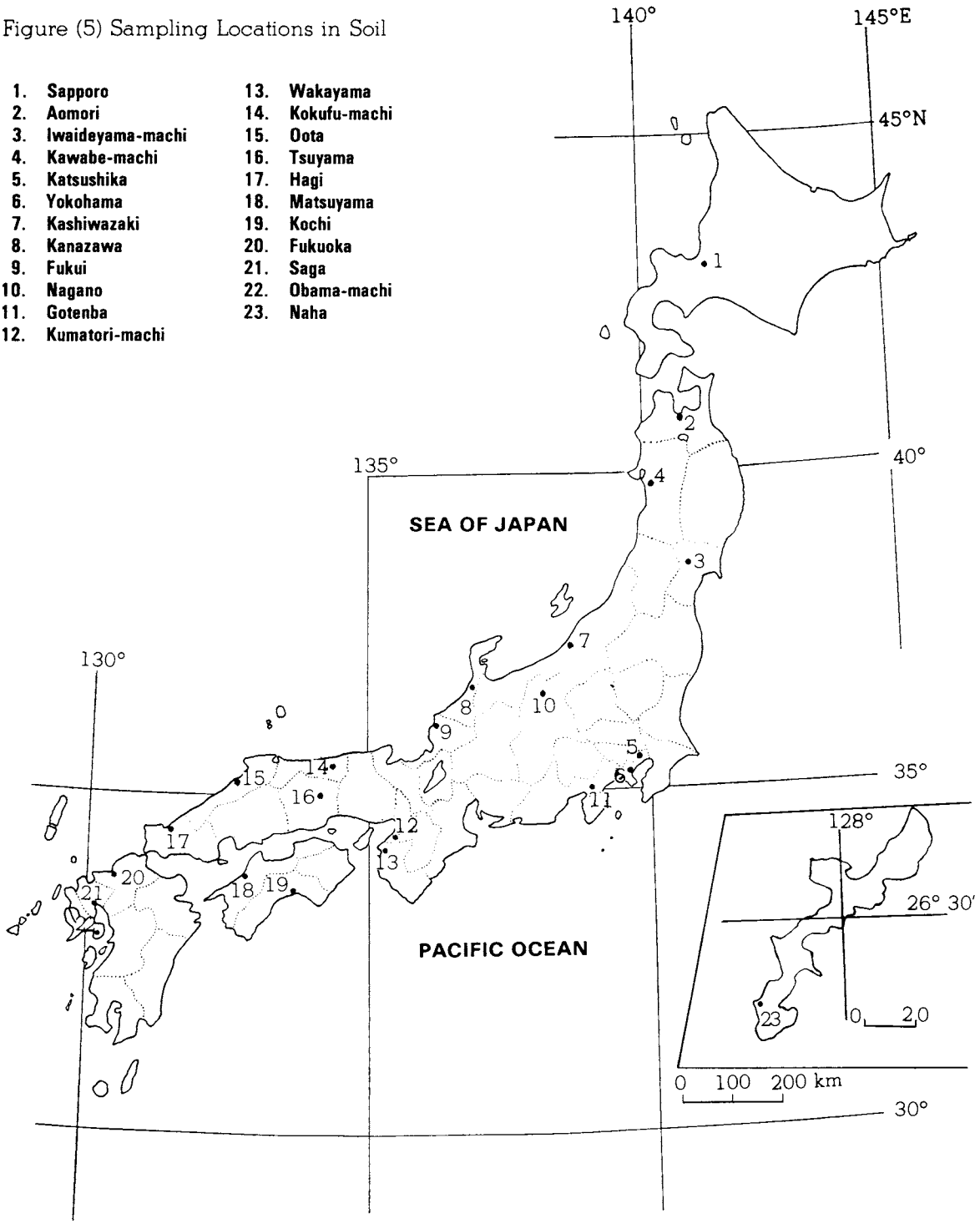
Table (5): Strontium-90 and Cesium-137 in Soil

Location	Sampling Depth(cm)	^{90}Sr		^{137}Cs	
		(pCi/kg)	(mCi/km^2)	(pCi/kg)	(mCi/km^2)
July, 1985					
Aomori, AOMORI	0~5	38± 3.8	1.4±0.14	22± 3.2	0.8±0.12
"	5~20	6± 2.4	0.7±0.25	3± 2.3	0.4±0.24
Katsushika, TOKYO	0~5	33± 4.0	1.8±0.22	65± 5.1	3.6±0.28
"	5~20	110± 6	22 ±1.2	230± 8	48 ±1.7
Kashiwazaki, NIIGATA	0~5	42± 3.9	3.4±0.32	580±13	47 ±1.1
"	5~20	100± 6	24 ±1.3	970±18	230 ±4
Kanazawa, ISHIKAWA	0~5	89± 5.9	3.5±0.23	260± 9	10 ±0.4
"	5~20	88± 5.4	15 ±0.9	160± 7	26 ±1.2
Nagano, NAGANO	0~5	48± 4.2	2.0±0.17	150± 7	6.0±0.28
"	5~20	72± 4.9	7.2±0.49	170± 7	17 ±0.7
Gotenba, SHIZUOKA	0~5	29± 3.9	1.0±0.13	91± 5.7	3.1±0.20
"	5~20	35± 3.7	4.6±0.49	220± 8	29 ±1.1
Kumatori-machi, OSAKA	0~5	90± 5.6	4.8±0.30	55± 4.7	3.0±0.25
"	5~20	44± 4.3	6.9±0.68	27± 3.9	4.3±0.62
Wakayama, WAKAYAMA	0~5	19± 3.5	0.6±0.12	81± 5.3	2.7±0.18
"	5~20	16± 3.5	1.3±0.29	50± 4.6	4.1±0.38
Kokufu-machi, TOTTORI	0~5	6± 3.0	0.3±0.16	27± 3.7	1.4±0.19
"	5~20	25± 5.1	3.3±0.67	36± 3.9	4.7±0.51
Oota, SHIMANE	0~5	1300±20.0	18 ±0.3	4200±40	56 ±0.5
"	5~20	510±12.0	33 ±0.8	1300±20	82 ±1.3
Tsuyama, OKAYAMA	0~5	25± 3.5	0.8±0.11	94± 5.8	3.1±0.19
"	5~20	27± 3.8	2.7±0.38	96± 5.8	9.7±0.58
Hagi, YAMAGUCHI	0~5	60± 4.8	3.2±0.25	180± 7	9.7±0.40
"	5~20	64± 5.0	15 ±1.2	170± 7	39 ±1.7
Kochi, KOCHI	0~5	280±10	15 ±0.5	940±17	50 ±0.9
"	5~20	190± 8	24 ±1.0	360±11	45 ±1.3
Fukuoka, FUKUOKA	0~5	270±10	10 ±0.4	350±10	14 ±0.4
"	5~20	220± 9	15 ±0.6	49± 4.3	3.4±0.30
Saga, SAGA	0~5	10± 2.9	0.4±0.13	10± 3.1	0.4±0.15
"	5~20	10± 2.8	1.8±0.52	16± 3.4	2.9±0.64

Location	Sampling Depth(cm)	^{90}Sr		^{137}Cs	
		(pCi/kg)	(mCi/km^2)	(pCi/kg)	(mCi/km^2)
Obama-machi, NAGASAKI	0~5	290± 9	12 ±0.4	2400±30	100 ±1
"	5~20	190± 8	19 ±0.8	650±14	65 ±1.4
Naha, OKINAWA	0~5	75± 5.0	3.7±0.25	220± 8	11 ±0.4
"	5~20	64± 4.8	12 ±0.90	130± 7	24 ±1.2
August, 1985					
Sapporo, HOKKAIDO	0~5	420±11	14 ±0.3	1200±20	40 ±0.6
"	5~20	230± 9	39 ±1.5	230± 9	40 ±1.5
Iwadeyama-machi, MIYAGI	0~5	110± 7	4.6±0.30	140± 7	6.0±0.30
"	5~20	66± 4.8	12 ±0.9	100± 6	18 ±1.1
Yokohama, KANAGAWA	0~5	270±11	8.6±0.35	750±15	24 ±0.5
"	5~20	150± 7	17 ±0.8	180± 8	21 ±0.9
Fukui, FUKUI	0~5	70± 5.4	2.7±0.21	160± 7	6.3±0.28
"	5~20	26± 4.2	4.3±0.71	35± 4.2	6.0±0.72
Matsuyama, EHIME	0~5	33± 3.8	1.3±0.15	840±15	34 ±0.6
"	5~20	5± 2.6	0.6±0.30	41± 4.2	4.8±0.50
September, 1985					
Kawabe-machi, AKITA	0~5	570±13	18 ±0.4	1400±20	45 ±0.7
"	5~20	860±15	81 ±1.5	2300±30	220 ±3

Figure (5) Sampling Locations in Soil

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



(6) Strontium-90 and Cesium-137 in Sea Water (from Jul. 1985 to Sep. 1985)

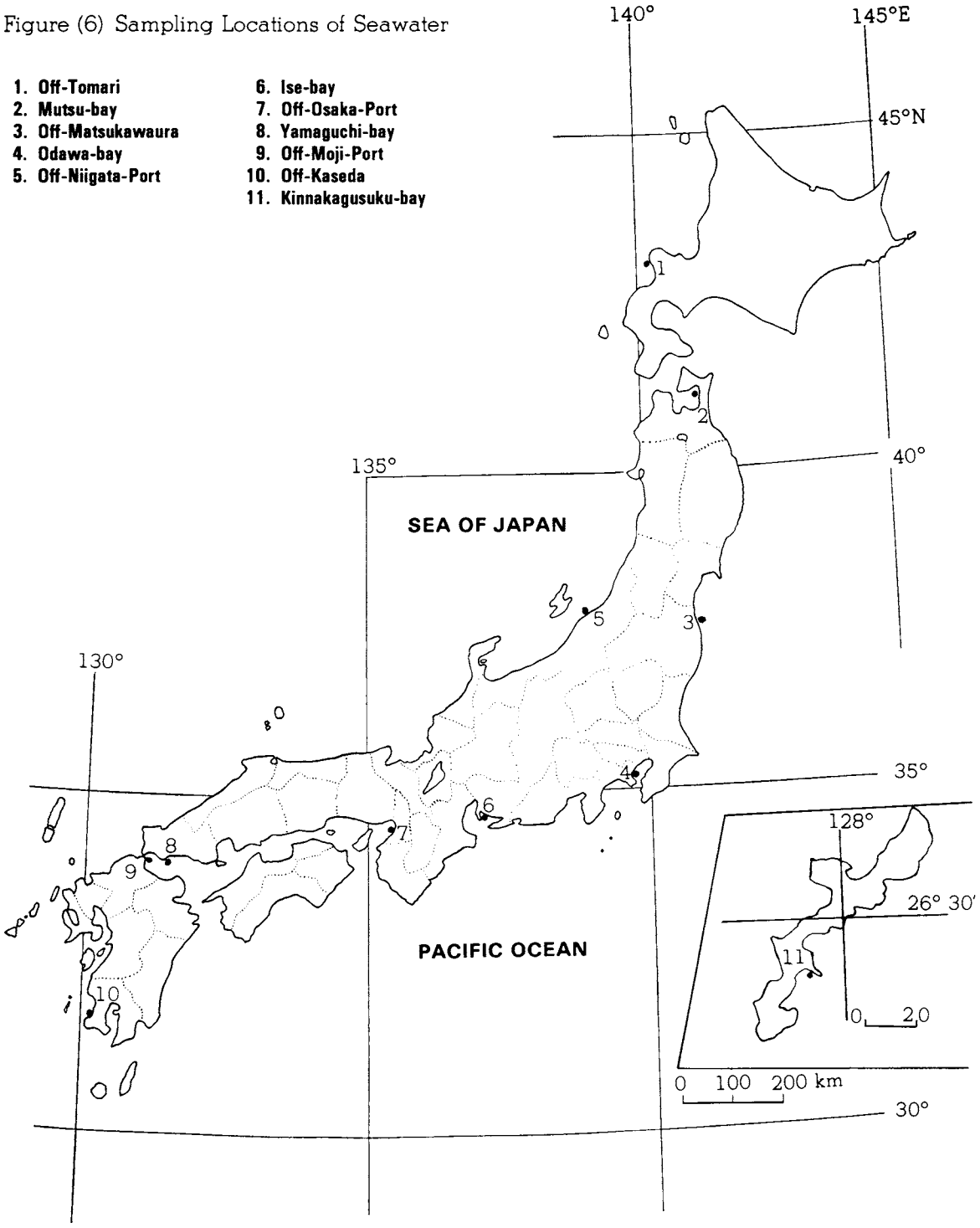
—continued from No. 70 of this publication—

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, 1985				
Off-Niigata-port, NIIGATA	41.3	17.52	0.12±0.011	0.12±0.011
Ise-bay, AICHI	40	14.6	0.08±0.010	0.09±0.010
Moji-port, FUKUOKA	40	17.79	0.08±0.010	0.11±0.011
Off-Kaseda, KAGOSHIMA	40	17.5	0.07±0.009	0.12±0.012
August, 1985				
Off-Tomari, HOKKAIDO	40	18.55	0.09±0.010	0.10±0.010
Mutsu-bay, AOMORI	40	17.7	0.09±0.010	0.11±0.010
Off-Matsukawaura, FUKUSHIMA	40	17.58	0.08±0.010	0.14±0.012
Odawa-bay, KANAGAWA	40	16.6	0.08±0.010	0.11±0.011
Off-Osaka-port, OSAKA	40	11.11	0.11±0.011	0.08±0.010
Yamaguchi-bay, YAMAGUCHI	40	18.3	0.09±0.011	0.11±0.010
September, 1985				
Kinnakagusuku-bay, OKINAWA	40	18.98	0.09±0.010	0.08±0.011

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 1985 to Sep. 1985)

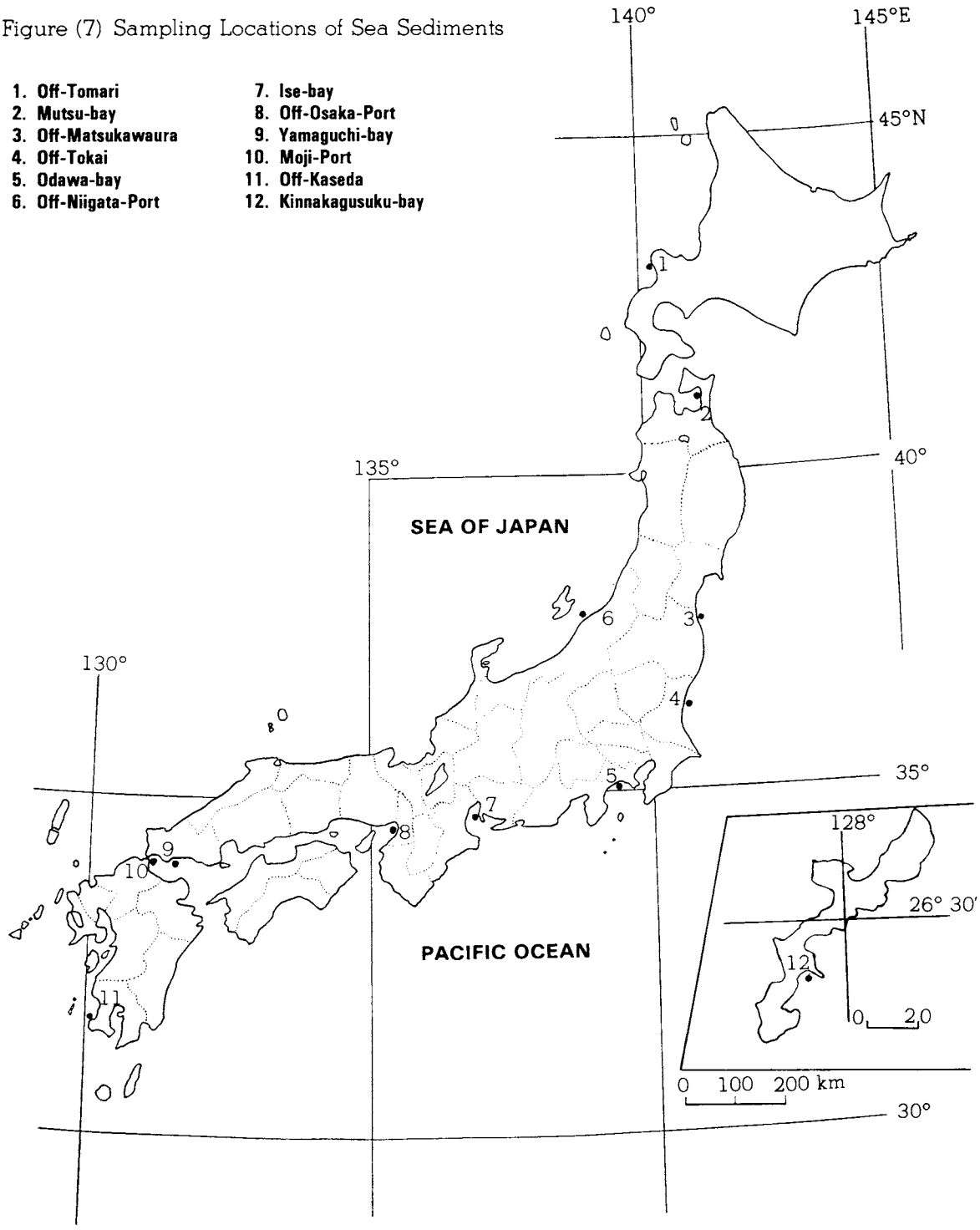
—continued from No. 70 of this publication—

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

Location	depth (m)	^{90}Sr (pCi/kg)	^{137}Cs (pCi/kg)
May, 1985			
Mutsu-bay, AOMORI	9	0±2.3	6±2.9
July, 1985			
Off-Tokai, IBARAGI	7	0±2.5	10±3.1
Off-Niigata-port, NIIGATA	30	0±2.5	77±5.2
Ise-bay, AICHI	20	0±2.6	68±4.9
Moji-port, FUKUOKA	9	1±2.6	74±5.3
Off-Kaseda, KAGOSHIMA	17	3±2.5	12±2.9
August, 1985			
Off-Tomari, HOKKAIDO	7	0±2.3	28±3.7
Mutsu-bay, AOMORI	11	12±3.0	210±8
Off-Matsukawaura, FUKUSHIMA	5	0±2.5	13±3.1
Odawa-bay, KANAGAWA	7.5	0±2.3	68±5.2
Osaka-port, OSAKA	12.5	4±2.8	140±7
Yamaguchi-bay, YAMAGUCHI	10	2±2.5	140±7
September, 1985			
Kinnakagusuku-bay, OKINAWA	14.7	4±2.7	16±3.1

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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