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RADIOACTIVITY SURVEY DATA in Japan

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National Institute of Radiological Sciences
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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 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 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.

* 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) Strontium-90 and Cesium-137 in Total diet (from Oct. 1983 to Jul. 1984)

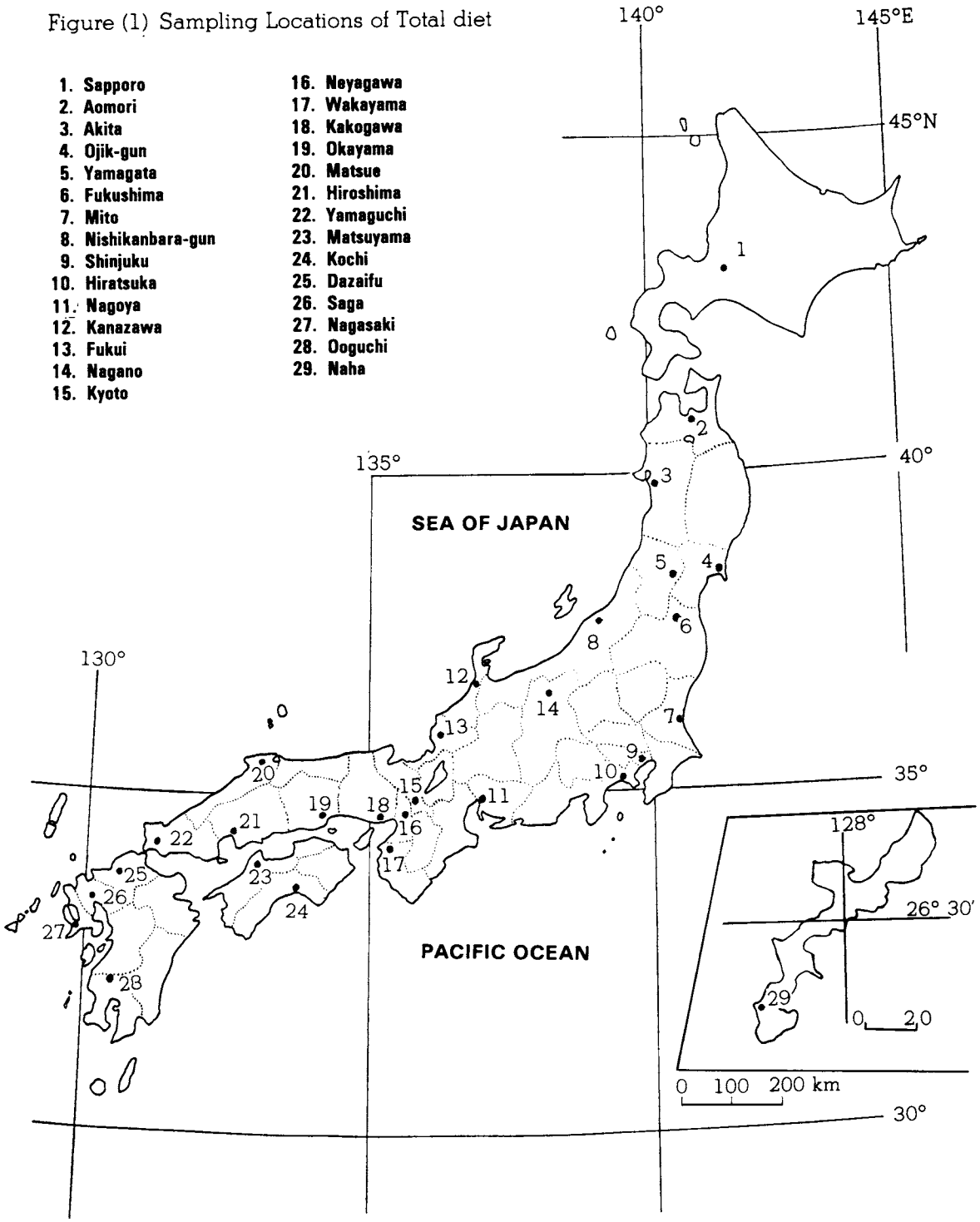
—continued from No. 67 of this publication—

Table (1): Strontium-90 and Cesium-137 in Total diet

Location	Ash	Ca	k	^{90}Sr		^{137}Cs	
	($g \cdot p^{-1} \cdot d^{-1}$)	($mg \cdot p^{-1} \cdot d^{-1}$)	($mg \cdot p^{-1} \cdot d^{-1}$)	$pCi \cdot p^{-1} \cdot d^{-1}$	S.U.	$pCi \cdot p^{-1} \cdot d^{-1}$	S.U.
October, 1983							
Nagasaki, NAGASAKI	14.0	509	1650	1.6±0.26	3.1±0.51	1.9±0.20	1.1±0.12
November, 1983							
Hiratsuka, KANAGAWA	16.2	612	2430	2.9±0.32	4.7±0.52	2.3±0.27	1.0±0.11
Fukui, FUKUI	12.1	696	1270	1.7±0.24	2.5±0.34	1.9±0.22	1.5±0.17
Iwami-gun, TOTTORI	17.3	409	2180	5.3±0.42	13.0±1.00	3.2±0.28	1.5±0.13
Matsue, SHIMANE	22.0	1320	2690	5.0±0.40	3.8±0.30	3.4±0.29	1.3±0.11
Dazaifu, FUKUOKA	13.7	561	1920	2.9±0.31	5.2±0.54	2.8±0.23	1.5±0.12
December, 1983							
Aomori, AOMORI	19.3	516	2150	2.9±0.38	5.7±0.74	2.5±0.30	1.2±0.14
Ojika-gun, MIYAGI	20.5	598	2760	4.5±0.40	7.6±0.67	2.1±0.27	0.8±0.10
Fukushima, FUKUSHIMA	16.6	458	1810	3.0±0.35	6.6±0.77	2.1±0.28	1.2±0.16
Shinjuku, TOKYO	15.1	498	1950	3.6±0.34	7.2±0.68	2.0±0.24	1.0±0.12
Nagano, NAGANO	13.7	431	1820	1.8±0.25	4.1±0.58	1.7±0.22	0.9±0.12
Neyagawa, OSAKA	15.3	564	1960	2.6±0.30	4.7±0.54	1.4±0.20	0.7±0.10
Hiroshima, HIROSHIMA	17.6	2420	1340	1.7±0.29	0.7±0.12	1.4±0.23	1.1±0.17
Matsuyama, EHIME	14.7	543	2040	2.1±0.29	3.8±0.53	1.3±0.18	0.6±0.09
January, 1984							
Yamagata, YAMAGATA	19.0	590	2270	2.7±0.37	4.6±0.63	2.9±0.32	1.3±0.14
Yamaguchi, YAMAGUCHI	15.0	444	2200	4.0±0.36	9.1±0.81	2.0±0.22	0.9±0.10
February, 1984							
Naha, OKINAWA	12.7	489	1520	2.0±0.28	4.1±0.57	0.9±0.19	0.6±0.13
May, 1984							
Wakayama, WAKAYAMA	19.3	515	2140	1.7±0.35	3.3±0.67	2.4±0.26	1.1±0.12
June, 1984							
Sapporo, HOKKIDO	16.5	518	2190	4.6±0.39	9.0±0.74	3.9±0.30	1.8±0.14
Aomori, AOMORI	16.8	492	1850	3.4±0.35	6.8±0.72	1.9±0.23	1.0±0.12
Mito, IBARAGI	15.3	468	2150	2.0±0.29	4.2±0.62	1.9±0.22	0.9±0.10
Shinjuku, TOKYO	12.3	288	1480	1.9±0.25	6.6±0.86	2.9±0.22	2.0±0.15
Hiratsuka, KANAGAWA	14.5	437	1740	1.6±0.30	3.6±0.68	2.4±0.26	1.4±0.15
Nishikanbara-gun, NIIGATA	17.8	668	2190	3.2±0.38	4.8±0.56	0.9±0.21	0.4±0.10
Kanazawa, ISHIKAWA	18.3	836	2340	2.9±0.40	3.5±0.48	2.9±0.30	1.2±0.13
Fukui, FUKUI	11.8	580	1430	1.0±0.20	1.8±0.34	0.9±0.15	0.6±0.10
Nagano, NAGANO	16.8	793	2070	1.8±0.27	2.3±0.34	1.5±0.21	0.7±0.10
Nagoya, AICHI	16.2	639	2020	3.7±0.33	5.8±0.52	4.7±0.31	2.3±0.15

Location	Ash	Ca	k	^{90}Sr		^{137}Cs	
	($q \cdot p^{-1} \cdot d^{-1}$)	($mg \cdot p^{-1} \cdot d^{-1}$)	($mg \cdot p^{-1} \cdot d^{-1}$)	$pCi \cdot p^{-1} \cdot d^{-1}$	S.U.	$pCi \cdot p^{-1} \cdot d^{-1}$	S.U.
Kyoto, KYOTO	18.1	940	2280	2.7±0.38	2.9±0.40	2.0±0.27	0.9±0.12
Kakogawa, HYOGO	13.1	529	1770	2.0±0.25	3.7±0.48	1.2±0.16	0.7±0.09
Iwami-gun, TOTTORI	14.1	440	1790	2.4±0.30	5.4±0.68	1.2±0.17	0.7±0.09
Okayama, OKAYAMA	15.6	443	1990	1.4±0.28	3.2±0.62	1.2±0.18	0.6±0.09
Matsuyama, EHIME	15.0	468	2340	1.4±0.28	3.0±0.60	1.3±0.19	0.6±0.08
Kochi, KOCHI	16.1	706	2060	4.1±0.36	5.8±0.51	2.0±0.22	1.0±0.11
Dazaifu, FUKUOKA	11.8	468	1600	1.5±0.22	3.3±0.47	0.9±0.13	0.6±0.08
Saga, SAGA	17.5	945	2050	2.7±0.32	2.8±0.34	1.6±0.21	0.8±0.10
Ooguchi, KAGOSHIMA	13.4	408	1890	2.2±0.29	5.3±0.71	3.1±0.24	1.7±0.13
Naha, OKINAWA	13.9	488	2200	1.7±0.29	3.5±0.59	1.1±0.16	0.5±0.07
July, 1984							
Akita, AKITA	19.1	624	2630	5.8±0.47	9.3±0.76	19.0±0.60	7.2±0.24
Yamagata, YAMAGATA	14.7	523	1830	1.5±0.26	3.0±0.49	0.9±0.17	0.5±0.09
Fukushima, FUKUSHIMA	14.3	217	1330	1.5±0.30	7.0±1.40	0.8±0.19	0.6±0.15

Figure (1) Sampling Locations of Total diet



(2)-1 Strontium-90 and Cesium-137 in Rice (producing districts) (from Nov. 1983 to Jan. 1984)

—continued from NO. 67 of this publication—

Table (2)-1: Strontium-90 and Cesium-137 in Rice

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/Kg)	K (g/Kg)	pCi/Kg	S.U.	pCi/Kg	C.U
November, 1983							
Yamaguchi, YAMAGUCHI	0.474	0.066	0.848	0.40±0.14	5.0±2.2	0.3±0.12	0.4±0.14
December, 1983							
Chikushino, FUKUOKA	0.505	0.063	0.883	0.01±0.13	0.0±2.1	0.3±0.12	0.3±0.13
January, 1984							
Akashi, HYOGO	0.411	0.060	0.789	0.30±0.14	5.0±2.4	0.2±0.12	0.2±0.15

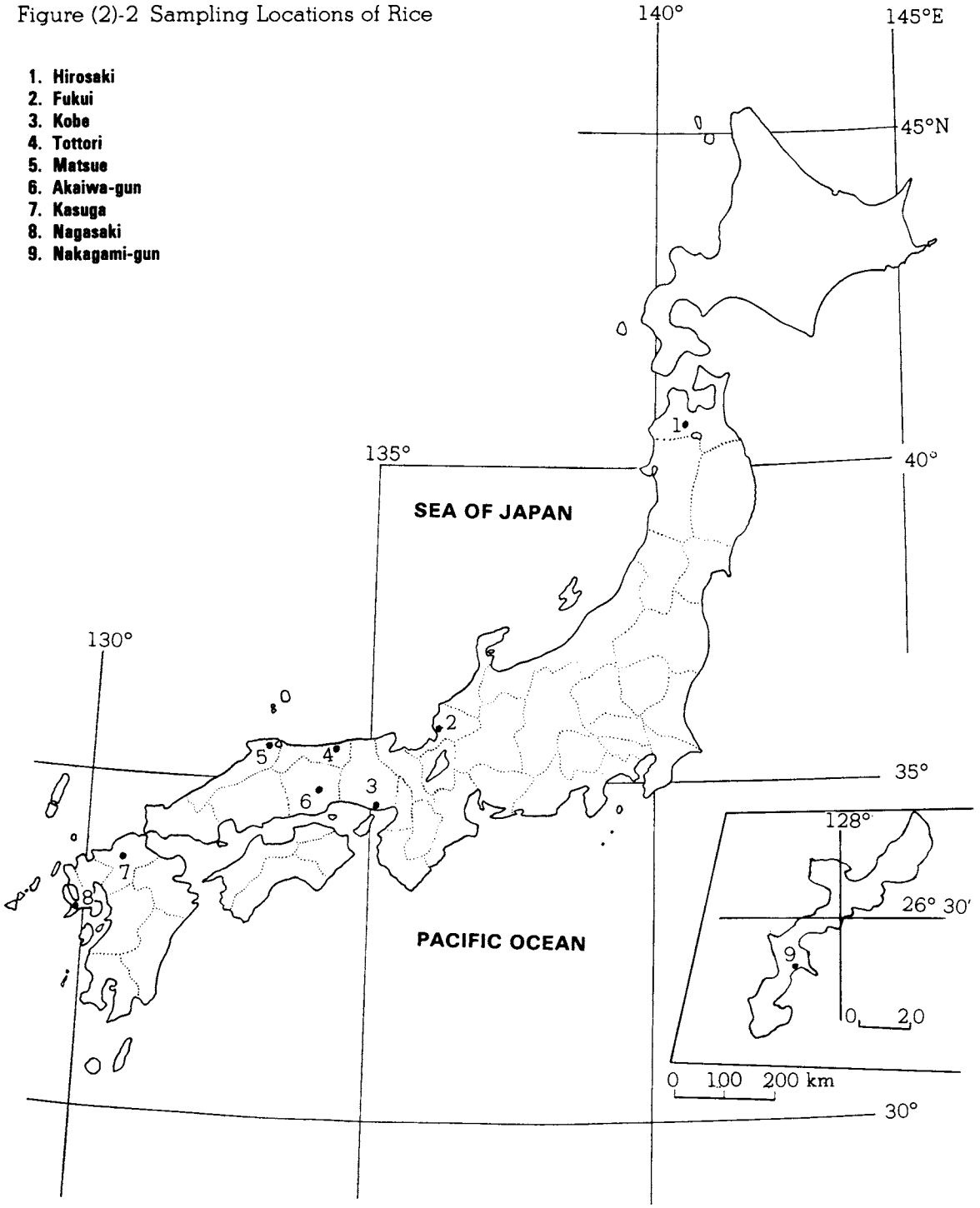
(2)-2 Strontium-90 and Cesium-137 in Rice (consuming districts) (from Nov. 1983 to Jan. 1984)

—continued from NO. 67 of this publication—

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

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/Kg)	K (g/Kg)	pCi/Kg	S.U.	pCi/Kg	C.U
November, 1983							
Fukui, FUKUI	0.452	0.064	0.922	0.70±0.17	10.0±2.7	0.6±0.15	0.7±0.16
December, 1983							
Tottori, TOTTORI	0.398	0.059	0.736	0.30±0.14	4.0±2.3	0.8±0.14	1.1±0.19
Matsue, SHIMANE	0.595	0.072	1.270	0.30±0.17	4.0±2.4	0.8±0.16	0.6±0.13
Akaiwa-gun, OKAYAMA	0.685	0.088	1.450	0.40±0.20	5.0±2.2	0.0±0.19	0.0±0.13
Kasuga, FUKUOKA	0.516	0.069	1.030	0.30±0.15	5.0±2.2	1.8±0.17	1.7±0.17
Nakagami-gun, OKINAWA	0.581	0.079	1.240	0.40±0.18	5.0±2.3	1.0±0.15	0.8±0.12
January, 1984							
Hirosaki, AOMORI	0.426	0.072	1.030	0.30±0.13	4.0±1.8	0.6±0.10	0.5±0.10
Kobe, HYOGO	0.484	0.076	1.010	0.60±0.17	8.0±2.3	1.0±0.13	1.0±0.13
Nagasaki, NAGASAKI	0.377	0.069	0.742	0.10±0.11	1.0±1.5	1.7±0.13	2.3±0.18

Figure (2)-2 Sampling Locations of Rice



(3)-1 Strontium-90 and Cesium-137 in Milk (producing districts for WHO program) (from Nov. 1983 to Jan. 1984)

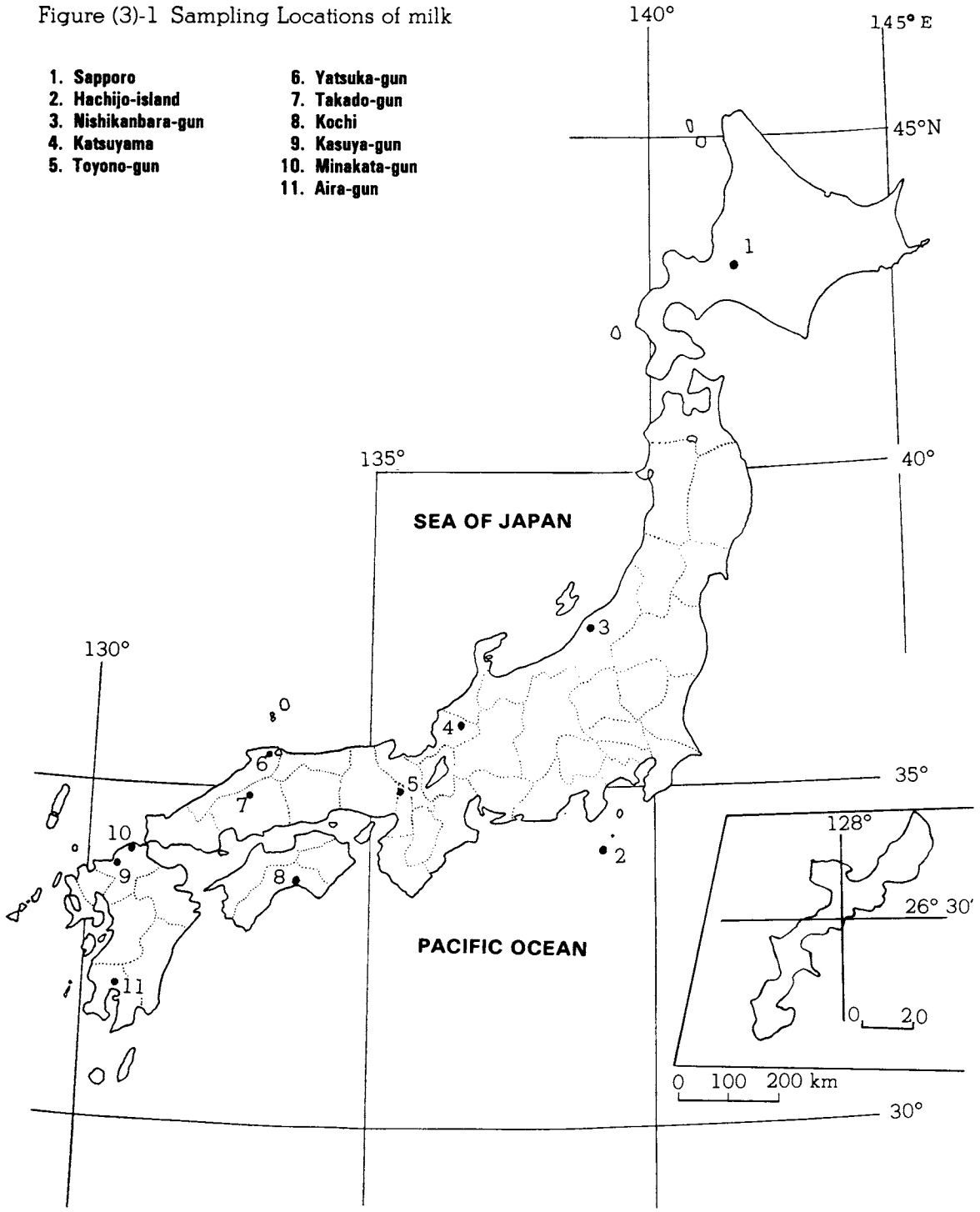
—continued from NO. 67 of this publication—

Table (3)-1: Strontium-90 and Cesium-137 in Milk

Location	Component			^{90}Sr		^{137}Cs	
	Ash (g/ℓ)	Ca (g/ℓ)	K (g/ℓ)	pCi/ℓ	S.U.	pCi/ℓ	C.U
November, 1983							
Kasuya-gun, FUKUOKA	7.63	1.03	1.36	1.8±0.30	1.7±0.29	1.0±0.21	0.8±0.16
January, 1984							
Toyono-gun, OSAKA	7.13	1.11	1.47	0.8±0.20	0.7±0.18	0.9±0.20	0.6±0.13
Takada-gun, HIROSHIMA	6.98	1.09	1.52	1.1±0.22	1.0±0.20	0.8±0.20	0.5±0.13
February, 1984							
Sapporo, HOKKAIDO	7.43	1.26	1.64	1.5±0.23	1.1±0.18	2.4±0.25	1.5±0.15
Hachijo-Island, TOKYO	7.60	1.10	1.33	11.0±0.50	10.0±0.50	50.0±0.90	38.0±0.70
Nishikanbara-gun, NIIGATA	7.72	1.14	1.69	1.3±0.25	1.1±0.22	1.4±0.23	0.8±0.14
Katsuyama, FUKUI	7.61	1.20	1.61	1.6±0.27	1.3±0.23	3.2±0.29	2.0±0.18
Yatsuka-gun, SHIMANE	7.64	1.11	1.61	1.3±0.26	1.2±0.23	1.7±0.19	1.0±0.12
Kochi, KOCHI	7.28	1.11	1.62	2.0±0.26	1.8±0.24	1.0±0.21	0.6±0.13
Kasuya-gun, FUKUOKA	7.40	1.18	1.37	1.4±0.27	1.2±0.23	1.1±0.20	0.8±0.15
Aira-gun, KAGOSHIMA	7.42	1.18	1.57	0.8±0.25	0.7±0.21	2.0±0.24	1.3±0.15
May, 1984							
Sapporo, HOKKAIDO	7.41	1.24	1.55	1.2±0.24	0.9±0.20	2.5±0.24	1.6±0.15
Hachijo-Island, TOKYO	6.69	0.951	1.35	4.8±0.34	5.0±0.36	29.0±0.60	22.0±0.50
Katsuyama, FUKUI	7.79	1.13	1.68	2.1±0.28	1.8±0.25	3.1±0.28	1.8±0.16
Toyono-gun, OSAKA	7.08	1.07	1.44	0.6±0.22	0.6±0.21	0.6±0.14	0.4±0.10
Kochi, KOCHI	7.30	1.09	1.62	2.5±0.29	2.3±0.26	1.2±0.19	0.7±0.12
Munkata-gun, FUKUOKA	6.72	1.06	1.41	0.5±0.21	0.5±0.19	8.0±0.34	5.6±0.24
Aira-gun, KAGOSHIMA	7.06	1.10	1.60	1.1±0.22	1.0±0.20	1.8±0.20	1.1±0.12
June, 1984							
Takada-gun, HIROSHIMA	6.14	0.934	1.29	0.2±0.18	0.2±0.20	0.9±0.14	0.7±0.11

Figure (3)-1 Sampling Locations of milk

1. Sapporo
2. Hachijo-island
3. Nishikanbara-gun
4. Katsuyama
5. Toyono-gun
6. Yatsuka-gun
7. Takado-gun
8. Kochi
9. Kasuya-gun
10. Minakata-gun
11. Aira-gun



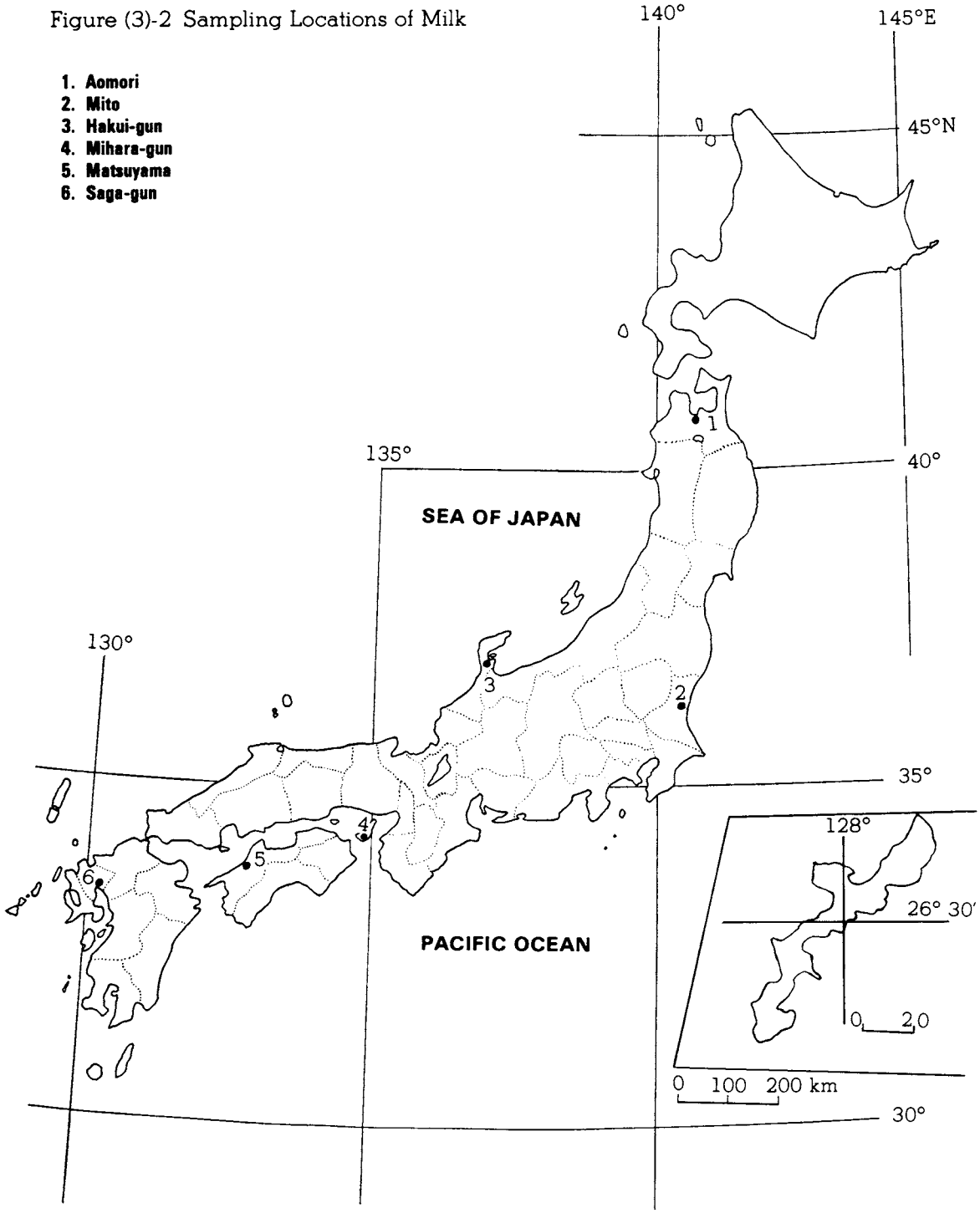
(3)-2 Strontium-90 and Cesium-137 in Mik (producing districts for domestic program) (from Jun. 1983 to Sept. 1983)

—continued from NO. 67 of this publication—

Table (3)-2: Strontium-90 and Cesium-137 in Milk

Location	Component			^{90}Sr		^{137}Cs	
	Ash (g/ℓ)	Ca (g/ℓ)	K (g/ℓ)	pCi/ℓ	S.U.	pCi/ℓ	C.U
October, 1983							
Saga-gun, SAGA	7.32	1.12	1.56	0.9±0.24	0.8±0.22	1.9±0.24	1.2±0.15
February, 1984							
Aomori, AOMORI	7.49	1.13	1.68	2.8±0.30	2.5±0.26	1.8±0.23	1.0±0.14
Mito, IBARAGI	7.66	1.27	1.64	1.0±0.23	0.8±0.18	0.5±0.21	0.3±0.12
Hakui-gun, ISHIKAWA	7.69	1.25	1.60	1.3±0.24	1.1±0.19	0.2±0.19	0.2±0.12
Mihara-gun, HYOGO	7.18	1.15	1.57	0.7±0.19	0.6±0.16	0.5±0.17	0.3±0.11
Matsuyama, EHIME	7.62	1.17	1.50	1.3±0.23	1.1±0.20	1.3±0.21	0.8±0.14

Figure (3)-2 Sampling Locations of Milk



(3)-3 Strontium-90 and Cesium-137 in Milk (consuming districts) (from May. 1983 to may. 1984)

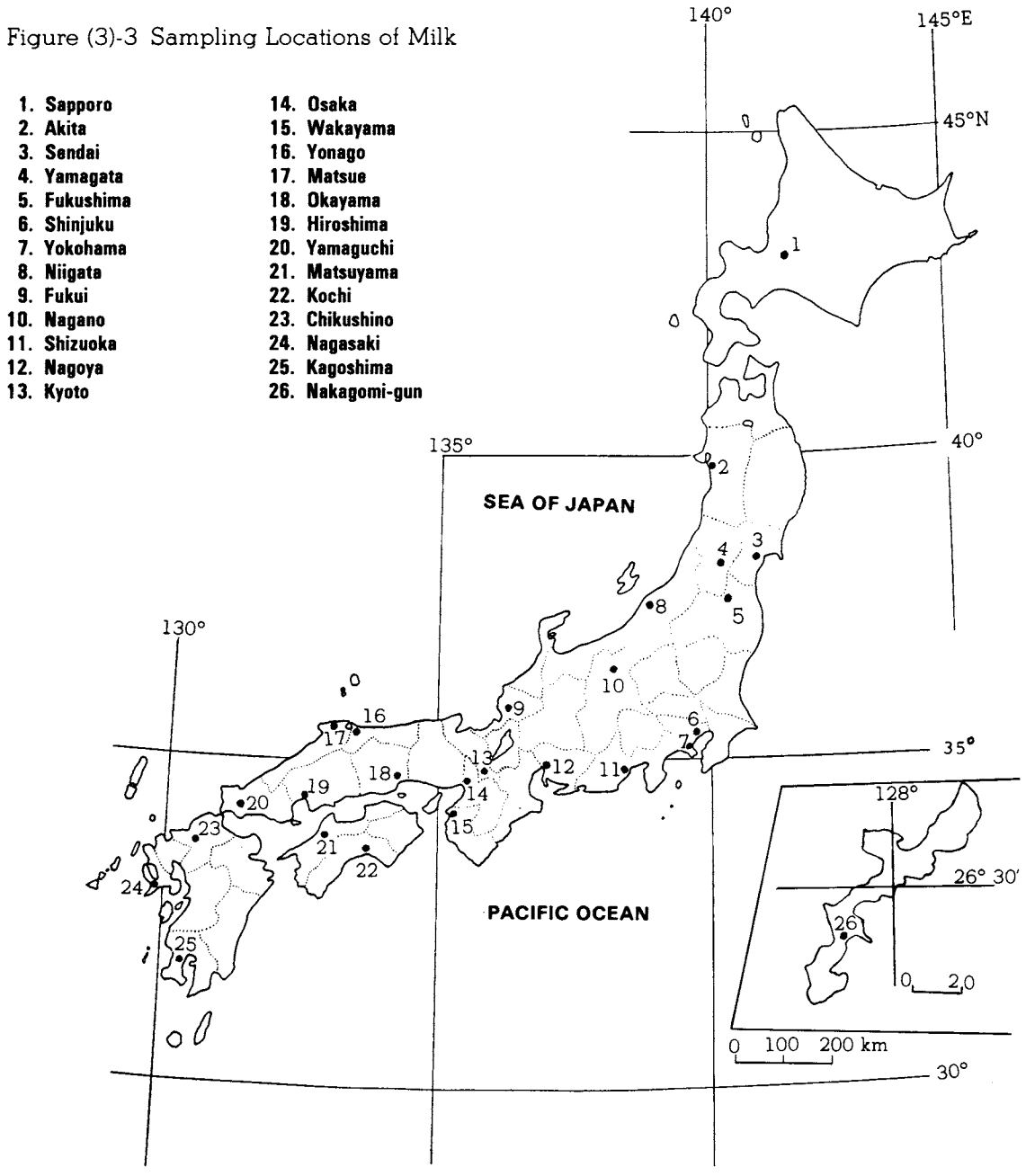
—continued from NO. 67 of this publication—

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

Location	Component			^{90}Sr		^{137}Cs	
	Ash (g/ℓ)	Ca (g/ℓ)	K (g/ℓ)	pCi/ℓ	S.U.	pCi/ℓ	C.U
May, 1983							
Fukushima, FUKUSHIMA	7.24	1.09	1.55	2.3±0.30	2.1±0.28	1.8±0.27	1.2±0.18
August, 1983							
Matsue, SHIMANE	6.77	1.02	1.52	1.3±0.22	1.2±0.21	1.0±0.19	0.7±0.12
September, 1983							
Sendai, MIYAGI	7.33	1.09	1.63	1.1±0.25	1.0±0.23	1.9±0.24	1.2±0.15
Wakayama, WAKAYAMA	5.53	0.819	1.15	1.1±0.17	1.3±0.21	1.4±0.18	1.2±0.16
October, 1983							
Kyoto, KYOTO	7.00	1.08	1.53	1.4±0.26	1.3±0.24	0.9±0.21	0.6±0.14
December, 1983							
Nakagami-gun, OKINAWA	6.22	0.987	1.28	0.5±0.20	0.5±0.21	0.6±0.16	0.4±0.13
January, 1984							
Akita, AKITA	7.14	1.13	1.57	1.8±0.25	1.6±0.22	2.0±0.24	1.3±0.15
Fukushima, FUKUSHIMA	7.27	1.15	1.57	1.2±0.26	1.1±0.22	2.9±0.30	1.9±0.19
Yokohama, KANAGAWA	7.19	1.11	1.52	0.8±0.24	0.7±0.22	0.8±0.17	0.6±0.11
Osaka, OSAKA	7.31	1.18	1.50	1.1±0.24	1.0±0.20	1.2±0.17	0.8±0.11
Matsue, SHIMANE	7.19	1.14	1.50	1.2±0.25	1.1±0.22	1.5±0.18	1.0±0.12
Hiroshima, HIROSHIMA	6.85	1.08	1.47	0.8±0.22	0.7±0.20	0.8±0.20	0.6±0.14
February, 1984							
Sapporo, HOKKAIDO	7.24	1.15	1.52	1.8±0.25	1.5±0.21	2.7±0.25	1.8±0.16
Yamagata, YAMAGATA	7.31	1.17	1.60	1.0±0.22	0.9±0.19	0.8±0.20	0.5±0.12
Shinjuku, Tokyo	7.22	1.09	1.36	1.1±0.23	1.0±0.21	2.4±0.25	1.8±0.18
Niigata, NIIGATA	7.85	1.15	1.56	1.1±0.24	0.9±0.21	2.0±0.26	1.3±0.16
Fukui, FUKUI	7.35	1.15	1.55	1.1±0.26	1.0±0.23	1.5±0.22	1.0±0.14
Nagano, NAGANO	7.18	1.15	1.51	0.9±0.25	0.8±0.22	0.7±0.18	0.5±0.12
Shizuoka, SHIZUOKA	7.10	1.08	1.51	0.9±0.21	0.8±0.20	1.3±0.18	0.8±0.12
Nagoya, AICHI	7.13	1.15	1.46	1.2±0.23	1.1±0.20	0.6±0.13	0.4±0.09
Wakayama, WAKAYAMA	6.41	1.05	1.32	0.7±0.20	0.6±0.19	0.3±0.11	0.3±0.09
Yonago, TOTTORI	7.35	1.20	1.51	1.2±0.24	1.0±0.20	3.3±0.25	2.2±0.17
Okayama, OKAYAMA	6.90	1.11	1.43	0.9±0.22	0.8±0.20	0.7±0.14	0.5±0.10
Yamaguchi, YAMAGUCHI	7.26	1.10	1.64	0.8±0.21	0.8±0.19	0.9±0.21	0.6±0.13
Matsuyama, EHIME	7.99	1.16	1.59	1.0±0.24	0.9±0.21	1.0±0.21	0.7±0.14
Kochi, KOCHI	7.27	1.15	1.53	1.3±0.24	1.1±0.20	1.0±0.21	0.6±0.14
Chikusino, FUKUOKA	7.31	1.15	1.58	1.0±0.23	0.9±0.20	2.1±0.24	1.3±0.15

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/Kg)	K (g/Kg)	pCi/Kg	S.U.	pCi/Kg	C.U
Nagasaki, Nagasaki	6.66	1.04	1.49	0.7±0.20	0.6±0.19	1.9±0.22	1.3±0.14
Kagoshima, KAGOSHI	7.09	1.11	1.50	0.9±0.22	0.8±0.20	1.9±0.23	1.3±0.15
May, 1984							
Sendai, MIYAGI	7.51	1.08	1.59	0.6±0.25	0.5±0.23	1.1±0.19	0.7±0.12
Kyoto, KYOTO	7.10	1.06	1.51	0.9±0.23	0.9±0.22	0.4±0.15	0.2±0.10

Figure (3)-3 Sampling Locations of Milk



(3)-4 Strontium-90 and Cesium-137 in Milk (Powderd milk)

—continued from NO. 67 of this publication—

Table (3)-4: Strontium-90 and Cesium-137 in Milk

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/Kg)	K (g/Kg)	pCi/Kg	S.U.	pCi/Kg	C.U
May, 1984							
Yukijirushi	2.55	3.72	5.28	3.4±0.39	0.9±0.11	14.0±0.60	2.7±0.11
Wakodo	2.53	3.90	5.14	2.0±0.34	0.5±0.09	5.1±0.41	1.0±0.08
Meiji	2.64	4.14	5.99	5.1±0.45	1.2±0.11	17.0±0.70	2.8±0.11
Morinaga	2.47	3.61	5.43	3.2±0.37	0.9±0.10	0.9±0.45	1.3±0.08
*Meiji	8.04	12.7	17.1	36.0±1.3	2.9±0.10	190.0±2.0	11.0±0.10
*Morinaga	8.17	13.0	17.6	20.0±1.0	1.5±0.08	18.0±0.8	1.0±0.05

*Skim milk

(4)-1 Strontium-90 and Cesium-137 in Vegetables(producing districts) (from Nov. 1983 to Mar. 1984)

—continued from NO. 67 of this publication—

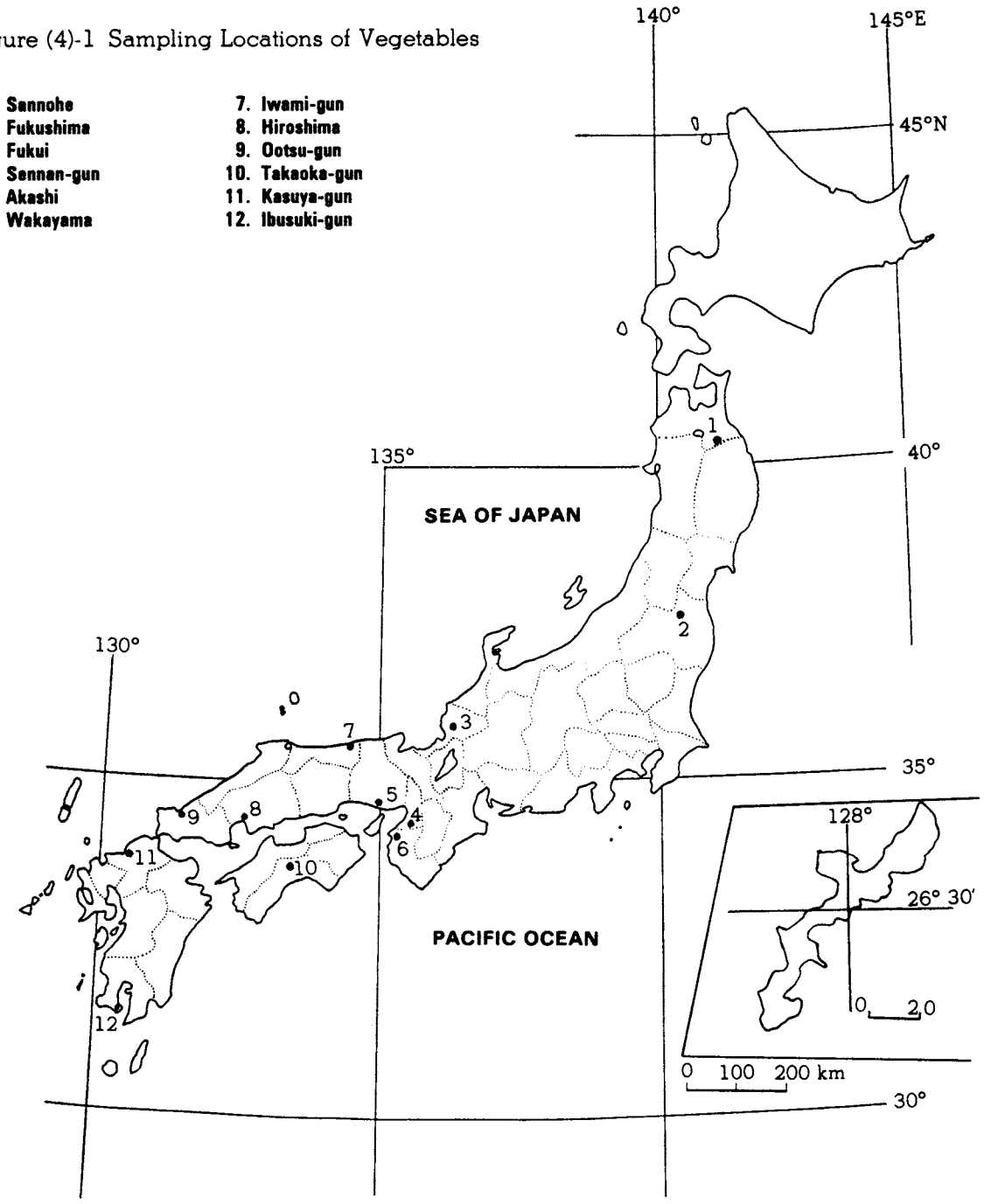
Table(4)-1: Strontium-90 and Cesium-137 in Vegetables

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Japanese Radish)							
November, 1983							
Sannohe, AOMORI	0.529	0.268	2.22	7.2±0.35	27.0±1.30	0.5±0.14	0.20±0.06
Kasuya-gun, FUKUOKA	0.523	0.358	2.04	4.3±0.29	12.0±0.80	0.30±0.13	0.10±0.06
December, 1983							
Fukushima, FUKUSHIMA	0.552	0.239	2.31	3.6±0.27	15.0±1.10	0.3±0.13	0.10±0.06
Iwami-gun, TOTTORI	0.599	0.256	2.50	8.8±0.42	34.0±1.60	0.1±0.10	0.05±0.04
January, 1984							
Takaoka-gun, KOCHI	0.488	0.329	2.06	19.0±0.60	59.0±1.70	0.3±0.10	0.10±0.05
February, 1984							
Ootsu-gun, YAMAGUCHI	0.595	0.411	2.32	9.1±0.44	22.0±1.10	0.2±0.14	0.10±0.06
March, 1984							
Hiroshima, HIROSHIMA	0.450	0.234	1.83	2.3±0.21	9.6±0.91	0.5±0.12	0.30±0.07
(Spinach)							
November, 1983							
Fukui, FUKUI	2.210	0.547	9.38	12.0±0.60	22.0±1.10	0.90±0.27	0.10±0.03
Kasuya-gun, FUKUOKA	1.630	0.956	6.77	9.0±0.54	9.5±0.57	0.70±0.23	0.10±0.03
Ibusuki-gun, KAGOSHIMA	2.030	0.902	7.16	5.3±0.52	5.8±0.58	1.60±0.26	0.20±0.04
December, 1983							
Fukushima, FUKUSHIMA	1.800	0.609	7.88	3.1±0.37	5.0±0.60	0.20±0.15	0.02±0.02
January, 1984							
Takaoka-gun, KOCHI	1.940	0.910	6.63	19.0±0.80	21.0±0.90	0.70±0.25	0.10±0.04
February, 1984							
Akashi, HYOGO	1.750	0.880	5.10	4.2±0.41	4.7±0.46	1.2±0.20	0.20±0.04
Ootsu, YAMAGUCHI	1.570	0.594	6.60	11.0±0.80	18.0±1.30	0.4±0.27	0.10±0.04
March, 1984							
Hiroshima, HIROSHIMA	1.270	0.510	5.07	0.9±0.30	1.8±0.59	0.5±0.24	0.10±0.05
(Cabbage)							
November, 1983							
Sannohe, AOMORI	0.584	0.334	2.44	9.2±0.43	28.0±1.30	0.5±0.15	0.20±0.06
February, 1984							
Sennan-gun, OSAKA	0.698	0.299	2.90	2.2±0.29	7.2±0.98	0.1±0.18	0.03±0.06

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Chinese Cabbage)							
December, 1983							
Wakayama, WAKAYAMA	0.889	0.994	2.91	5.4±0.45	5.4±0.46	0.4±0.16	0.10±0.06

Figure (4)-1 Sampling Locations of Vegetables

1. **Sannohe**
2. **Fukushima**
3. **Fukui**
4. **Sennan-gun**
5. **Akashi**
6. **Wakayama**
7. **Iwami-gun**
8. **Hiroshima**
9. **Ootsu-gun**
10. **Takaoka-gun**
11. **Kasuya-gun**
12. **Ibusuki-gun**



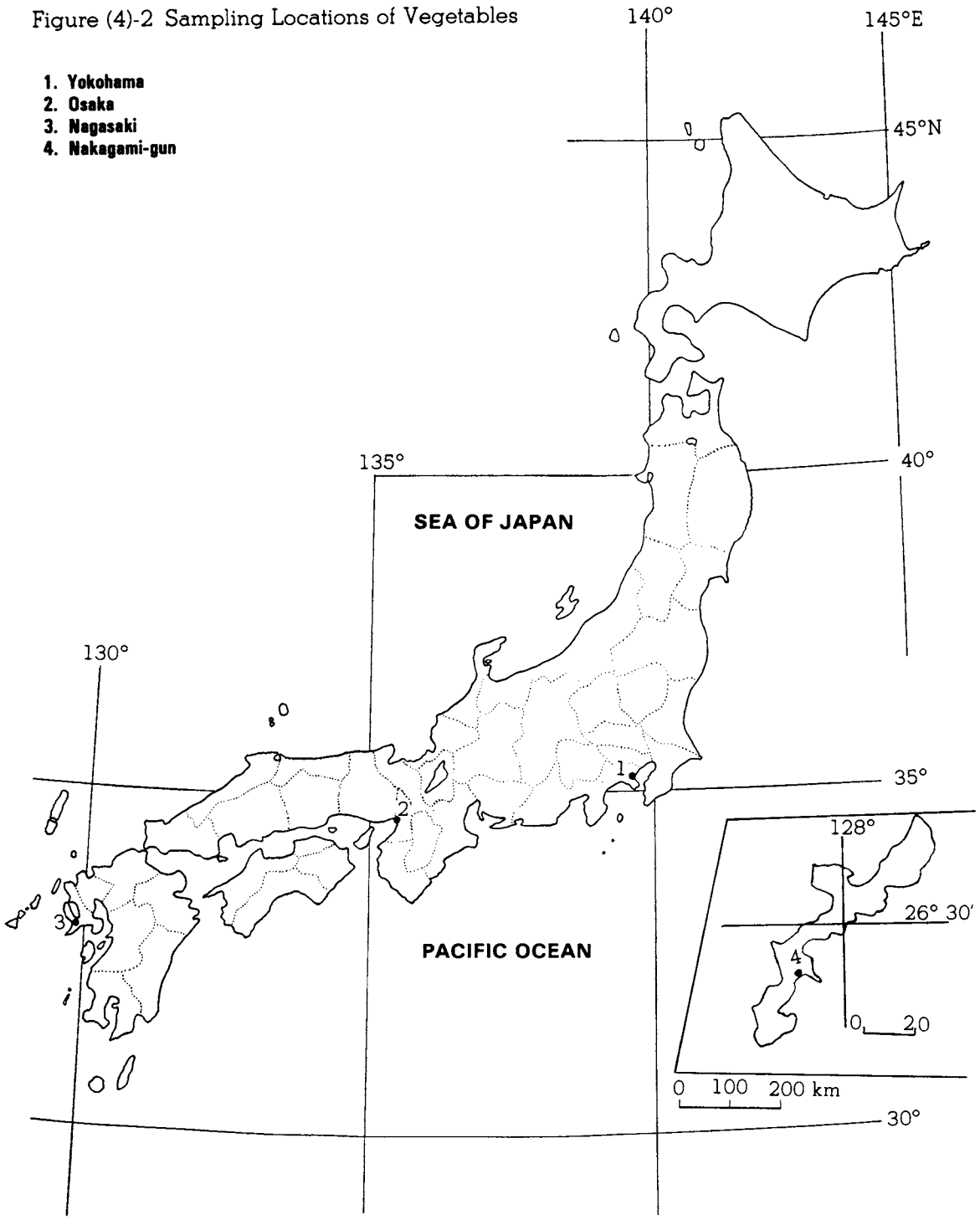
(4)-2 Strontium-90 and Cesium-137 in Vegetables(consuming districts) (from Nov. 1983 to Feb. 1984)

—continued from NO. 67 of this publication—

Table(4)-2: Strontium-90 and Cesium-137 in Vegetables

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Japanese radish)							
December, 1983 Nakagami-gun, OKINAWA	0.721	0.264	2.65	2.8±0.34	11.0±1.3	0.00±0.10	0.00±0.04
January, 1984 Nagasaki, NAGASAKI	0.517	0.302	2.10	6.9±0.36	23.0±1.2	0.30±0.13	0.10±0.06
February, 1984 Yokohama, KANAGAWA	0.378	0.233	1.43	1.1±0.18	4.9±0.79	0.40±0.13	0.30±0.09
(Spinach)							
November, 1983 Osaka, OSAKA	2.430	0.680	10.50	2.4±0.36	3.6±0.53	0.50±0.29	0.10±0.03
December, 1983 Nakagami-gun, OKINAWA	1.580	0.614	6.14	1.5±0.30	2.4±0.49	0.00±0.11	0.00±0.02
January, 1984 Nagasaki, NAGASAKI	1.900	0.631	7.91	0.8±0.29	1.3±0.47	0.20±0.25	0.03±0.03
February, 1984 Yokohama, KANAGAWA	1.620	0.460	6.78	4.1±0.39	9.0±0.84	0.40±0.16	0.10±0.02

Figure (4)-2 Sampling Locations of Vegetables



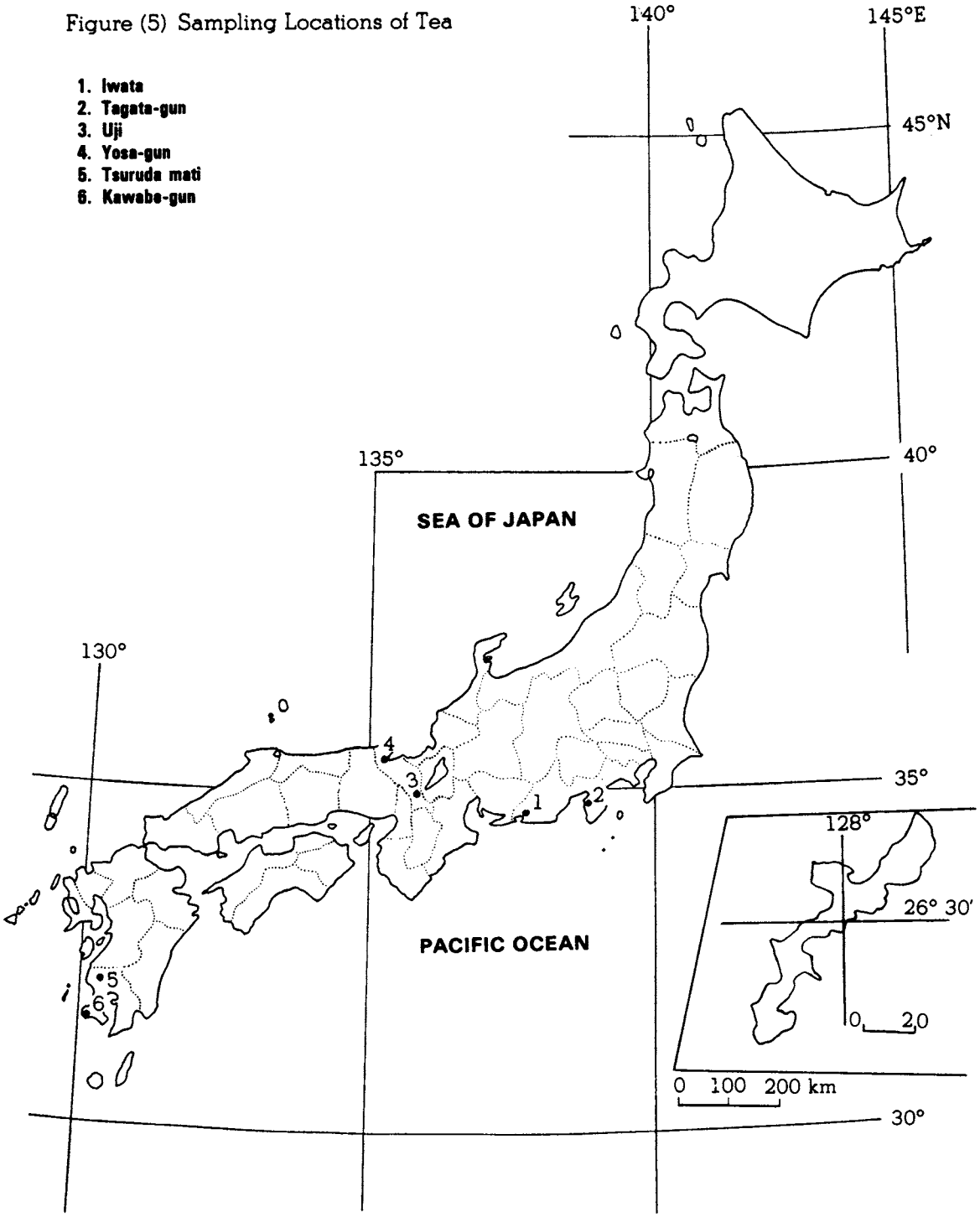
(5) Strontium-90 and Cesium-137 in Tea(Japanese tea)

—continued from NO. 67 of this publication—

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

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
June, 1984							
Iwata, SHIZUOKA	5.10	3.05	19.8	33±2.6	11.0±0.8	11.0±1.40	0.5±0.07
Tagata-gun, SHIZUOKA	5.18	4.62	15.9	81±3.8	18.0±0.8	16.0±1.60	1.0±0.10
Uji, KYOTO	5.20	2.63	18.9	52±3.0	20.0±1.2	4.6±0.96	0.2±0.05
Yosa-gun, KYOTO	4.97	4.01	14.3	88±3.7	22.0±0.9	26.0±1.80	1.8±0.13
Tsuruda-mati, KAGOSHIMA	5.33	2.65	20.2	28±2.7	10.0±1.0	39.0±2.40	1.9±0.12
Kawabe-gun, KAGOSHIMA	5.15	2.48	20.5	26±2.4	11.0±1.0	99.0±3.60	4.8±0.18

Figure (5) Sampling Locations of Tea



(6) Strontium-90 and Cesium-137 in Sea fish (from Nov. 1983 to June. 1984)

—continued from NO. 67 of this publication—

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

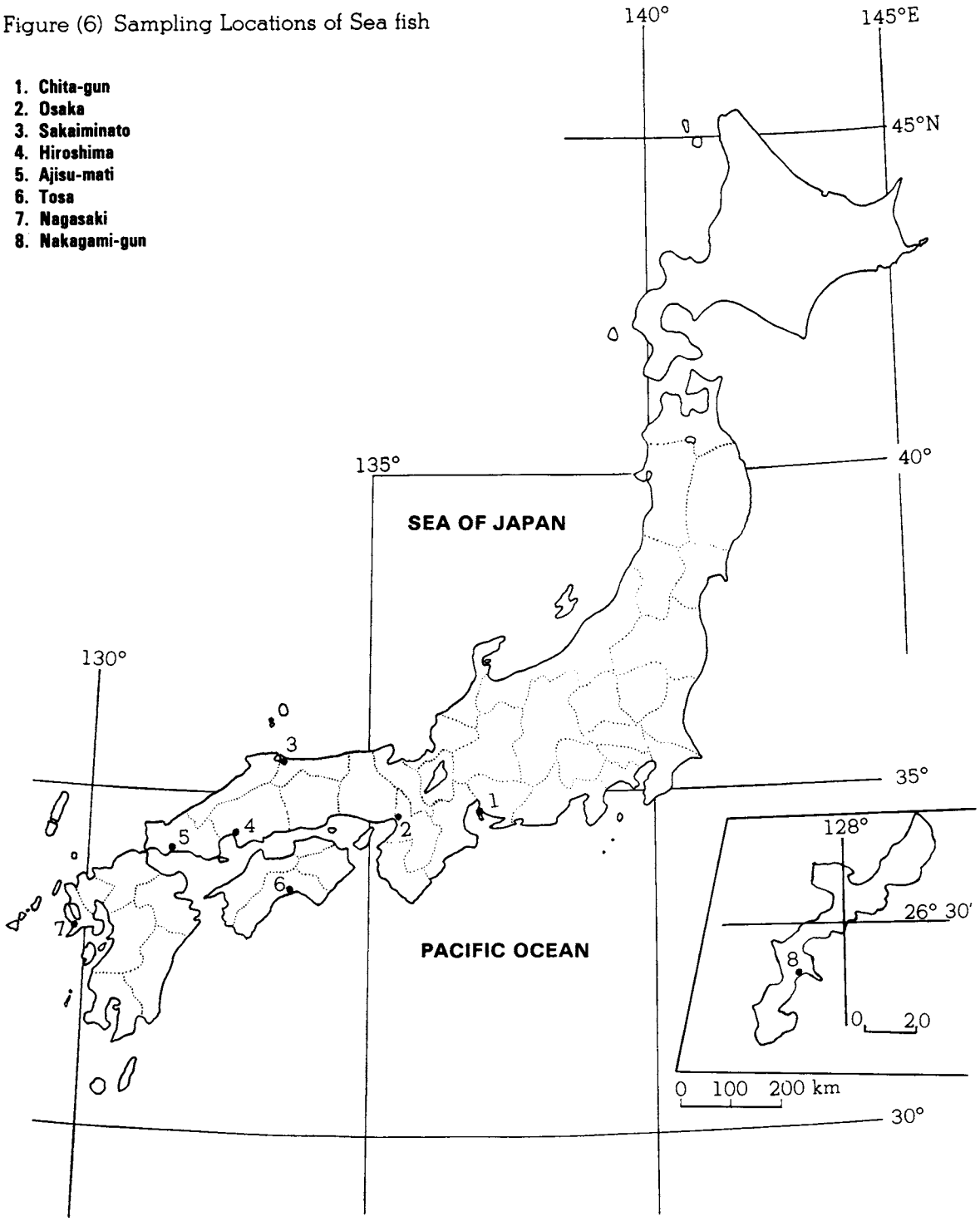
Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Branchiostegus sp.) December, 1983 Nagasaki, NAGASAKI	1.220	0.979	3.41	0.0±0.26	0.0 ±0.27	8.2±0.52	2.4±0.15
(Katsuwonus pelamis) May, 1984 Tosa, KOCHI	1.290	0.162	4.08	0.0±0.33	0.0 ±2.00	14.0±0.60	3.4±0.14
(Limanda herzensteini) February, 1984 Hiroshima, HIROSHIMA	3.510	7.31	3.49	1.0±0.24	0.1 ±0.03	3.6±0.30	1.0±0.08
(Sillago sihama) June, 1984 Chita-gun, AICHI	3.420	9.23	3.56	0.6±0.29	0.1 ±0.03	3.4±0.32	0.9±0.09
(Pneumatophorus japonicus) November, 1983 Osaka, OSAKA	0.978	0.137	3.15	0.1±0.23	0.0 ±1.70	7.0±0.41	2.2±0.13
January, 1984 Sakaiminato, TOTTORI	1.280	0.892	3.40	0.2±0.21	0.2 ±0.24	7.5±0.41	2.2±0.12
(Caesio chrysozonus cuvier) December, 1983 Nakagami-gun, OKINAWA	4.330	11.400	3.97	0.9±0.26	0.1 ±0.02	5.6±0.37	1.4±0.09
(Sebastes Inermis) April, 1984 Ajisu-mati, YAMAGUCHI	5.200	11.300	3.64	1.0±0.25	0.1 ±0.02	5.9±0.41	1.6±0.11

Sea fish

Japanese name	English name	Scientific name
Amadai	Tile fish	Branchiostegus sp.
Katsuo	Bonito	Katsuwonus pelamis
Karei	Flatfish	Limanda herzensteini
Kiss	Sillago	Sillago sihama
Saba	Common mackerel	Pneumatophorus japonicus
Takasago	Takasago	Caesio chrysozonus cuvier
Mebaru	Black Rochfish	Sebastes Inermis

Figure (6) Sampling Locations of Sea fish

1. **Chita-gun**
2. **Osaka**
3. **Sakaiminato**
4. **Hiroshima**
5. **Ajisu-mati**
6. **Tosa**
7. **Nagasaki**
8. **Nakagami-gun**



(7) Strontium-90 and Cesium-137 in Shellfish (from Feb. 1984 to Jul. 1984)

—continued from NO. 67 of this publication—

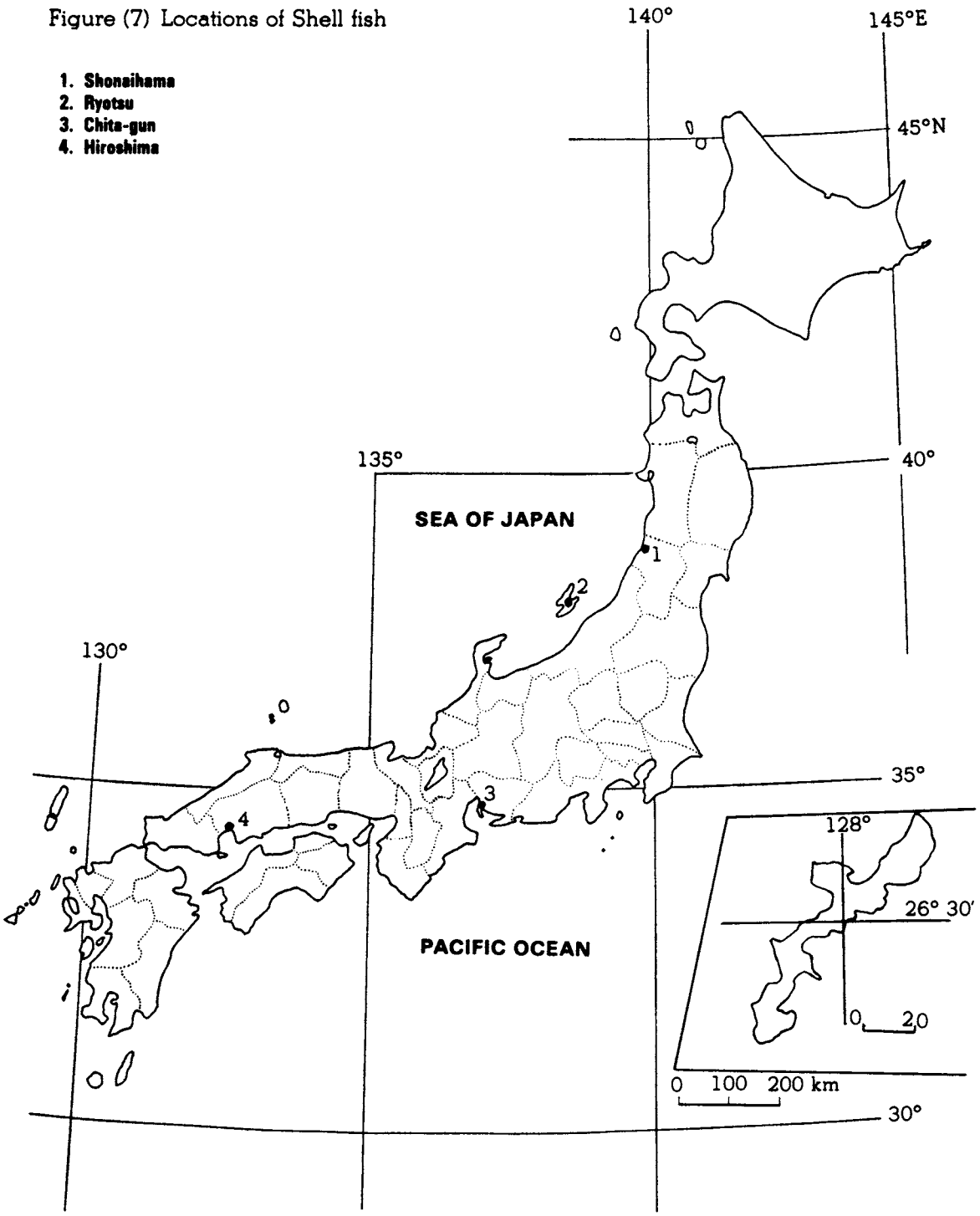
Table(7): Strontium-90 and Cesium-137 in Shellfish

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Saxidomuspurpuratus) June, 1984 Chita-gun, AICHI	1.55	0.346	2.28	0.0±0.39	0.0±1.10	0.8±0.32	0.4±0.14
(Ostrea gigas) February, 1984 Hiroshima, HIROSHIMA	1.70	0.843	2.34	0.5±0.47	0.6±0.55	1.2±0.34	0.5±0.15
(Gomphina melanaegis) July, 1984 Shonaihama, YAMAGATA	1.00	0.819	1.62	0.0±0.57	0.0±0.69	0.7±0.37	0.4±0.23
(Turbo cornutus) May, 1984 Ryotsu, NIIGATA	2.36	0.750	2.39	0.0±0.94	0.0±1.30	0.9±0.56	0.4±0.24

Japanese name	English name	Scientific name
Ohasari		Saxidomuspurpuratus
Kaki	Oyster	Ostrea gigas
Kodamagai	Aclam	Gomphina melanaegis
Sazae	Wreath shell	Turbo cornutus

Figure (7) Locations of Shell fish

1. Shonaihama
2. Ryotsu
3. Chita-gun
4. Hiroshima



(8) Strontium-90 and Cesium-137 in Seaweeds (from Feb. 1984 to Jun. 1984)

—continued from NO. 67 of this publication—

Table(8): Strontium-90 and Cesium-137 in Seaweeds

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Undaria pinnatifida)							
February, 1984							
Chita-gun, AICHI	1.72	0.522	5.26	0.9±0.23	1.8±0.45	0.6±0.16	0.1±0.03
Hiroshima, HIROSHIMA	1.71	0.462	3.31	0.9±0.25	1.9±0.54	0.9±0.19	0.3±0.06
Shimabara, NAGASAKI	2.18	0.730	6.73	1.2±0.28	1.6±0.38	0.9±0.19	0.1±0.03
April, 1984							
Hakui-gun, ISHIKAWA	1.66	0.809	3.98	1.4±0.28	1.8±0.35	0.9±0.18	0.2±0.05
May, 1984							
Ryotsu, NIIGATA	3.72	1.19	6.79	1.0±0.40	0.8±0.34	1.6±0.23	0.2±0.03
June, 1984							
Sakata, YAMAGATA	1.22	0.987	2.17	1.4±0.27	1.5±0.27	0.5±0.16	0.2±0.07

Japanese name	English name	Scientific name
Wakame	Wakame seaweed	Undaria pinnatifida

Figure (8) Sampling Locations of Seaweeds

1. **Sakata**
2. **Ryotsu**
3. **Hakui-gun**
4. **Chita-gun**
5. **Hiroshima**
6. **Shimabara**