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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 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, 100ℓ 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 constant 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 transferred 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 (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 (harvesting 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 hydrochloric 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 sediments

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 strontium-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 ontamination by rubidium-87 was not negligible for the measurement of cesium-137, the following 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 efficiency, recovery, self-absorption and decay to obtain the content of strontium-90 and cesium-137 radio activity 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. 1984 to Jul. 1985)

– continued from No. 71 of this publication –

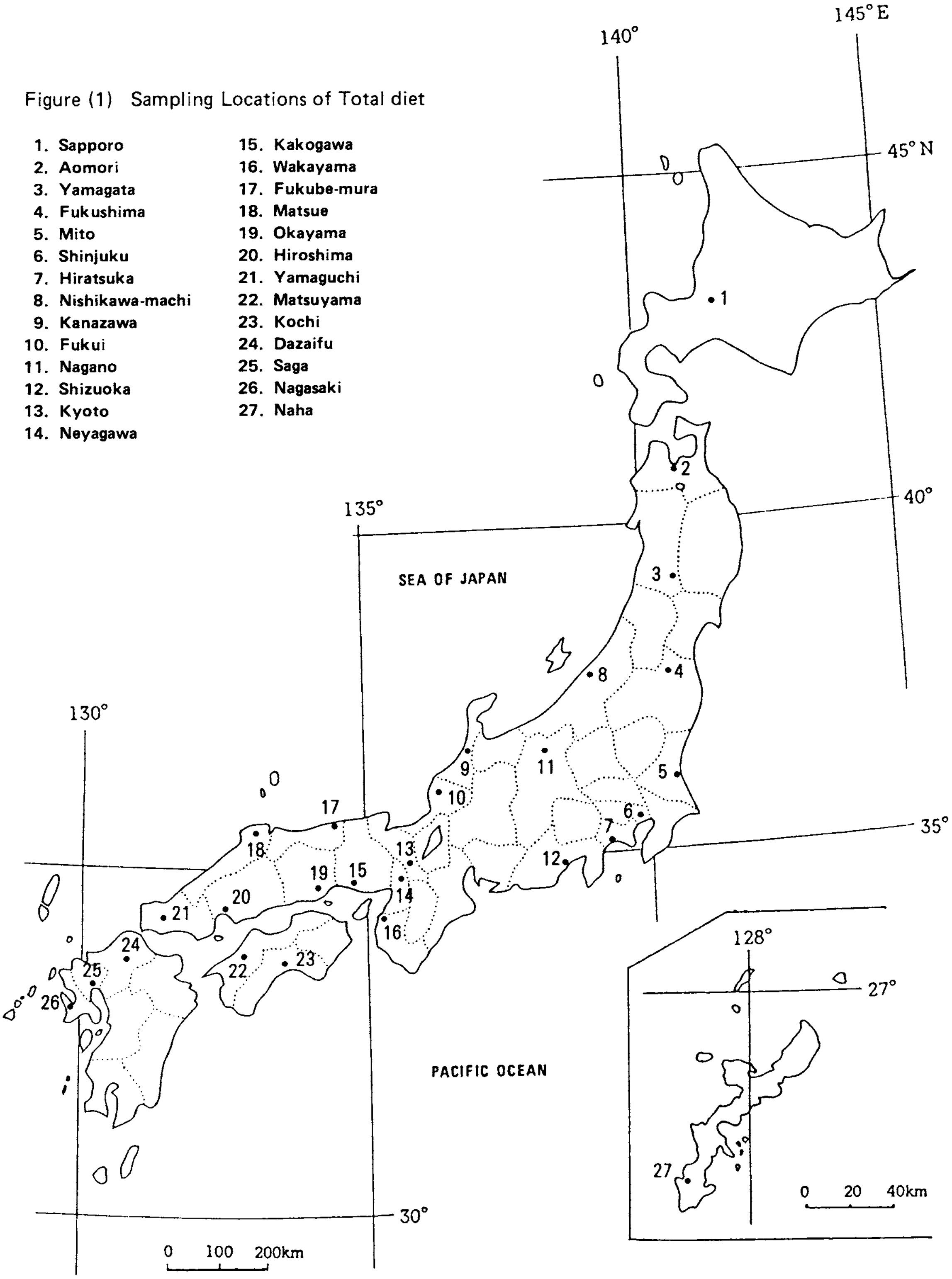
Table (1): Strontium-90 and Cesium-137 in Total diet

Location	Ash	Ca	K	^{90}Sr		^{137}Cs	
	g/p·d	mg/p·d	mg/p·d	PCi/p·d	S.U.	PCi/p·d	C.U.
October, 1984							
Matsue, SHIMANE	19.6	764	2500	3.8 ± 0.44	5.0 ± 0.57	4.1 ± 0.36	1.6 ± 0.14
November, 1984							
Shizuoka, SHIZUOKA	16.2	692	2390	2.5 ± 0.33	3.6 ± 0.47	2.3 ± 0.27	1.0 ± 0.11
Fukube-mura, TOTTORI	12.6	320	1710	3.2 ± 0.32	10 ± 1.0	1.6 ± 0.18	0.9 ± 0.11
Dazaifu, FUKUOKA	13.6	430	1700	1.9 ± 0.27	4.4 ± 0.62	1.5 ± 0.19	0.9 ± 0.11
Nagasaki, NAGASAKI	14.4	547	1940	2.9 ± 0.33	5.4 ± 0.60	3.5 ± 0.27	1.8 ± 0.14
December, 1984							
Aomori, AOMORI	15.5	518	2010	1.4 ± 0.27	2.7 ± 0.51	2.0 ± 0.25	1.0 ± 0.12
Shinjuku, TOKYO	12.0	470	1620	1.9 ± 0.24	4.0 ± 0.50	3.3 ± 0.24	2.0 ± 0.15
Hiratsuka, KANAGAWA	15.2	562	2160	1.5 ± 0.26	2.6 ± 0.47	2.2 ± 0.23	1.0 ± 0.11
Kanazawa, ISHIKAWA	20.7	646	2280	3.0 ± 0.41	4.7 ± 0.63	3.4 ± 0.34	1.5 ± 0.15
Kyoto, KYOTO	17.0	644	2200	2.1 ± 0.34	3.3 ± 0 53	1.4 ± 0.25	0.6 ± 0.11
Neyagawa, OSAKA	18.8	680	2510	2.8 ± 0.37	4.2 ± 0.55	2.1 ± 0.28	0.8 ± 0.11
Kakogawa, HYOGO	13.4	694	1940	2.0 ± 0.26	2.8 ± 0.37	1.8 ± 0.21	0.9 ± 0.11
Hiroshima, HIROSHIMA	11.6	457	1330	2.1 ± 0.25	4.7 ± 0.54	1.8 ± 0.18	1.4 ± 0.14
January, 1985							
Yamagata, YAMAGATA	15.9	536	1980	2.7 ± 0.32	5.1 ± 0.60	2.0 ± 0.24	1.0 ± 0.12
Fukushima, FUKUSHIMA	20.8	862	2160	3.3 ± 0.41	3.8 ± 0.47	4.9 ± 0.40	2.3 ± 0.18
Yamaguchi, YAMAGUCHI	19.8	798	2530	3.3 ± 0.41	4.1 ± 0.51	3.6 ± 0.34	1.4 ± 0.14
Naha, OKINAWA	13.9	479	2190	2.7 ± 0.35	5.5 ± 0.72	1.2 ± 0.22	0.5 ± 0.10
May, 1985							
Wakayama, WAKAYAMA	9.50	531	1100	1.2 ± 0.17	2.2 ± 0.32	0.8 ± 0.12	0.7 ± 0.11

Location	Ash	Ca	K	^{90}Sr		^{137}Cs	
	g/p·d	mg/p·d	mg/p·d	pCi/p·d	S.U.	pCi/p·d	C.U.
June, 1985							
Sapporo, HOKKAIDO	19.1	565	2290	3.3 ± 0.37	5.8 ± 0.66	3.7 ± 0.32	1.6 ± 0.14
Yamagata, YAMAGATA	18.3	638	2010	2.4 ± 0.34	3.8 ± 0.52	3.5 ± 0.33	1.7 ± 0.16
Mito, IBARAGI	17.0	599	2320	2.5 ± 0.32	4.2 ± 0.54	1.5 ± 0.22	0.6 ± 0.09
Nishikawa-machi, NIIGATA	20.3	651	2430	4.5 ± 0.43	6.9 ± 0.67	1.9 ± 0.25	0.8 ± 0.10
Kanazawa, ISHIKAWA	18.1	661	2420	3.0 ± 0.35	4.5 ± 0.53	1.8 ± 0.24	0.7 ± 0.10
Fukui, FUKUI	14.8	933	1830	2.8 ± 0.35	3.0 ± 0.38	1.6 ± 0.23	0.9 ± 0.13
Nagano, NAGANO	18.5	612	2380	1.6 ± 0.30	2.7 ± 0.49	1.9 ± 0.24	0.8 ± 0.10
Shizuoka, SHIZUOKA	17.5	1120	2500	2.7 ± 0.32	2.4 ± 0.29	1.5 ± 0.21	0.6 ± 0.09
Kyoto, KYOTO	16.1	765	2250	1.9 ± 0.29	2.5 ± 0.38	1.1 ± 0.21	0.5 ± 0.10
Kakogawa, HYOGO	12.0	509	1700	1.8 ± 0.23	3.6 ± 0.45	1.0 ± 0.16	0.6 ± 0.09
Fukube-mura, TOTTORI	12.7	531	1700	2.8 ± 0.28	5.2 ± 0.52	2.0 ± 0.20	1.2 ± 0.12
Okayama, OKAYAMA	17.2	521	2180	2.1 ± 0.33	4.1 ± 0.61	1.0 ± 0.19	0.5 ± 0.09
Matsuyama, EHIME	16.5	790	1810	1.5 ± 0.28	1.9 ± 0.35	1.7 ± 0.22	0.9 ± 0.12
Kochi, KOCHI	15.0	453	1790	2.4 ± 0.30	5.3 ± 0.66	1.0 ± 0.18	0.6 ± 0.10
Saga, SAGA	11.8	376	1850	2.0 ± 0.24	5.3 ± 0.63	1.3 ± 0.16	0.7 ± 0.09

Figure (1) Sampling Locations of Total diet

1. Sapporo
2. Aomori
3. Yamagata
4. Fukushima
5. Mito
6. Shinjuku
7. Hiratsuka
8. Nishikawa-machi
9. Kanazawa
10. Fukui
11. Nagano
12. Shizuoka
13. Kyoto
14. Neyagawa
15. Kakogawa
16. Wakayama
17. Fukube-mura
18. Matsue
19. Okayama
20. Hiroshima
21. Yamaguchi
22. Matsuyama
23. Kochi
24. Dazaifu
25. Saga
26. Nagasaki
27. Naha



(2)-1 Strontium-90 and Cesium-137 in Rice (producing districts) (from Sep. 1984 to Jan. 1985)

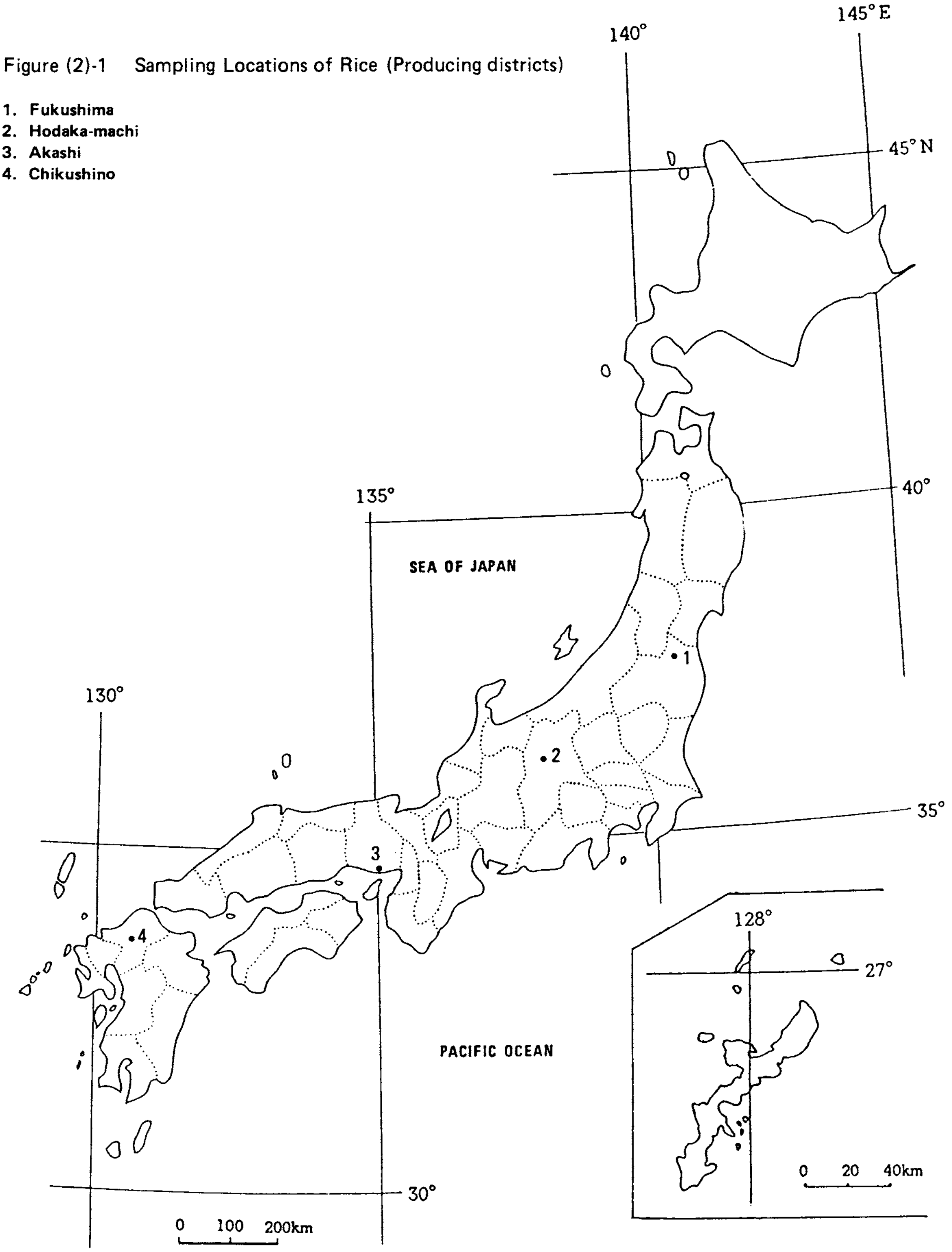
– continued from No. 71 of this publication –

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.
September							
Hodaka-machi, NAGANO	0.474	0.059	0.715	0.3 ± 0.22	5 ± 3.8	0.2 ± 0.19	0.2 ± 0.27
December							
Fukushima, FUKUSHIMA	0.592	0.060	0.976	0.3 ± 0.23	4 ± 3.7	0.9 ± 0.26	1.0 ± 0.26
Chikushino, FUKUOKA	0.498	0.056	1.070	0.1 ± 0.24	2 ± 4.3	0.4 ± 0.20	0.4 ± 0.19
January, 1985							
Akashi, HYOGO	0.394	0.057	0.831	0.2 ± 0.19	4 ± 3.3	0.3 ± 0.17	0.4 ± 0.21

Figure (2)-1 Sampling Locations of Rice (Producing districts)

1. Fukushima
2. Hodaka-machi
3. Akashi
4. Chikushino



(2)-2 Strontium-90 and Cesium-137 in Rice (consuming districts) (from Nov. 1984 to Jan. 1985)

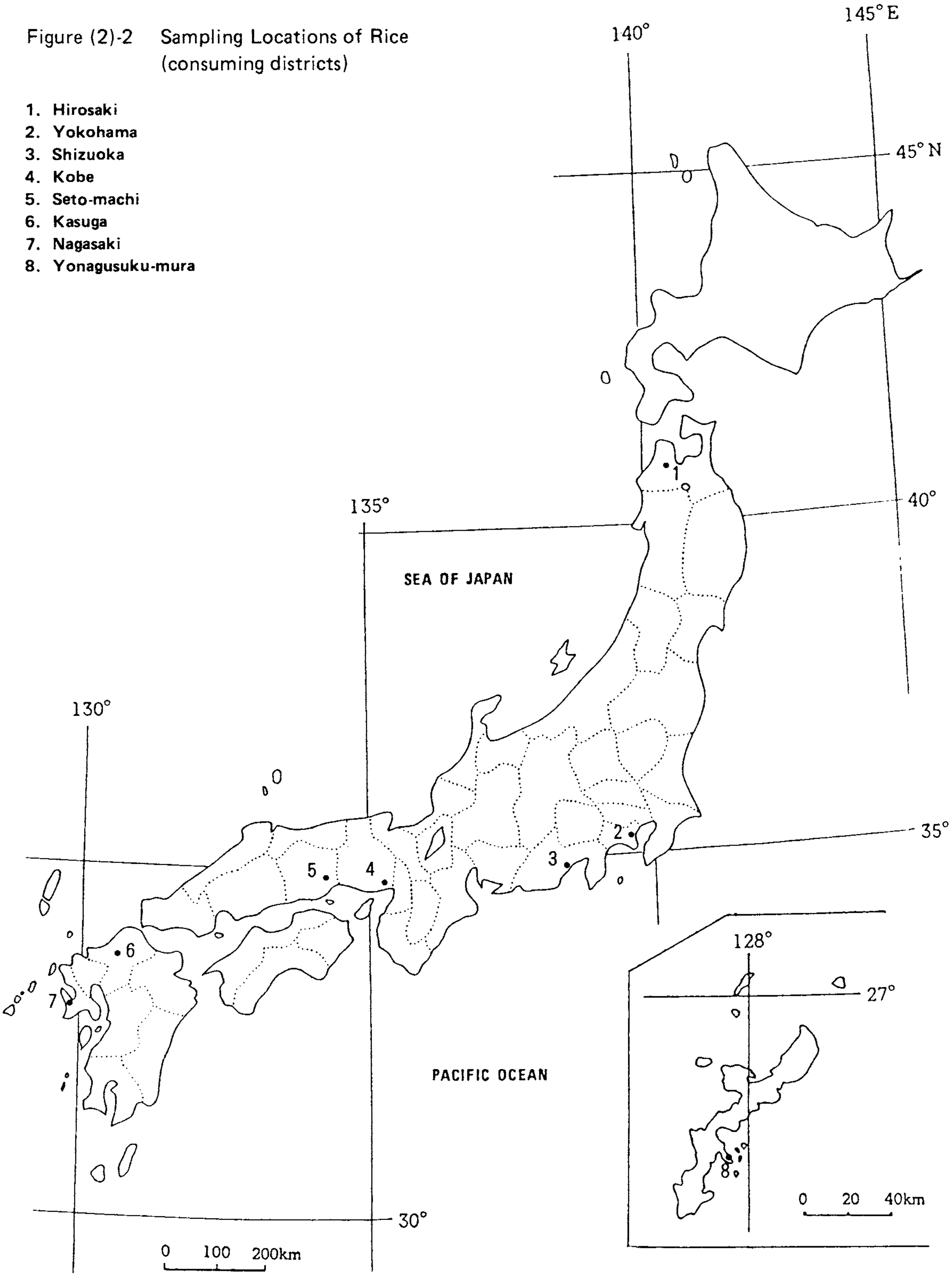
— continued from No. 71 of this publication —

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, 1984							
Yokohama, KANAGAWA	0.352	0.044	0.661	0.4 ± 0.17	9 ± 3.9	1.8 ± 0.21	2.7 ± 0.32
Shizuoka, SHIZUOKA	0.372	0.049	0.736	0.4 ± 0.19	9 ± 4.0	1.2 ± 0.22	1.6 ± 0.30
December, 1984							
Seto-machi, OKAYAMA	0.521	0.046	1.08	0.0 ± 0.26	0 ± 5.5	0.2 ± 0.22	0.2 ± 0.21
Kasuga, FUKUOKA	0.576	0.049	1.08	0.0 ± 0.27	0 ± 5.4	0.6 ± 0.23	0.5 ± 0.21
Yonagusuku-mura, OKINAWA	0.514	0.039	0.950	0.0 ± 0.29	0 ± 7.3	1.1 ± 0.25	1.1 ± 0.26
January, 1985							
Hirosaki, AOMORI	0.390	0.053	0.768	0.5 ± 0.20	10 ± 3.8	0.3 ± 0.17	0.4 ± 0.23
Kobe, HYOGO	0.444	0.051	0.821	0.3 ± 0.22	6 ± 4.3	1.1 ± 0.22	1.3 ± 0.27
Nagasaki, NAGASAKI	0.473	0.041	0.614	0.2 ± 0.25	4 ± 6.0	3.1 ± 0.32	5.0 ± 0.52

Figure (2)-2 Sampling Locations of Rice (consuming districts)

1. Hirosaki
2. Yokohama
3. Shizuoka
4. Kobe
5. Seto-machi
6. Kasuga
7. Nagasaki
8. Yonagusuku-mura



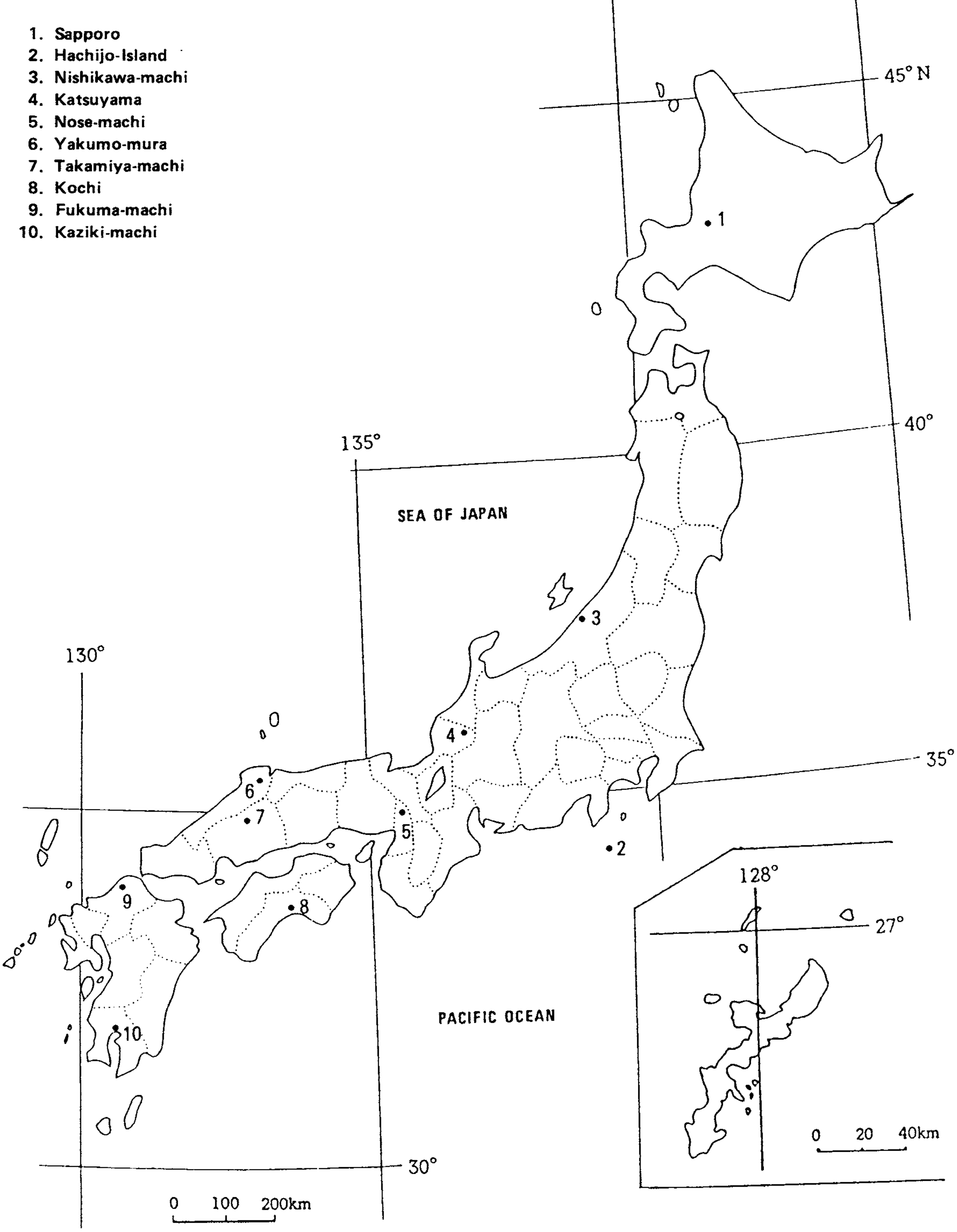
(3)-1 Strontium-90 and Cesium-137 in Milk (producing districts for WHO program) (from Dec. 1984 to Jun. 1985)

— continued from No. 71 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.
December, 1984							
Yakumo-mura, SHIMANE	8.18	1.460	1.56	1.5 ± 0.26	1.1 ± 0.18	2.3 ± 0.24	1.5 ± 0.15
January, 1985							
Nose-machi, OSAKA	7.54	1.19	1.55	0.6 ± 0.22	0.5 ± 0.18	0.7 ± 0.17	0.5 ± 0.11
Takamiya-machi, HIROSHIMA	7.17	1.13	1.59	1.2 ± 0.23	1.0 ± 0.20	0.6 ± 0.15	0.4 ± 0.10
February, 1985							
Sapporo, HOKKAIDO	7.44	1.15	1.62	1.5 ± 0.23	1.3 ± 0.20	1.8 ± 0.21	1.1 ± 0.13
Hachijo-Island, TOKYO	6.60	0.965	1.34	5.5 ± 0.34	5.7 ± 0.36	16 ± 0.5	12 ± 0.4
Nishikawa-machi, NIIGATA	7.77	1.23	1.69	1.4 ± 0.25	1.1 ± 0.20	1.1 ± 0.18	0.6 ± 0.11
Katsuyama, FUKUI	7.61	1.17	1.63	1.5 ± 0.24	1.2 ± 0.21	4.1 ± 0.30	2.5 ± 0.18
Kochi, KOCHI	7.37	1.14	1.69	1.9 ± 0.25	1.7 ± 0.22	0.8 ± 0.16	0.4 ± 0.10
Fukuma-machi, FUKUOKA	7.69	1.32	1.58	1.0 ± 0.22	0.8 ± 0.17	1.8 ± 0.21	1.2 ± 0.13
Kaziki-machi, KAGOSHIMA	7.38	1.17	1.58	1.0 ± 0.22	0.8 ± 0.19	2.1 ± 0.22	1.4 ± 0.14
April, 1985							
Yakumo-mura, SHIMANE	7.86	1.15	1.31	1.8 ± 0.27	1.6 ± 0.24	1.3 ± 0.22	1.0 ± 0.17
May, 1985							
Sapporo, HOKKAIDO	7.41	1.21	1.60	1.6 ± 0.24	1.3 ± 0.20	1.9 ± 0.22	1.2 ± 0.14
Hachijo-Island, TOKYO	6.80	1.03	1.35	3.8 ± 0.31	3.6 ± 0.30	24 ± 0.6	18 ± 0.4
Nishikawa, NIIGATA	7.42	1.13	1.63	2.0 ± 0.27	1.7 ± 0.24	2.3 ± 0.24	1.4 ± 0.15
Katsuyama, FUKUI	7.66	1.17	1.77	2.9 ± 0.31	2.5 ± 0.26	2.2 ± 0.24	1.3 ± 0.14
Nose-machi, OSAKA	7.50	1.19	1.63	0.7 ± 0.21	0.6 ± 0.18	0.6 ± 0.18	0.4 ± 0.11
Takamiya-machi, HIROSHIMA	6.92	1.06	1.57	0.7 ± 0.20	0.7 ± 0.19	0.8 ± 0.18	0.5 ± 0.11
Kochi, KOCHI	7.07	1.12	1.58	2.3 ± 0.28	2.0 ± 0.25	1.0 ± 0.18	0.6 ± 0.11
Fukuma-machi, FUKUOKA	7.76	1.30	1.58	1.1 ± 0.25	0.9 ± 0.19	6.5 ± 0.36	4.1 ± 0.23
Kaziki-machi, KAGOSHIMA	7.31	1.18	1.65	1.2 ± 0.24	1.0 ± 0.20	1.3 ± 0.21	0.8 ± 0.13
June, 1985							
Yakumo-mura, SHIMANE	7.63	1.04	1.71	3.1 ± 0.30	3.0 ± 0.29	2.1 ± 0.23	1.2 ± 0.14

Figure (3)-1 Sampling Locations of Milk
(Producing districts for WHO program)



(3)-2 Strontium-90 and Cesium-137 in Milk (producing districts for domestic program) (from Sep. 1984 to Jun. 1985)

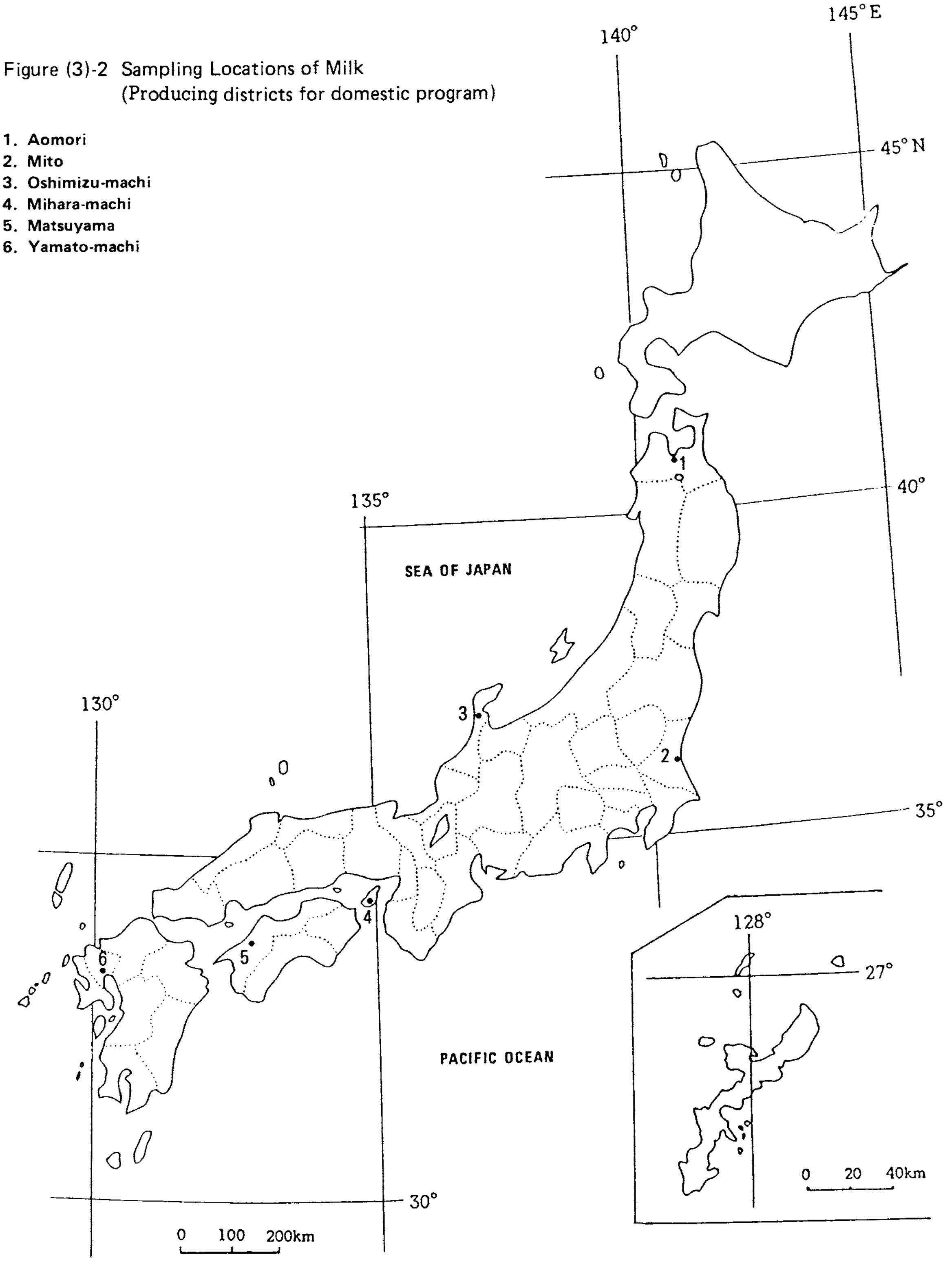
– continued from No. 71 of this publication –

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.
September, 1984							
Aomori, AOMORI	7.35	1.14	1.63	6.0 ± 0.38	5.3 ± 0.33	6.0 ± 0.34	3.7 ± 0.21
February, 1985							
Aomori, AOMORI	7.58	1.07	1.77	2.7 ± 0.28	2.5 ± 0.27	3.0 ± 0.26	1.7 ± 0.15
Mito, IBARAGI	7.82	1.23	1.66	1.1 ± 0.23	0.9 ± 0.19	0.8 ± 0.18	0.5 ± 0.11
Oshimizu-machi, ISHIKAWA	7.52	1.13	1.54	1.3 ± 0.23	1.1 ± 0.20	1.5 ± 0.21	1.0 ± 0.13
Mihara-machi, HYOGO	6.96	1.08	1.60	0.7 ± 0.22	0.7 ± 0.20	0.9 ± 0.15	0.6 ± 0.10
Matsuyama, EHIME	7.64	1.18	1.42	1.0 ± 0.23	0.8 ± 0.20	0.4 ± 0.15	0.3 ± 0.11
June, 1985							
Yamato-machi, SAGA	7.41	1.12	1.64	1.5 ± 0.23	1.4 ± 0.21	5.1 ± 0.31	3.1 ± 0.19

Figure (3)-2 Sampling Locations of Milk
(Producing districts for domestic program)

1. Aomori
2. Mito
3. Oshimizu-machi
4. Mihara-machi
5. Matsuyama
6. Yamato-machi



(3)-3 Strontium-90 and Cesium-137 in Milk (consuming districts) (from Aug. 1984 to May 1985)

– continued from No. 71 of this publication –

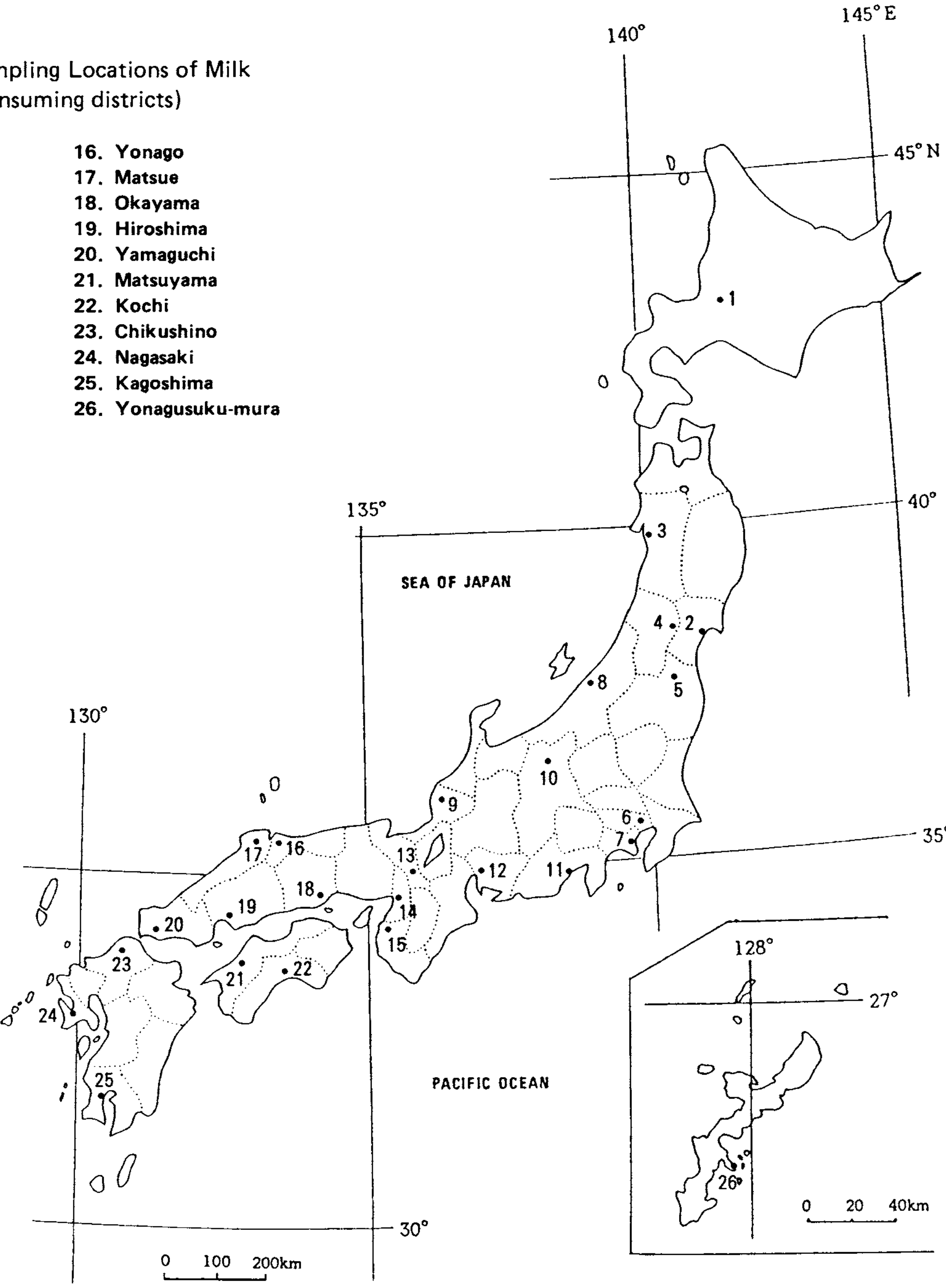
Table (3)-3: Strontium-90 and Cesium-137 in Milk

Location	Component			^{90}Sr		^{137}Cs	
	Ash (g/ℓ)	Ca (g/ℓ)	K (g/ℓ)	pCi/ℓ	S.U.	pCi/ℓ	C.U.
August, 1984							
Yokohama, KANAGAWA	7.38	1.09	1.61	0.5 ± 0.22	0.5 ± 0.20	1.7 ± 0.22	1.1 ± 0.14
October, 1984							
Kyoto, KYOTO	6.93	1.11	1.48	1.2 ± 0.23	1.1 ± 0.21	1.4 ± 0.19	1.0 ± 0.13
December, 1984							
Akita, AKITA	7.36	1.15	1.57	1.4 ± 0.23	1.2 ± 0.20	1.2 ± 0.19	0.7 ± 0.12
Matsue, SHIMANE	7.14	1.13	1.52	1.3 ± 0.23	1.1 ± 0.21	3.5 ± 0.26	2.3 ± 0.17
Yonagusuku-mura, OKINAWA	7.35	1.14	1.59	0.2 ± 0.18	0.2 ± 0.16	0.3 ± 0.13	0.2 ± 0.09
January, 1985							
Fukushima, FUKUSHIMA	7.26	1.12	1.51	0.7 ± 0.25	0.7 ± 0.22	1.3 ± 0.23	0.8 ± 0.15
Yokohama, KANAGAWA	7.10	1.08	1.51	0.5 ± 0.19	0.5 ± 0.18	0.9 ± 0.17	0.6 ± 0.11
Osaka, OSAKA	7.46	1.20	1.56	1.3 ± 0.25	1.1 ± 0.21	0.9 ± 0.16	0.6 ± 0.10
Hiroshima, HIROSHIMA	7.06	1.10	1.59	0.6 ± 0.19	0.5 ± 0.17	0.6 ± 0.16	0.4 ± 0.10
February, 1985							
Sapporo, HOKKAIDO	7.22	1.13	1.49	2.9 ± 0.28	2.6 ± 0.25	3.6 ± 0.27	2.4 ± 0.18
Yamagata, YAMAGATA	6.98	1.03	1.51	0.9 ± 0.19	0.9 ± 0.19	0.8 ± 0.17	0.5 ± 0.11
Shinjuku, TOKYO	7.16	1.09	1.54	0.6 ± 0.19	0.5 ± 0.18	0.7 ± 0.15	0.5 ± 0.10
Niigata, NIIGATA	7.49	1.09	1.56	1.2 ± 0.24	1.1 ± 0.21	1.7 ± 0.21	1.1 ± 0.14
Fukui, FUKUI	7.31	1.10	1.57	1.3 ± 0.23	1.2 ± 0.21	3.7 ± 0.27	2.4 ± 0.17
Nagano, NAGANO	7.02	1.10	1.50	1.0 ± 0.22	0.9 ± 0.20	0.6 ± 0.14	0.4 ± 0.09
Shizuoka, SHIZUOKA	7.14	1.09	1.53	1.1 ± 0.23	1.0 ± 0.21	1.7 ± 0.22	1.1 ± 0.14
Nagoya, AICHI	7.16	1.11	1.51	1.5 ± 0.25	1.4 ± 0.22	0.9 ± 0.16	0.6 ± 0.11
Wakayama, WAKAYAMA	6.64	1.03	1.41	0.7 ± 0.21	0.7 ± 0.21	0.6 ± 0.14	0.4 ± 0.10
Yonago, TOTTORI	7.19	1.15	1.52	0.8 ± 0.23	0.7 ± 0.20	1.5 ± 0.20	1.0 ± 0.13
Okayama, OKAYAMA	7.02	1.17	1.52	1.1 ± 0.21	0.9 ± 0.18	0.7 ± 0.15	0.5 ± 0.10
Yamaguchi, YAMAGUCHI	6.98	1.13	1.52	0.9 ± 0.22	0.8 ± 0.19	1.1 ± 0.18	0.7 ± 0.12
Matsuyama, EHIME	7.67	1.18	1.62	1.6 ± 0.27	1.4 ± 0.23	1.0 ± 0.18	0.6 ± 0.11
Kochi, KOCHI	7.31	1.16	1.56	1.8 ± 0.24	1.5 ± 0.21	3.4 ± 0.26	2.2 ± 0.17
Chikusino, FUKUOKA	7.53	1.20	1.61	0.9 ± 0.20	0.7 ± 0.17	0.7 ± 0.15	0.4 ± 0.09
Nagasaki, NAGASAKI	6.95	1.11	1.50	1.0 ± 0.20	0.9 ± 0.18	0.9 ± 0.16	0.6 ± 0.11
Kagoshima, KAGOSHIMA	7.15	1.15	1.52	1.1 ± 0.22	1.0 ± 0.19	3.1 ± 0.25	2.0 ± 0.17

Location	Component			^{90}Sr		^{137}Cs	
	Ash (g/ℓ)	Ca (g/ℓ)	K (g/ℓ)	pCi/ℓ	S.U.	pCi/ℓ	C.U.
May, 1985							
Sendai, MIYAGI	7.35	1.16	1.70	0.5 ± 0.19	0.4 ± 0.16	1.0 ± 0.20	0.6 ± 0.12
Fukushima, FUKUSHIMA	7.50	1.12	1.59	1.0 ± 0.24	0.9 ± 0.21	0.8 ± 0.18	0.5 ± 0.12
Kyoto, KYOTO	7.03	1.05	1.48	0.7 ± 0.21	0.7 ± 0.20	0.2 ± 0.17	0.1 ± 0.11

Figure (3)-3 Sampling Locations of Milk (consuming districts)

1. Sapporo
2. Sendai
3. Akita
4. Yamagata
5. Fukushima
6. Shinjuku
7. Yokohama
8. Niigata
9. Fukui
10. Nagano
11. Shizuoka
12. Nagoya
13. Kyoto
14. Osaka
15. Wakayama
16. Yonago
17. Matsue
18. Okayama
19. Hiroshima
20. Yamaguchi
21. Matsuyama
22. Kochi
23. Chikushino
24. Nagasaki
25. Kagoshima
26. Yonagusuku-mura



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

– continued from No. 71 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.
June, 1985							
Yukijirushi	2.73	3.63	5.92	2.8 ± 0.34	0.8 ± 0.09	15 ± 0.6	2.6 ± 0.10
Meiji	2.53	3.82	5.69	2.4 ± 0.30	0.6 ± 0.08	6.8 ± 0.38	1.2 ± 0.07
Morinaga	2.43	3.26	5.61	2.4 ± 0.29	0.7 ± 0.09	5.6 ± 0.35	1.0 ± 0.08
July, 1985							
Wakodo	2.67	4.27	5.66	3.2 ± 0.35	0.7 ± 0.08	6.3 ± 0.39	1.1 ± 0.07
*Meiji	7.90	12.4	17.5	31 ± 1.2	2.5 ± 0.10	62 ± 1.5	3.5 ± 0.08
*Morinaga	8.15	12.8	18.2	19 ± 1.0	1.5 ± 0.08	28 ± 1.0	1.5 ± 0.06

*Skim milk

(4)-1 Strontium-90 and Cesium-137 in Vegetables (producing districts) (from Oct. 1984 to Mar. 1985)

– continued from No. 71 of this publication –

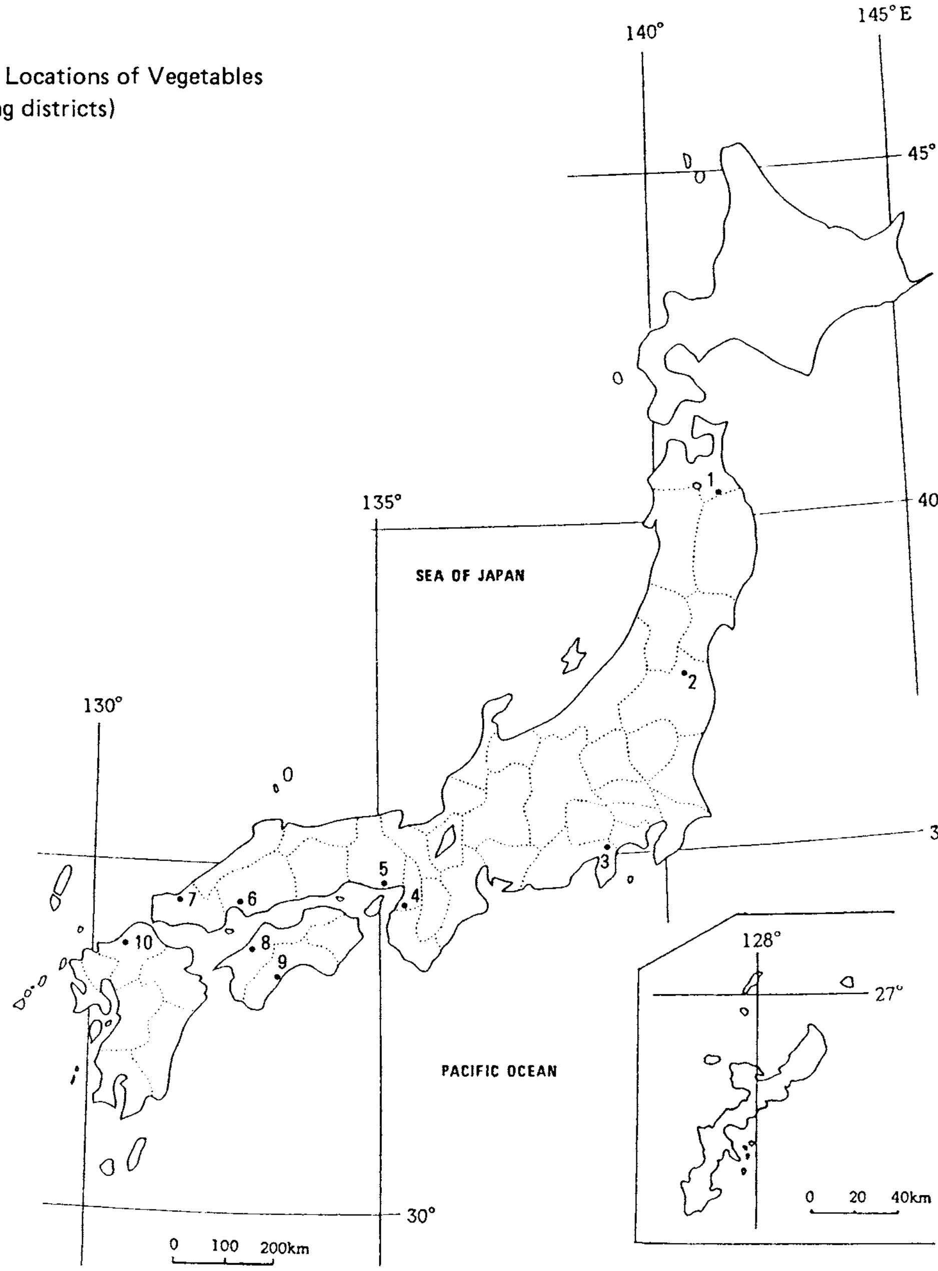
Table (4)-1: Strontium-90 and Cesium-137 in Vegetables

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Japanese radish)							
October, 1984							
Sannohe, AOMORI	0.539	0.298	2.27	5.0 ± 0.30	17 ± 1.0	1.3 ± 0.15	0.6 ± 0.07
November, 1984							
Gotenba, SHIZUOKA	0.525	0.323	2.25	7.9 ± 0.38	24 ± 1.2	0.7 ± 0.13	0.3 ± 0.06
Shime-machi, FUKUOKA	0.587	0.247	2.65	3.8 ± 0.30	15 ± 1.2	1.1 ± 0.17	6.4 ± 0.06
December, 1984							
Fukushima, FUKUSHIMA	0.461	0.229	1.78	2.4 ± 0.34	11 ± 1.5	0.3 ± 0.17	0.2 ± 0.09
January, 1985							
Yuya-machi, YAMAGUCHI	0.723	0.280	3.19	15 ± 0.6	53 ± 2.1	0.1 ± 0.13	0.02 ± 0.04
Kubokawa-machi, KOCHI	0.537	0.284	2.27	15 ± 0.5	55 ± 1.8	0.1 ± 0.10	0.02 ± 0.04
March, 1985							
Hiroshima, HIROSHIMA	0.422	0.234	1.71	1.3 ± 0.25	5.4 ± 1.0	0.5 ± 0.16	0.3 ± 0.09
(Spinach)							
November, 1984							
Gotenba, SHIZUOKA	1.59	0.545	7.23	2.6 ± 0.33	4.8 ± 0.61	1.6 ± 0.23	0.2 ± 0.03
December, 1984							
Fukushima, FUKUSHIMA	1.49	0.768	5.86	3.5 ± 0.38	4.5 ± 0.50	0.3 ± 0.19	0.1 ± 0.03
Matsuyama, EHIME	1.59	0.759	6.45	1.7 ± 0.29	2.3 ± 0.39	1.7 ± 0.24	0.3 ± 0.04
January, 1985							
Yuya-machi, YAMAGUCHI	1.90	0.759	7.84	16 ± 0.7	21 ± 0.9	0.7 ± 0.20	0.1 ± 0.03
Kubokawa-machi, KOCHI	1.87	1.12	7.64	29 ± 0.9	26 ± 0.8	2.9 ± 0.32	0.4 ± 0.04
February, 1985							
Akashi, HYOGO	1.49	0.698	6.30	0.6 ± 0.31	0.8 ± 0.44	0.4 ± 0.18	0.1 ± 0.03
March, 1985							
Hiroshima, HIROSHIMA	1.58	0.491	4.47	0.7 ± 0.25	1.3 ± 0.50	0.7 ± 0.20	0.1 ± 0.04

Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Cabbage)							
October, 1984							
Sannohe-machi, AOMORI	0.596	0.409	2.40	12 ± 0.5	28 ± 1.2	4.4 ±0.26	1.8 ± 0.11
December, 1984							
Kumatori-machi, OSAKA	0.636	0.477	2.48	3.0 ± 0.27	6.2 ± 0.56	0.7 ± 0.15	0.3 ± 0.06

Figure (4)-1 Sampling Locations of Vegetables (Producing districts)

1. **Sannohe**
2. **Fukushima**
3. **Gotenba**
4. **Kumatori-machi**
5. **Akashi**
6. **Hiroshima**
7. **Yuya-machi**
8. **Matsuyama**
9. **Kubokawa-machi**
10. **Shime-machi**



(4)-2 Strontium-90 and Cesium-137 in Vegetables (consuming districts) (from Nov. 1984 to Feb. 1985)

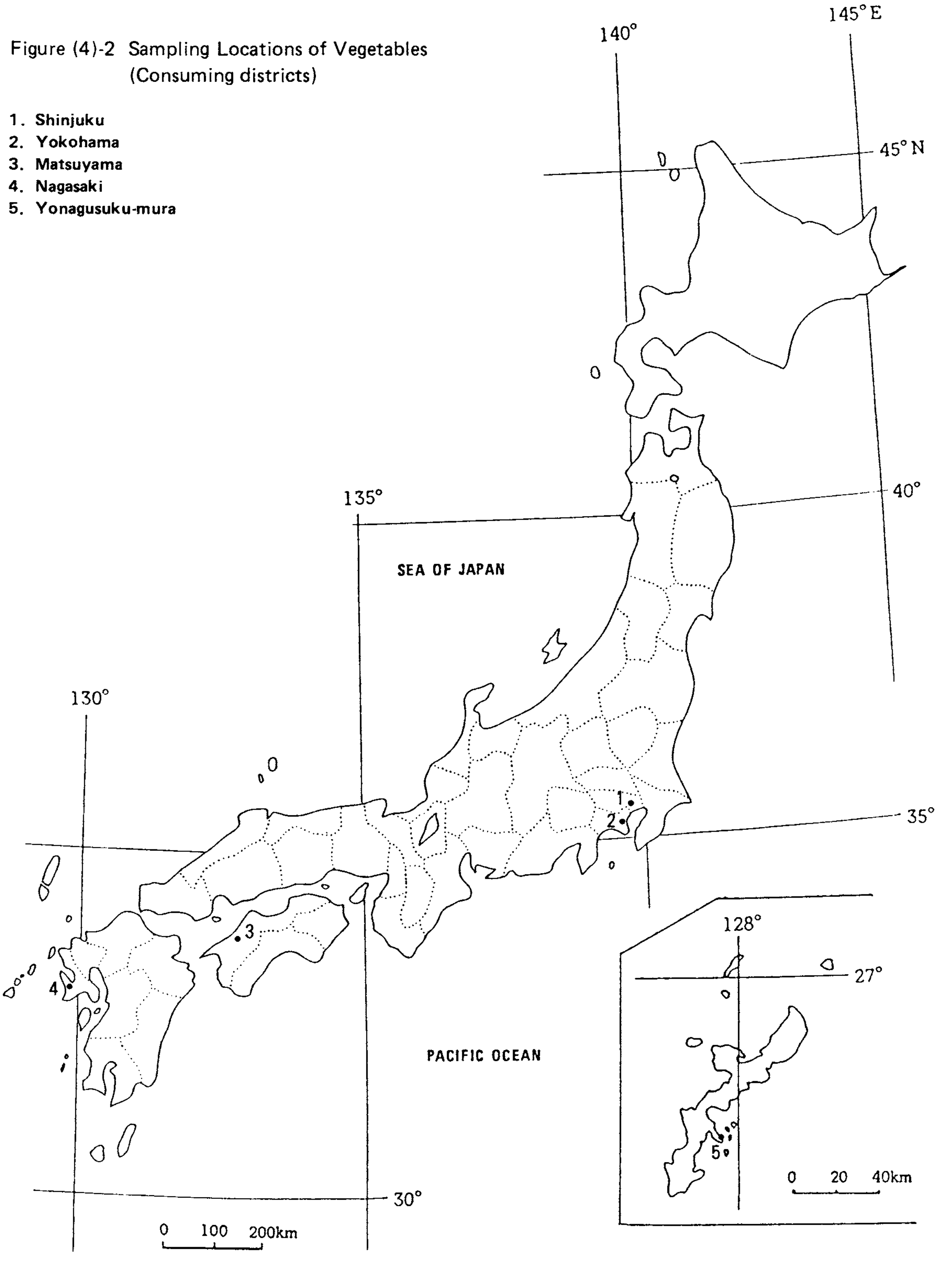
– continued from No. 71 of this publication –

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)							
November, 1984							
Yonagusuku-mura, OKINAWA	0.821	0.343	3.40	2.9 ± 0.33	8.4 ± 0.95	0.4 ± 0.17	0.1 ± 0.05
December, 1984							
Shinjuku, TOKYO	0.648	0.288	2.79	3.4 ± 0.30	12 ± 1.0	0.2 ± 0.12	0.1 ± 0.04
January, 1985							
Nagasaki, NAGASAKI	0.520	0.280	2.27	1.8 ± 0.22	6.4 ± 0.77	0.9 ± 0.15	0.4 ± 0.07
February, 1985							
Yokohama, KANAGAWA	0.395	0.202	1.60	0.3 ± 0.21	1.0 ± 1.1	0.2 ± 0.14	0.1 ± 0.09
(Spinach)							
November, 1984							
Yonagusuku-mura, OKINAWA	1.05	0.454	4.84	0.3 ± 0.21	0.6 ± 0.47	0.0 ± 0.16	0.0 ± 0.03
December, 1984							
Shinjuku, TOKYO	1.65	0.626	7.14	2.4 ± 0.32	3.8 ± 0.51	0.8 ± 0.20	0.1 ± 0.03
Matsuyama, EHIME	1.65	0.473	7.13	2.1 ± 0.30	4.5 ± 0.63	0.3 ± 0.17	0.04 ± 0.02
January, 1985							
Nagasaki, NAGASAKI	1.36	0.919	4.64	2.1 ± 0.31	2.3 ± 0.34	3.3 ± 0.32	0.7 ± 0.07
February, 1985							
Yokohama, KANAGAWA	1.54	0.518	6.52	1.7 ± 0.35	3.3 ± 0.68	0.4 ± 0.18	0.1 ± 0.03

Figure (4)-2 Sampling Locations of Vegetables
(Consuming districts)

1. Shinjuku
2. Yokohama
3. Matsuyama
4. Nagasaki
5. Yonagusuku-mura



(5) Strontium-90 and Cesium-137 in Tea (Japanese tea) (from Jun. 1985)

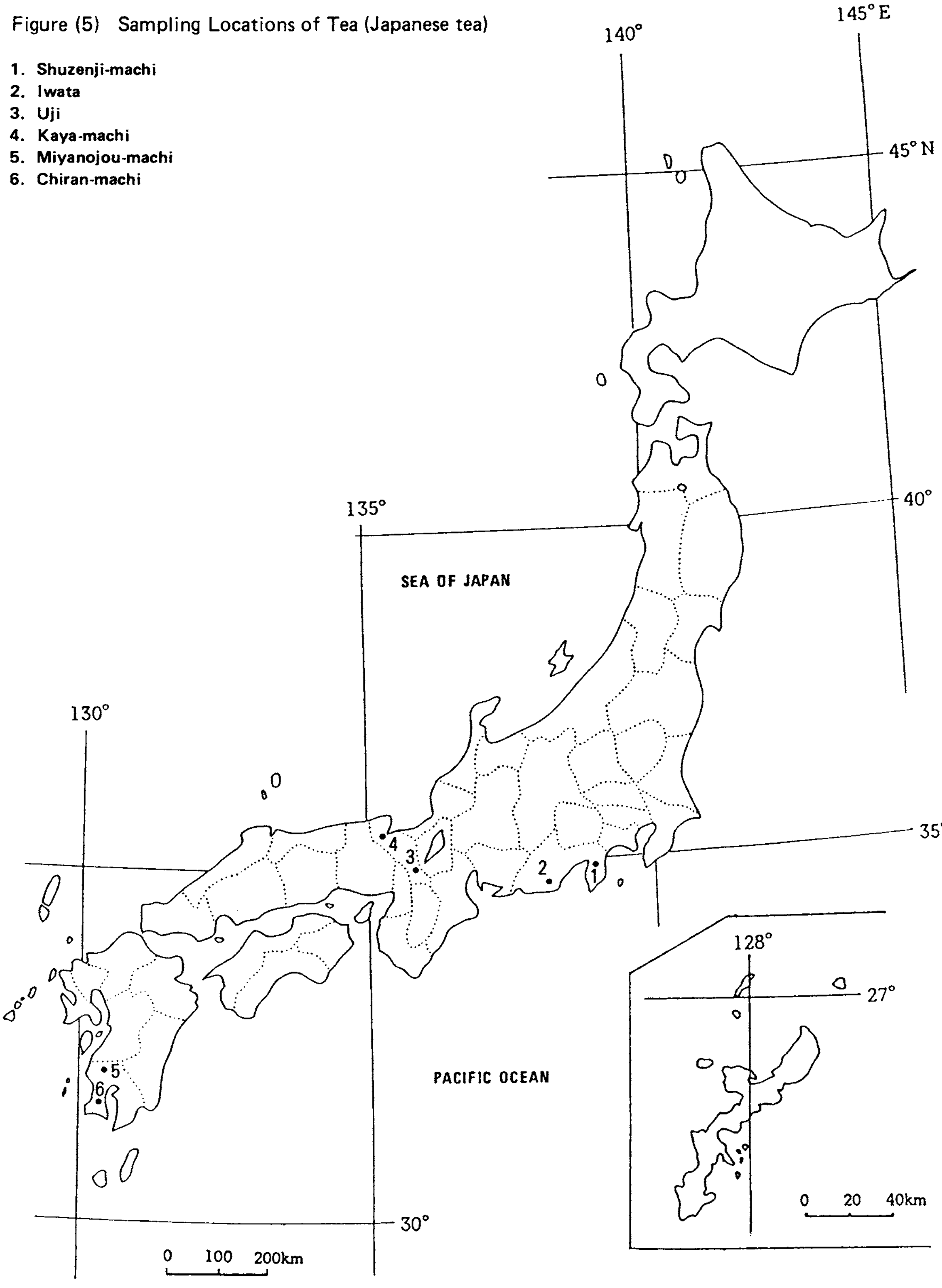
— continued from No. 69 of this publication —

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, 1985							
Shuzenji-machi, SHIZUOKA	5.26	3.30	19.7	53 ± 3.0	16 ± 0.9	20 ± 1.8	1.0 ± 0.09
Iwata, SHIZUOKA	5.16	3.20	19.2	19 ± 2.1	6.0 ± 0.65	7 ± 1.2	0.4 ± 0.06
Uji, KYOTO	4.91	2.95	18.4	23 ± 2.2	7.8 ± 0.74	3.1 ± 0.94	0.2 ± 0.05
Kaya-machi, KYOTO	5.31	2.93	19.2	37 ± 2.8	13 ± 1.0	36 ± 2.3	1.9 ± 0.12
Miyanojou-machi, KAGOSHIMA	6.12	3.14	23.6	28 ± 2.7	8.9 ± 0.85	22 ± 2.0	0.9 ± 0.08
Chiran-machi, KAGOSHIMA	4.95	2.32	18.7	13 ± 1.9	5.6 ± 0.83	66 ± 2.9	3.5 ± 0.15

Figure (5) Sampling Locations of Tea (Japanese tea)

1. Shuzenji-machi
2. Iwata
3. Uji
4. Kaya-machi
5. Miyanojou-machi
6. Chiran-machi



(6) Strontium-90 and Cesium-137 in Sea fish (from Nov. 1984 to Jun. 1985)

– continued from No. 71 of this publication –

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

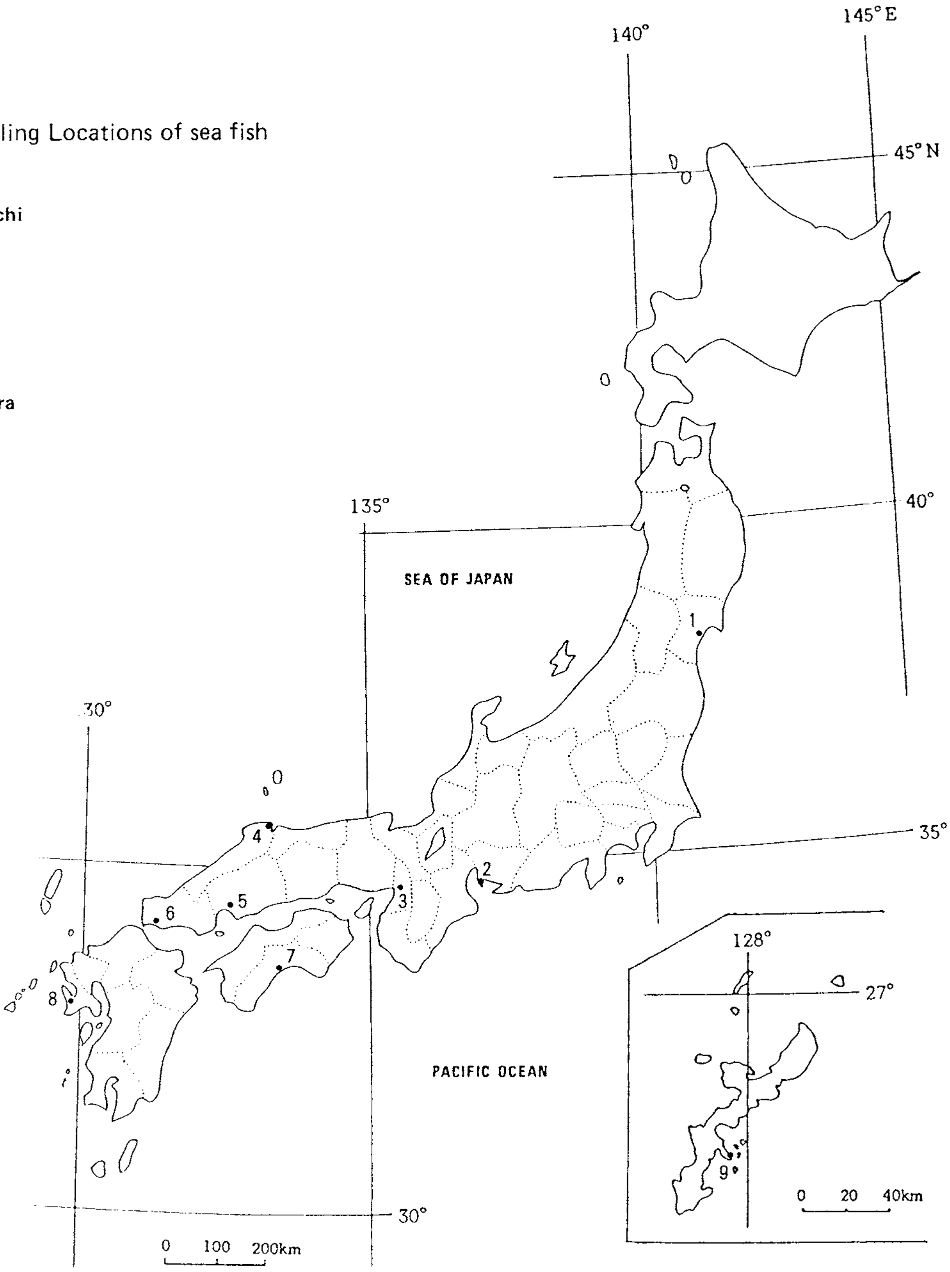
Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Branchiostegus sp.)							
November, 1984							
Nagasaki, NAGASAKI	0.980	0.322	2.94	0.6 ± 0.48	2 ± 1.5	5.4 ± 0.58	1.8 ± 0.20
(Katsuwonus pelamis)							
May, 1985							
Tosa, KOCHI	1.35	0.434	4.02	0.4 ± 0.25	0.8 ± 0.57	12 ± 0.5	3.0 ± 0.13
(Limanda herzensteini)							
March, 1985							
Hiroshima, HIROSHIMA	2.54	5.64	2.44	0.9 ± 0.26	0.2 ± 0.05	3.3 ± 0.32	1.4 ± 0.13
June, 1985							
Sendai, MIYAGI	2.98	7.45	2.05	0.4 ± 0.22	0.1 ± 0.03	2.1 ± 0.29	1.0 ± 0.14
(Sillago sihama)							
June, 1985							
Minamichita-machi, AICHI	3.70	8.92	3.19	0.7 ± 0.22	0.1 ± 0.02	3.8 ± 0.33	1.2 ± 0.10
(Scomber japonicus)							
November, 1984							
Osaka, OSAKA	1.13	0.126	2.50	0.2 ± 0.27	1 ± 2.2	5.5 ± 0.42	2.2 ± 0.17
January, 1985							
Sakaiminato, TOTTORI	1.35	0.952	3.72	0.1 ± 0.23	0.2 ± 0.24	6.2 ± 0.39	1.7 ± 0.11
(Caesio chrysozonus cuvier)							
November, 1984							
Yonagusuku-mura, OKINAWA	3.16	8.13	3.01	0.0 ± 0.24	0.0 ± 0.03	4.5 ± 0.34	1.5 ± 0.11
(Sebastes Inermis)							
February, 1985							
Ajisu-machi, YAMAGUCHI	5.26	15.0	3.49	0.7 ± 0.27	0.05 ± 0.02	5.6 ± 0.42	1.6 ± 0.12

Sea fish

Japanese name	English name	Scientific name
Amadai	Tilefish	Branchiostegus sp.
Katsuo	Bonito	Katsuwonus pelamis
Karei	Flatfish	Limanda herzensteini
Kisu	Sillago	Sillago sihama
Saba	Common mackerel	Scomber japonicus
Takasago	Black-tipped fusilier	Caesio chrysozonus cuvier
Mebaru	Black Rockfish	Sebastes Inermis

Figure (6) Sampling Locations of sea fish

1. Sendai
2. Minamichita-machi
3. Oosaka
4. Sakaiminato
5. Hiroshima
6. Ajisu-machi
7. Tosa
8. Nagasaki
9. Yonagusuku-mura



(7) Strontium-90 and Cesium-137 in Shellfish (from Mar 1985 to Jul. 1985)

– continued from No. 71 of this publication –

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

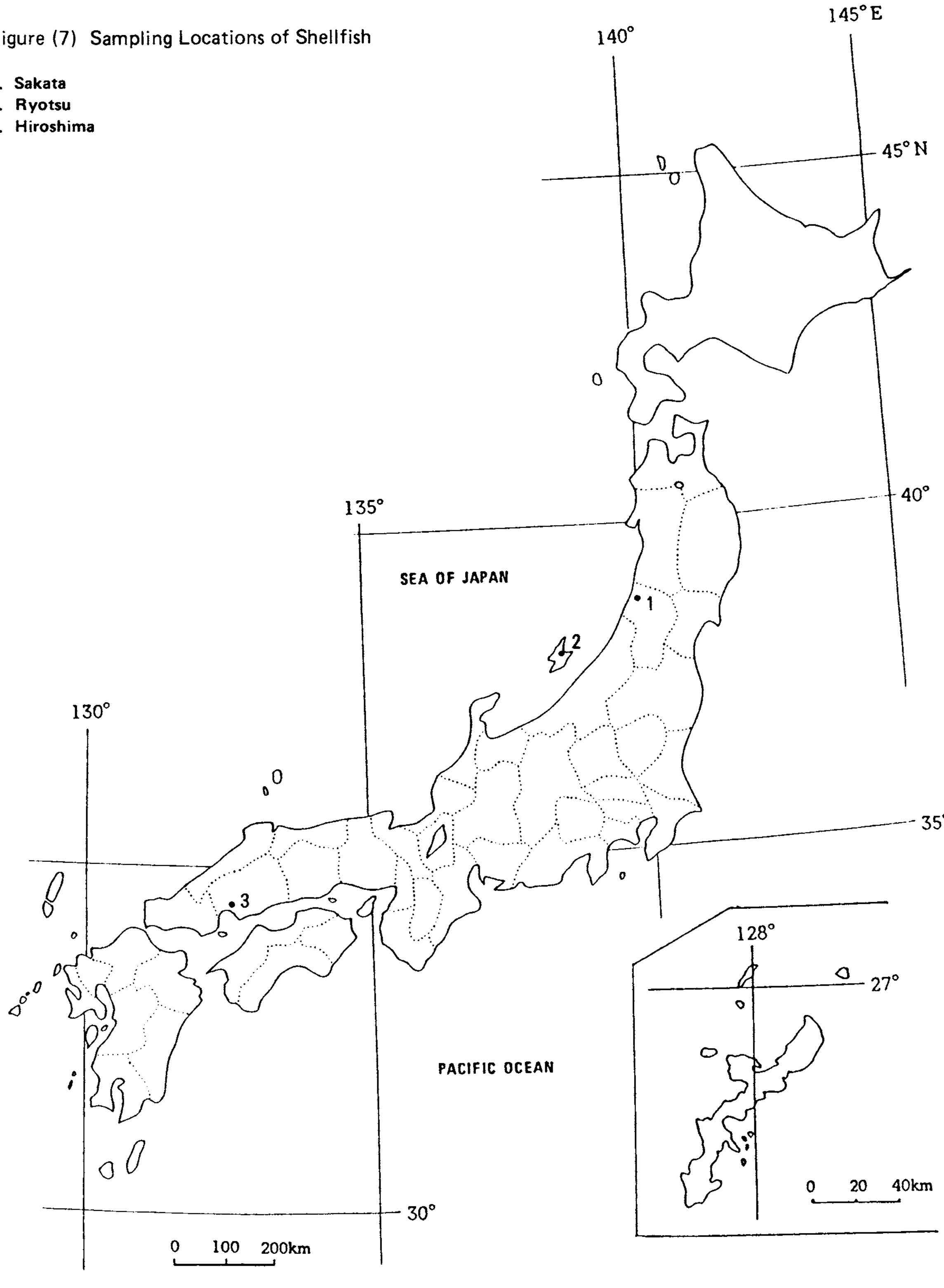
Location	Component			^{90}Sr		^{137}Cs	
	Ash (%)	Ca (g/kg)	K (g/kg)	pCi/kg	S.U.	pCi/kg	C.U.
(Ostrea gigas)							
March, 1985							
Hiroshima, HIROSHIMA	1.76	1.09	2.09	0.4 ± 0.49	0.4 ± 0.45	0.8 ± 0.33	0.4 ± 0.16
(Turbo cornutus)							
May, 1985							
Ryotsu, NIIGATA	2.19	0.495	2.71	0.2 ± 0.88	0 ± 1.8	0.7 ± 0.70	0.3 ± 0.26
July, 1985							
Sakata, YAMAGATA	3.29	3.78	2.61	0.4 ± 0.27	0.1 ± 0.07	1.4 ± 0.26	0.5 ± 0.10

Shellfish

Japanese name	English name	Scientific name
Kaki	Oyster	Ostrea gigas
Sazae	Wreath shell	Turbo cornutus

Figure (7) Sampling Locations of Shellfish

1. Sakata
2. Ryotsu
3. Hiroshima



(8) Strontium-90 and Cesium-137 in Seaweeds (from Feb. 1985 to Jun. 1985)

– continued from No. 71 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, 1985							
Minamichita-machi, AICHI	2.08	0.606	5.52	1.3 ± 0.30	2.1 ± 0.49	0.8 ± 0.21	0.1 ± 0.04
Shimabara, NAGASAKI	3.31	0.683	10.6	0.5 ± 0.29	0.7 ± 0.43	1.6 ± 0.24	0.1 ± 0.02
March, 1985							
Hiroshima, HIROSHIMA	2.96	0.549	8.17	0.6 ± 0.24	1.1 ± 0.43	1.0 ± 0.20	0.1 ± 0.02
April, 1985							
Togi-machi, ISHIKAWA	1.51	0.642	3.13	1.4 ± 0.29	2.2 ± 0.45	1.0 ± 0.23	0.3 ± 0.07
May, 1985							
Ryotsu, NIIGATA	3.97	0.988	6.64	1.9 ± 0.36	1.9 ± 0.36	1.1 ± 0.24	0.2 ± 0.04
June, 1985							
Sakata, YAMAGATA	2.39	1.22	3.01	2.1 ± 0.32	1.7 ± 0.27	1.2 ± 0.23	0.4 ± 0.08

Japanese name	English name	Scientific name
Wakame	Wakame seaweed	Undaria pinnatifida

Figure (8) Sampling Locations of Seaweeds

1. Sakata
2. Ryotsu
3. Togi-machi
4. Minamichita-machi
5. Hiroshima
6. Shimabara