ISSN 0441-2516
NIRS-RSD-57

# RADIOACTIVITY SURVEY DATA in Japan

NUMBER 57
Jun. 1981

National Institute of Radiological Sciences
Chiba, 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.

* 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)-1 Strontium-90 and Cesium-137 in Rain and dry fallout (for domestic program) (from Jan. 1981 to Mar. 1981)

*– continued from No. 54 of this publication –*

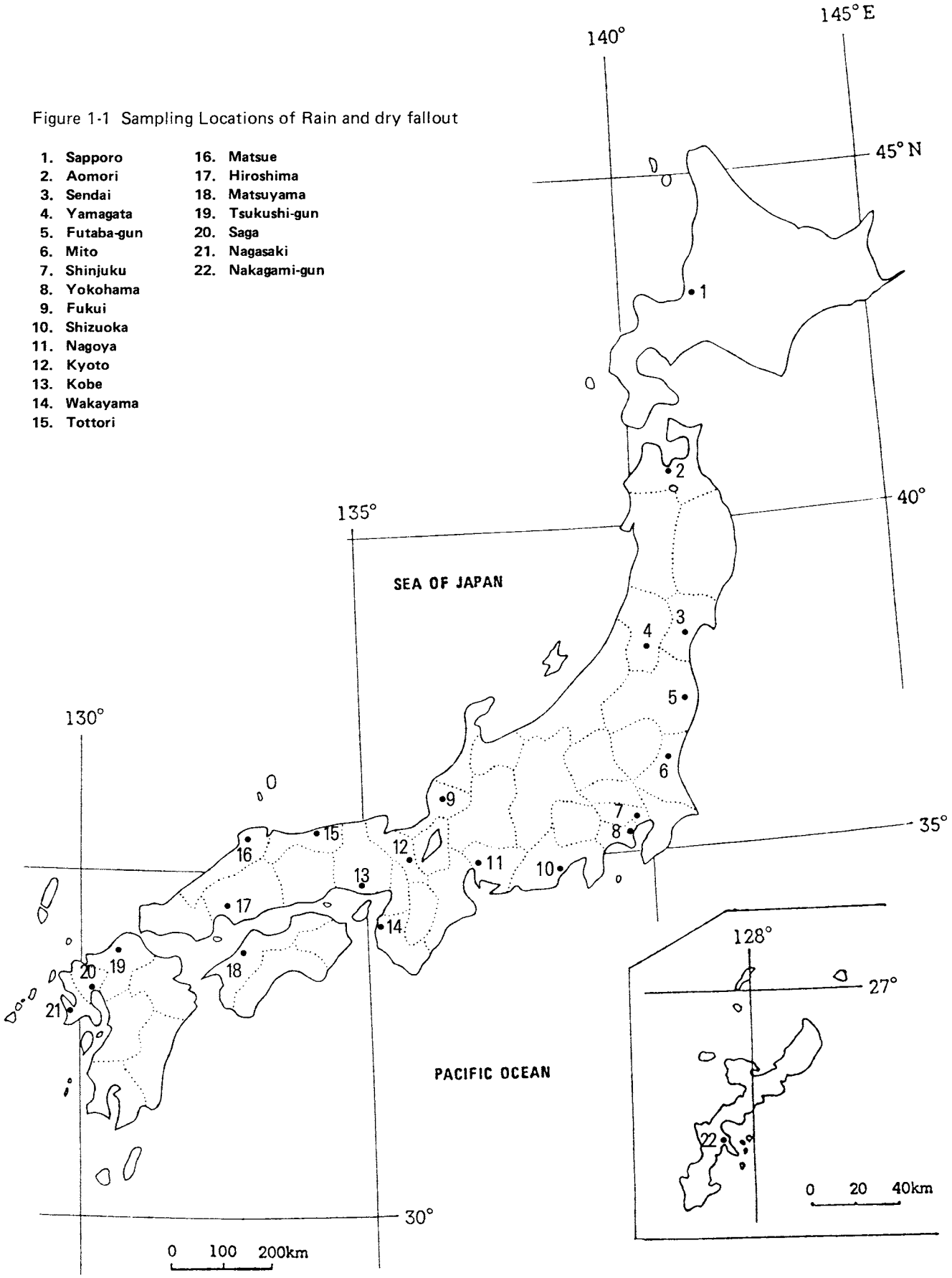
**Table (1)-1: Strontium-90 and Cesium-137 in Rain and dry fallout**

| Location | Duration (Days) | Precipitation (mm) | $^{90}Sr$ (mCi/km$^2$) | $^{137}Cs$ (mCi/km$^2$) |
|---|---|---|---|---|
| January, 1981 | | | | |
| Sapporo, HOKKAIDO | 39 | 158.0 | 0.022 ± 0.0012 | 0.033 ± 0.0015 |
| Aomori, AOMORI | 28 | 93.25 | 0.026 ± 0.0013 | 0.040 ± 0.0016 |
| Sendai, MIYAGI | 28 | 3.5 | 0.003 ± 0.0007 | 0.005 ± 0.0008 |
| Yamagata, YAMAGATA | 37 | 172.0 | 0.011 ± 0.0009 | 0.016 ± 0.0011 |
| Futaba-gun, FUKUSHIMA | 29 | 12 | 0.003 ± 0.0006 | 0.003 ± 0.0007 |
| Mito, IBARAGI | 29 | 7.0 | 0.003 ± 0.0006 | 0.006 ± 0.0008 |
| Shinjuku, TOKYO | 31 | 3.0 | 0.004 ± 0.0007 | 0.004 ± 0.0007 |
| Yokohama, KANAGAWA | 29 | 4.7 | 0.004 ± 0.0007 | 0.004 ± 0.0008 |
| Fukui, FUKUI | 28 | 293.0 | 0.057 ± 0.0019 | 0.089 ± 0.0022 |
| Shizuoka, SHIZUOKA | 28 | 21.5 | 0.004 ± 0.0007 | 0.006 ± 0.0007 |
| Nagoya, AICHI | 29 | 29.6 | 0.004 ± 0.0007 | 0.007 ± 0.0008 |
| Kyoto, KYOTO | 29 | 24.7 | 0.006 ± 0.0007 | 0.009 ± 0.0009 |
| Kobe, HYOGO | 37 | 8.6 | 0.005 ± 0.0007 | 0.010 ± 0.0009 |
| Wakayama, WAKAYAMA | 26 | 24.5 | 0.007 ± 0.0008 | 0.011 ± 0.0010 |
| Tottori, TOTTORI | 28 | 131.36 | 0.039 ± 0.0017 | 0.060 ± 0.0020 |
| Matsue, SHIMANE | 32 | 81.2 | 0.029 ± 0.0014 | 0.051 ± 0.0018 |
| Hiroshima, HIROSHIMA | 22 | 21.8 | 0.012 ± 0.0010 | 0.020 ± 0.0013 |
| Matsuyama, EHIME | 36 | 13.5 | 0.009 ± 0.0011 | 0.015 ± 0.0011 |
| Tsukushi-gun, FUKUOKA | 27 | 57.5 | 0.009 ± 0.0009 | 0.017 ± 0.0011 |
| Saga, SAGA | 32 | 27.5 | 0.015 ± 0.0011 | 0.023 ± 0.0012 |
| Nagasaki, NAGASAKI | 29 | 33.0 | 0.016 ± 0.0011 | 0.026 ± 0.0013 |
| Nakagami-gun, OKINAWA | 27 | 30.5 | 0.012 ± 0.0010 | 0.013 ± 0.0010 |
| February, 1981 | | | | |
| Sapporo, HOKKAIDO | 29 | 42.0 | 0.012 ± 0.0009 | 0.019 ± 0.0012 |
| Aomori, AOMORI | 29 | 35.8 | 0.027 ± 0.0013 | 0.041 ± 0.0016 |
| Sendai, MIYAGI | 31 | 26.5 | 0.008 ± 0.0008 | 0.013 ± 0.0010 |
| Yamagata, YAMAGATA | 29 | 61.5 | 0.016 ± 0.0010 | 0.024 ± 0.0013 |
| Futaba-gun, FUKUSHIMA | 29 | 46 | 0.011 ± 0.0009 | 0.013 ± 0.0010 |

| Location | Duration (Days) | Precipitation (mm) | $^{90}Sr$ (mCi/km$^2$) | $^{137}Cs$ (mCi/km$^2$) |
|---|---|---|---|---|
| Mito, IBARAGI | 29 | 41.0 | 0.011 ± 0.0010 | 0.018 ± 0.0012 |
| Shinjuku, TOKYO | 29 | 48 | 0.015 ± 0.0011 | 0.016 ± 0.0011 |
| Yokohama, KANAGAWA | 30 | 57.7 | 0.014 ± 0.0011 | 0.023 ± 0.0013 |
| Fukui, FUKUI | 29 | 98.5 | 0.044 ± 0.0017 | 0.084 ± 0.0022 |
| Shizuoka, SHIZUOKA | 29 | 76.5 | 0.020 ± 0.0012 | 0.035 ± 0.0015 |
| Nagoya, AICHI | 29 | 62 | 0.021 ± 0.0012 | 0.031 ± 0.0014 |
| Kyoto, KYOTO | 31 | 71.9 | 0.024 ± 0.0013 | 0.034 ± 0.0015 |
| Kobe, HYOGO | 29 | 46.3 | 0.015 ± 0.0012 | 0.023 ± 0.0012 |
| Wakayama, WAKAYAMA | 32 | 83.5 | 0.023 ± 0.0013 | 0.030 ± 0.0014 |
| Tottori, TOTTORI | 29 | 114.72 | 0.045 ± 0.0017 | 0.065 ± 0.0020 |
| Hiroshima, HIROSHIMA | 31 | 65.3 | 0.020 ± 0.0012 | 0.033 ± 0.0015 |
| Matsuyama, EHIME | 32 | 58.5 | 0.041 ± 0.0017 | 0.072 ± 0.0021 |
| Tsukushi-gun, FUKUOKA | 29 | 56.2 | 0.027 ± 0.0013 | 0.045 ± 0.0016 |
| Saga, SAGA | 24 | 71.3 | 0.027 ± 0.0014 | 0.040 ± 0.0016 |
| Nagasaki, NAGASAKI | 28 | 103.5 | 0.040 ± 0.0016 | 0.066 ± 0.0022 |
| Nakagami-gun, OKINAWA | 30 | 48.5 | 0.024 ± 0.0013 | 0.034 ± 0.0014 |
| March, 1981 | | | | |
| Sapporo, HOKKAIDO | 31 | 125.0 | 0.044 ± 0.0016 | 0.073 ± 0.0021 |
| Aomori, AOMORI | 31 | 47 | 0.032 ± 0.0013 | 0.052 ± 0.0018 |
| Sendai, MIYAGI | 30 | 48.4 | 0.028 ± 0.0014 | 0.043 ± 0.0016 |
| Yamagata, YAMAGATA | 32 | 41.5 | 0.023 ± 0.0012 | 0.045 ± 0.0017 |
| Futaba-gun, FUKUSHIMA | 31 | 42 | 0.029 ± 0.0014 | 0.043 ± 0.0017 |
| Mito, IBARAGI | 31 | 121.5 | 0.043 ± 0.0017 | 0.074 ± 0.0020 |
| Shinjuku, TOKYO | 32 | 114 | 0.051 ± 0.0017 | 0.083 ± 0.0022 |
| Yokohama, KANAGAWA | 28 | 145.8 | 0.043 ± 0.0016 | 0.071 ± 0.0020 |
| Fukui, FUKUI | 31 | 60.5 | 0.058 ± 0.0018 | 0.11 ± 0.003 |
| Shizuoka, SHIZUOKA | 31 | 292.0 | 0.093 ± 0.0024 | 0.15 ± 0.003 |
| Nagoya, AICHI | 31 | 149 | 0.046 ± 0.0016 | 0.077 ± 0.0023 |
| Kyoto, KYOTO | 29 | 85.7 | 0.045 ± 0.0016 | 0.079 ± 0.0021 |
| Kobe, HYOGO | 29 | 69.7 | 0.031 ± 0.0014 | 0.052 ± 0.0018 |
| Wakayama, WAKAYAMA | 28 | 38.4 | 0.025 ± 0.0013 | 0.034 ± 0.0015 |
| Tottori, TOTTORI | 31 | 66.36 | 0.047 ± 0.0019 | 0.093 ± 0.0025 |
| Matsue, SHIMANE | 31 | 54.8 | 0.035 ± 0.0014 | 0.064 ± 0.0020 |
| Hiroshima, HIROSHIMA | 28 | 87.2 | 0.037 ± 0.0016 | 0.056 ± 0.0018 |
| Matsuyama, EHIME | 30 | 52.5 | 0.037 ± 0.0015 | 0.061 ± 0.0019 |
| Tsukushi-gun, FUKUOKA | 33 | 71.4 | 0.038 ± 0.0015 | 0.062 ± 0.0019 |
| Saga, SAGA | 24 | 95.0 | 0.030 ± 0.0013 | 0.049 ± 0.0019 |
| Nagasaki, NAGASAKI | 31 | 125.5 | 0.046 ± 0.0016 | 0.074 ± 0.0021 |
| Nakagami-gun, OKINAWA | 30 | 244.5 | 0.070 ± 0.0020 | 0.10 ± 0.003 |

Figure 1-1 Sampling Locations of Rain and dry fallout

1. Sapporo
2. Aomori
3. Sendai
4. Yamagata
5. Futaba-gun
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. Tsukushi-gun
20. Saga
21. Nagasaki
22. Nakagami-gun



## (1)-2 Strontium-90 and Cesium-137 in Rain and dry fallout (for WHO program) (from Jan. 1981 to Mar. 1981)

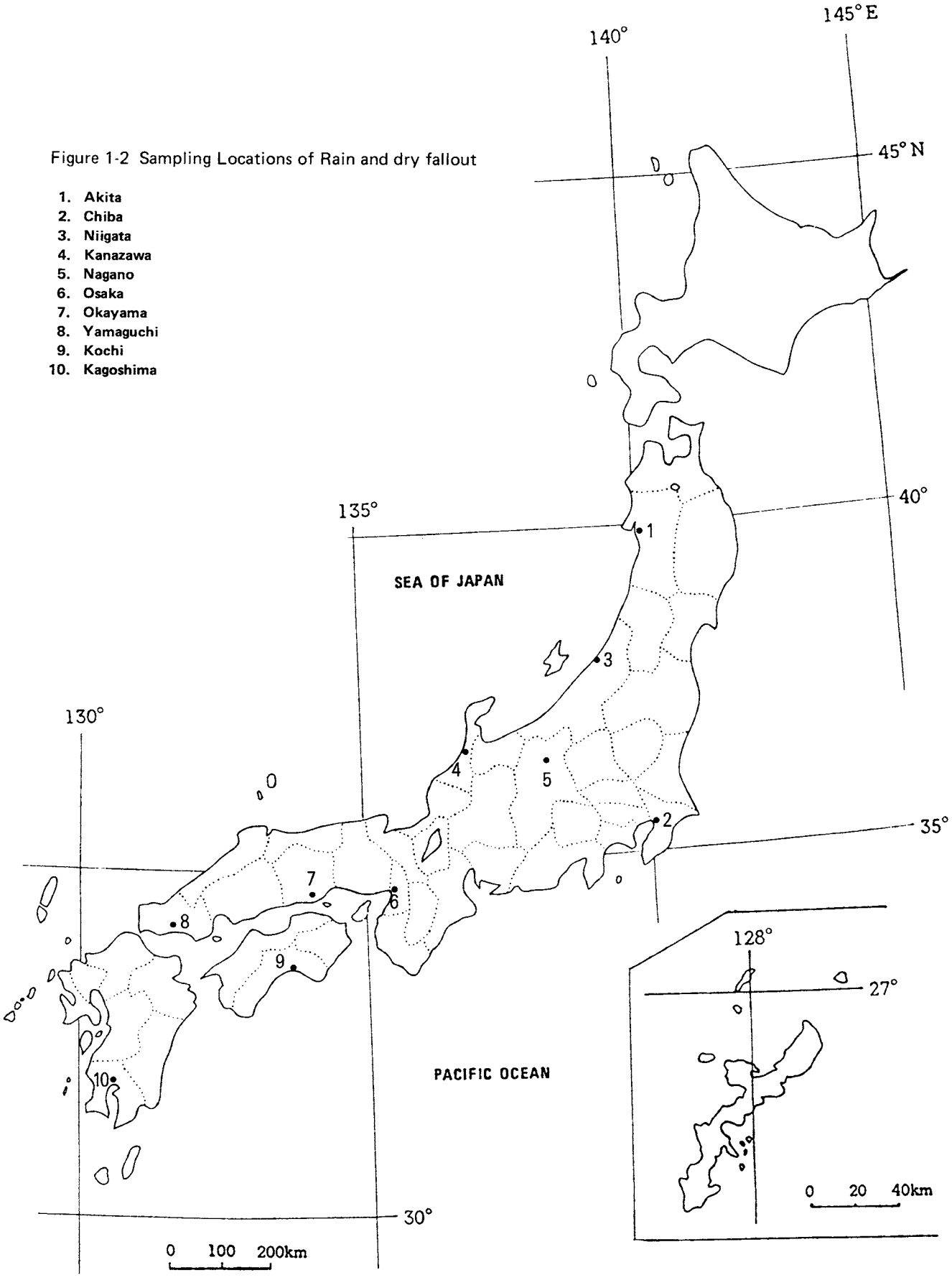
*– continued from No. 54 of this publication –*

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

| Location | Duration (Days) | Precipitation (mm) | $^{90}Sr$ (mCi/km$^2$) | $^{137}Cs$ (mCi/km$^2$) |
|---|---|---|---|---|
| January, 1981 | | | | |
| Akita, AKITA | 32 | 135.89 | 0.023 ± 0.0013 | 0.040 ± 0.0015 |
| Niigata, NIIGATA | 28 | 81.21 | 0.024 ± 0.0012 | 0.044 ± 0.0016 |
| Kanazawa, ISHIKAWA | 29 | 287.0 | 0.059 ± 0.0020 | 0.099 ± 0.0024 |
| Nagano, NAGANO | 29 | 44.5 | 0.009 ± 0.0008 | 0.013 ± 0.0010 |
| Osaka, OSAKA | 33 | 12.74 | 0.007 ± 0.0008 | 0.009 ± 0.0009 |
| Okayama, OKAYAMA | 28 | 12.4 | 0.006 ± 0.0007 | 0.009 ± 0.0009 |
| Yamaguchi, YAMAGUCHI | 28 | 29.5 | 0.013 ± 0.0010 | 0.018 ± 0.0011 |
| Kochi, KOCHI | 27 | 15.4 | 0.010 ± 0.0009 | 0.007 ± 0.0008 |
| Kagoshima, KAGOSHIMA | 28 | 19.7 | 0.008 ± 0.0008 | 0.012 ± 0.0009 |
| Chiba, CHIBA | 29 | 8.9 | 0.004 ± 0.0009 | 0.006 ± 0.0008 |
| February, 1981 | | | | |
| Akita, AKITA | 30 | 94.55 | 0.035 ± 0.0015 | 0.061 ± 0.0019 |
| Niigata, NIIGATA | 29 | 90.69 | 0.042 ± 0.0016 | 0.079 ± 0.0021 |
| Kanazawa, ISHIKAWA | 29 | 91.0 | 0.075 ± 0.0022 | 0.12 ± 0.003 |
| Nagano, NAGANO | 29 | 58.5 | 0.012 ± 0.0009 | 0.020 ± 0.0012 |
| Osaka, OSAKA | 29 | 76.11 | 0.016 ± 0.0011 | 0.028 ± 0.0014 |
| Okayama, OKAYAMA | 29 | 56.9 | 0.018 ± 0.0011 | 0.034 ± 0.0015 |
| Yamaguchi, YAMAGUCHI | 30 | 75.0 | 0.036 ± 0.0016 | 0.063 ± 0.0019 |
| Kochi, KOCHI | 29 | 102.9 | 0.033 ± 0.0015 | 0.047 ± 0.0017 |
| Kagoshima, KAGOSHIMA | 29 | 94.5 | 0.034 ± 0.0014 | 0.043 ± 0.0016 |
| Chiba, CHIBA | 29 | 45.0 | 0.016 ± 0.0013 | 0.024 ± 0.0013 |
| March, 1981 | | | | |
| Akita, AKITA | 31 | 112.8 | 0.031 ± 0.0014 | 0.055 ± 0.0018 |
| Niigata, NIIGATA | 31 | 43.08 | 0.028 ± 0.0014 | 0.049 ± 0.0018 |
| Kanazawa, ISHIKAWA | 31 | 86.0 | 0.070 ± 0.0021 | 0.12 ± 0.003 |
| Nagano, NAGANO | 31 | 34.0 | 0.022 ± 0.0012 | 0.033 ± 0.0014 |
| Osaka, OSAKA | 30 | 97.24 | 0.041 ± 0.0016 | 0.067 ± 0.0020 |
| Okayama, OKAYAMA | 31 | 92.6 | 0.025 ± 0.0013 | 0.043 ± 0.0016 |
| Yamaguchi, YAMAGUCHI | 30 | 114.0 | 0.048 ± 0.0016 | 0.074 ± 0.0021 |
| Kochi, KOCHI | 29 | 215.9 | 0.090 ± 0.0023 | 0.12 ± 0.003 |
| Kagoshima, KAGOSHIMA | 32 | 306.2 | 0.073 ± 0.0021 | 0.10 ± 0.002 |
| Chiba, CHIBA | 31 | 114.9 | 0.045 ± 0.0018 | 0.077 ± 0.0021 |

Figure 1-2 Sampling Locations of Rain and dry fallout

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 Airborne dust (from Oct. 1980 to Mar. 1981)

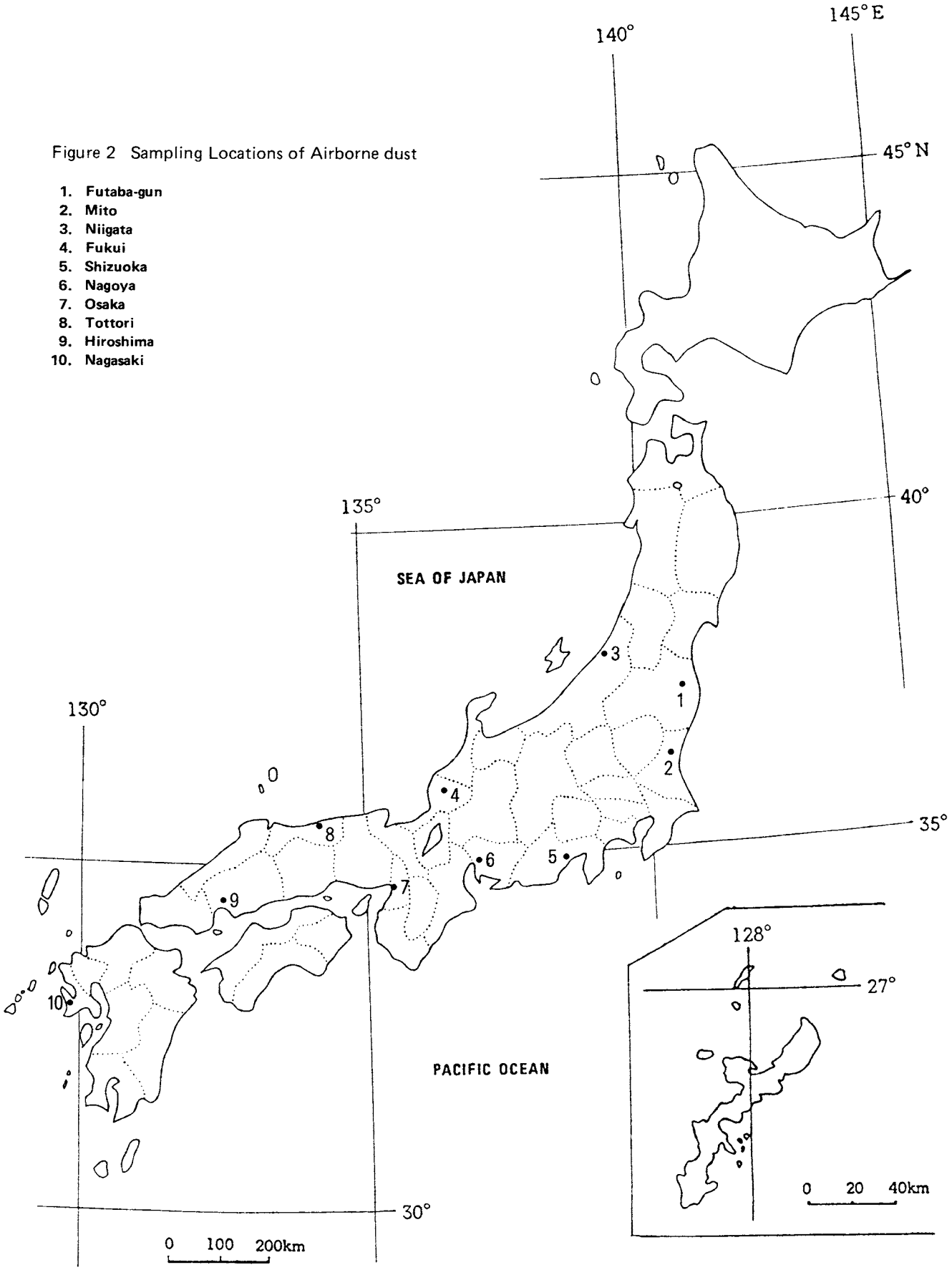
*— continued from No. 54 of this publication —*

**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/$m^3$) |
|---|---|---|---|---|
| October ~ December 1980 | | | | |
| Futaba-gun, FUKUSHIMA | 10 | 10,816 | 0.1 ± 0.02 | 0.1 ± 0.02 |
| Mito, IBARAGI | 10 ~ 12 | 10,116 | 0.1 ± 0.03 | 0.1 ± 0.03 |
| Niigata, NIIGATA | 10 ~ 12 | 13,218 | 0.2 ± 0.03 | 0.2 ± 0.02 |
| Fukui, FUKUI | 10 ~ 12 | 12,650 | 0.2 ± 0.03 | 0.2 ± 0.02 |
| Shizuoka, SHIZUOKA | 10 ~ 12 | 9,216 | 0.1 ± 0.04 | 0.2 ± 0.03 |
| Nagoya, AICHI | 10 ~ 12 | 10,244 | 0.2 ± 0.03 | 0.2 ± 0.03 |
| Osaka, OSAKA | 10 ~ 12 | 7,776 | 0.1 ± 0.04 | 0.3 ± 0.04 |
| Tottori, TOTTORI | 10 ~ 12 | 11,440 | 0.1 ± 0.03 | 0.2 ± 0.03 |
| Hiroshima, HIROSHIMA | 10 ~ 12 | 10,800 | 0.1 ± 0.03 | 0.1 ± 0.03 |
| Nagasaki, NAGASAKI | 10 ~ 12 | 13,570 | 0.1 ± 0.03 | 0.2 ± 0.02 |
| January ~ March 1981 | | | | |
| Futaba-gun, FUKUSHIMA | 1, 3 | 23,103 | 0.6 ± 0.03 | 0.9 ± 0.03 |
| Mito, IBARAGI | 1 ~ 3 | 10,368 | 0.1 ± 0.04 | 0.3 ± 0.04 |
| Niigata, NIIGATA | 1 ~ 3 | 14,514.2 | 0.6 ± 0.04 | 1.1 ± 0.04 |
| Fukui, FUKUI | 1 ~ 3 | 18,071 | 0.8 ± 0.04 | 1.3 ± 0.04 |
| Shizuoka, SHIZUOKA | 1 ~ 3 | 11,737 | 0.3 ± 0.03 | 0.4 ± 0.03 |
| Nagoya, AICHI | 1 ~ 3 | 10,927 | 0.5 ± 0.04 | 0.8 ± 0.04 |
| Osaka, OSAKA | 1 ~ 3 | 8,424 | 0.4 ± 0.04 | 0.6 ± 0.05 |
| Tottori, TOTTORI | 1 ~ 3 | 13,946 | 0.8 ± 0.05 | 1.1 ± 0.04 |
| Hiroshima, HIROSHIMA | 1 ~ 3 | 10,800 | 1.5 ± 0.07 | 2.5 ± 0.07 |
| Nagasaki, NAGASAKI | 1 ~ 3 | 13,558 | 1.1 ± 0.05 | 1.7 ± 0.05 |

Figure 2 Sampling Locations of Airborne dust

1. Futaba-gun
2. Mito
3. Niigata
4. Fukui
5. Shizuoka
6. Nagoya
7. Osaka
8. Tottori
9. Hiroshima
10. Nagasaki



## (3) Strontium-90 and Cesium-137 in Service water (from Nov. 1980 to Jun. 1981)

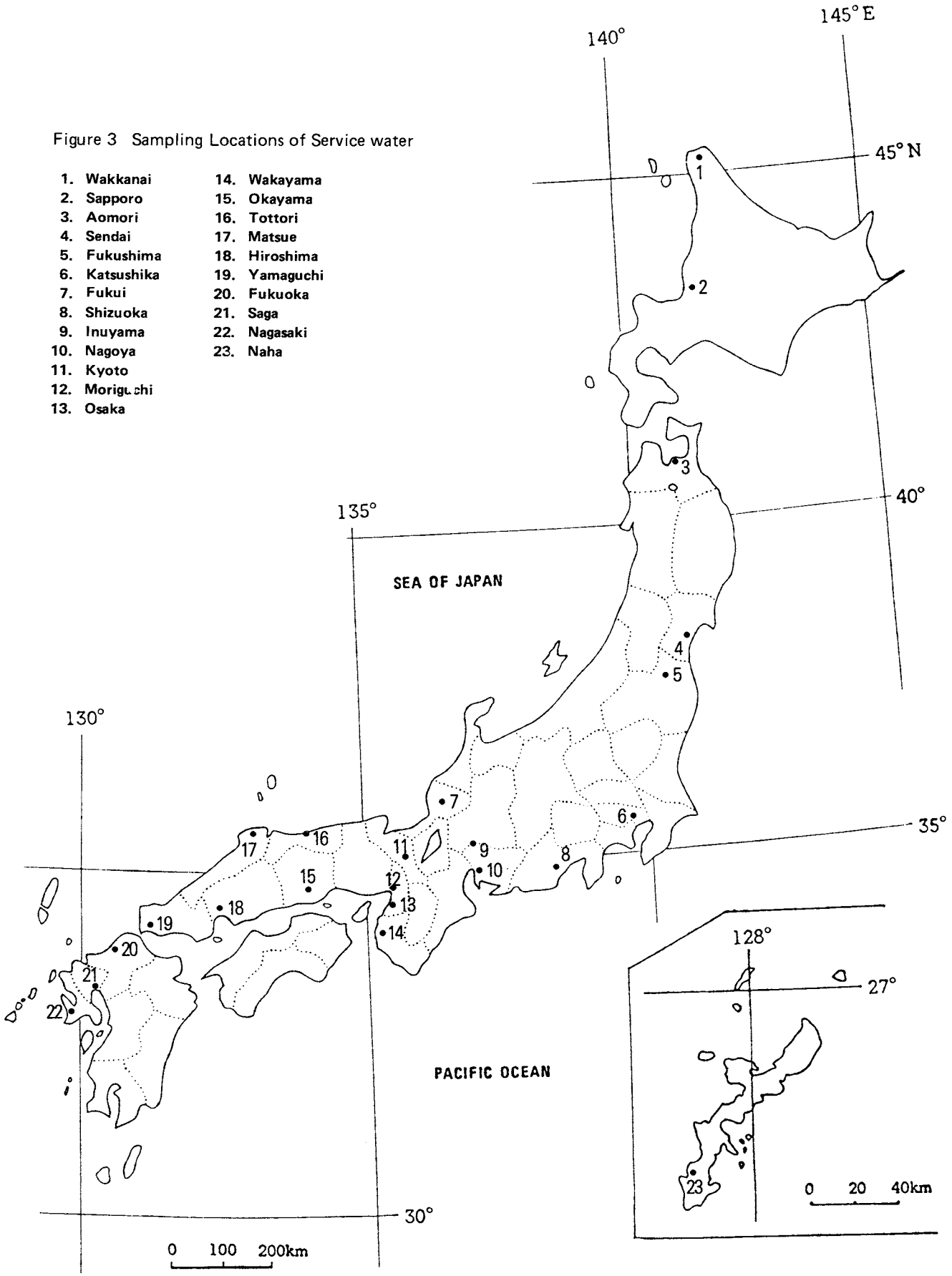
*– continued from No. 54 of this publication –*

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

| Location | pH | $^{90}Sr$ (pCi/ℓ) | $^{137}Cs$ (pCi/ℓ) |
|---|---|---|---|
| (Source water) | | | |
| December, 1980 | | | |
| Katsushika, TOKYO | 7.0 | 0.07 ± 0.005 | 0.01 ± 0.003 |
| Inuyama, AICHI | 6.7 | 0.08 ± 0.005 | 0.01 ± 0.003 |
| Moriguchi, OSAKA | 6.8 | 0.18 ± 0.008 | 0.01 ± 0.003 |
| Fukuoka, FUKUOKA | 6.9 | 0.09 ± 0.006 | 0.005 ± 0.003 |
| January, 1981 | | | |
| Sapporo, HOKKAIDO | 7.1 | 0.09 ± 0.005 | 0.01 ± 0.003 |
| Kyoto, KYOTO | 7.3 | 0.25 ± 0.008 | 0.01 ± 0.003 |
| (Tap water) | | | |
| Nobember, 1980 | | | |
| Hiroshima, HIROSHIMA | 7.3 | 0.10 ± 0.006 | 0.003 ± 0.003 |
| December, 1980 | | | |
| Wakkanai, HOKKAIDO | 6.3 | 0.41 ± 0.010 | 0.02 ± 0.004 |
| Aomori, AOMORI | 7.3 | 0.05 ± 0.005 | 0.01 ± 0.003 |
| Sendai, MIYAGI | 7.24 | 0.08 ± 0.006 | 0.01 ± 0.003 |
| Fukushima, FUKUSHIMA | – | 0.13 ± 0.006 | 0.002 ± 0.003 |
| Katsushika, TOKYO | 6.3 | 0.07 ± 0.005 | 0.01 ± 0.003 |
| Shizuoka, SHIZUOKA | 7.2 | 0.005 ± 0.003 | 0.003 ± 0.003 |
| Nagoya, AICHI | 6.6 | 0.08 ± 0.005 | 0.005 ± 0.003 |
| Osaka, OSAKA | 6.6 | 0.12 ± 0.006 | 0.004 ± 0.003 |
| Tottori, TOTTORI | 7.1 | 0.08 ± 0.005 | 0.005 ± 0.003 |
| Okayama, OKAYAMA | 6.8 | 0.02 ± 0.004 | 0.003 ± 0.003 |
| Yamaguchi, YAMAGUCHI | 6.0 | 0.07 ± 0.006 | 0.003 ± 0.003 |
| Fukuoka, FUKUOKA | 6.5 | 0.10 ± 0.006 | 0.00 ± 0.003 |
| Saga, SAGA | 7.35 | 0.08 ± 0.005 | 0.001 ± 0.003 |
| Nagasaki, NAGASAKI | – | 0.07 ± 0.005 | 0.01 ± 0.003 |
| January, 1981 | | | |
| Fukui, FUKUI | 7.1 | 0.01 ± 0.003 | 0.01 ± 0.004 |
| Kyoto, KYOTO | 6.9 | 0.25 ± 0.008 | 0.003 ± 0.003 |
| Wakayama, WAKAYAMA | 7.5 | 0.06 ± 0.004 | 0.01 ± 0.003 |
| Matsue, SHIMANE | 6.4 | 0.10 ± 0.006 | 0.00 ± 0.003 |
| Naha, OKINAWA | 7.6 | 0.13 ± 0.006 | 0.01 ± 0.003 |

Figure 3 Sampling Locations of Service water

1. Wakkanai
2. Sapporo
3. Aomori
4. Sendai
5. Fukushima
6. Katsushika
7. Fukui
8. Shizuoka
9. Inuyama
10. Nagoya
11. Kyoto
12. Moriguchi
13. Osaka
14. Wakayama
15. Okayama
16. Tottori
17. Matsue
18. Hiroshima
19. Yamaguchi
20. Fukuoka
21. Saga
22. Nagasaki
23. Naha



## (4) Strontium-90 and Cesium-137 in Total diet (from Nov. 1980 to Feb. 1981)

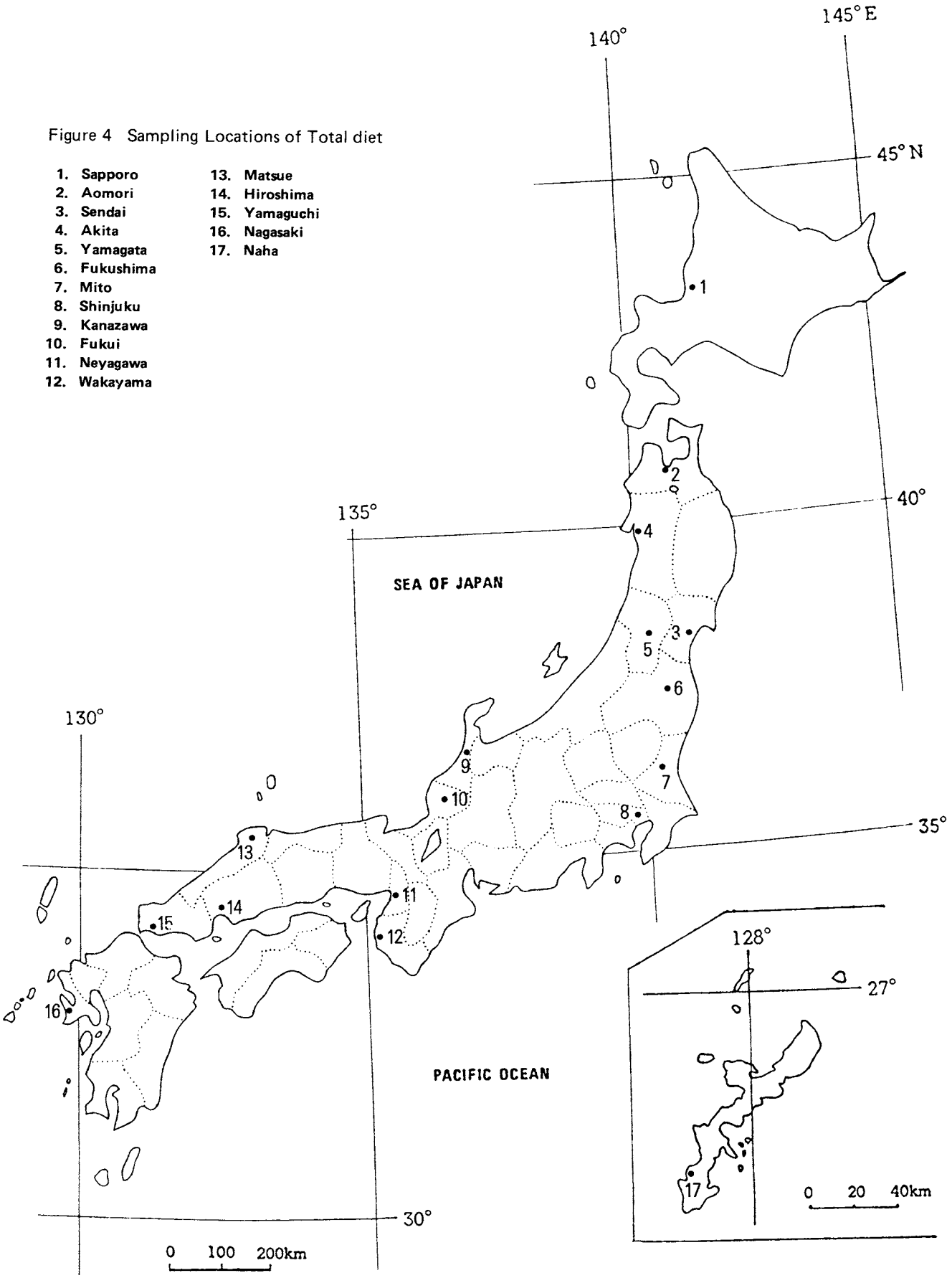
*— continued from No. 54 of this publication —*

### Table 4: Strontium-90 and Cesium-137 in Total diet

| Location | Ash | Ca | Ka | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|
| | (g/p/d) | (mg/p/d) | (mg/p/d) | pCi/p/d | S.U. | pCi/p/d | C.U. |
| November, 1980 | | | | | | | |
| Sapporo, HOKKAIDO | 14.9 | 483 | 2,220 | 3.4 ± 0.34 | 7.0 ± 0.70 | 2.9 ± 0.27 | 1.3 ± 0.12 |
| Fukui, FUKUI | 13.9 | 508 | 2,060 | 3.3 ± 0.30 | 6.6 ± 0.59 | 8.1 ± 0.38 | 3.9 ± 0.19 |
| Matsue, SHIMANE | 24.7 | 1,440 | 2,990 | 6.6 ± 0.54 | 4.5 ± 0.38 | 6.0 ± 0.48 | 2.0 ± 0.16 |
| December, 1980 | | | | | | | |
| Aomori, AOMORI | 15.4 | 542 | 2,280 | 3.7 ± 0.36 | 6.8 ± 0.67 | 5.2 ± 0.34 | 2.3 ± 0.15 |
| Sendai, MIYAGI | 16.3 | 335 | 1,990 | 3.2 ± 0.41 | 9.4 ± 1.2 | 3.8 ± 0.32 | 1.9 ± 0.16 |
| Akita, AKITA | 16.8 | 478 | 2,010 | 4.0 ± 0.43 | 8.4 ± 0.90 | 3.6 ± 0.31 | 1.8 ± 0.15 |
| Fukushima, FUKUSHIMA | 18.5 | 476 | 2,380 | 5.4 ± 0.46 | 11 ± 1.0 | 3.1 ± 0.33 | 1.3 ± 0.14 |
| Mito, IBARAGI | 18.8 | 524 | 2,170 | 3.2 ± 0.38 | 6.0 ± 0.73 | 3.0 ± 0.31 | 1.4 ± 0.14 |
| Shinjuku, TOKYO | 17.0 | 558 | 1,900 | 2.8 ± 0.36 | 5.1 ± 0.64 | 2.7 ± 0.29 | 1.4 ± 0.15 |
| Kanazawa, ISHIKAWA | 20.0 | 505 | 2,420 | 3.6 ± 0.43 | 7.1 ± 0.85 | 4.1 ± 0.37 | 1.7 ± 0.15 |
| Neyagawa, OSAKA | 12.9 | 486 | 1,860 | 2.2 ± 0.27 | 4.6 ± 0.56 | 4.0 ± 0.28 | 2.2 ± 0.15 |
| Yamaguchi, YAMAGUCHI | 16.1 | 467 | 2,170 | 3.6 ± 0.37 | 7.7 ± 0.79 | 1.5 ± 0.24 | 0.7 ± 0.11 |
| Nagasaki, NAGASAKI | 18.0 | 970 | 1,700 | 2.5 ± 0.34 | 2.6 ± 0.35 | 0.7 ± 0.25 | 0.4 ± 0.15 |
| Naha, OKINAWA | 17.3 | 1,230 | 1,790 | 2.2 ± 0.29 | 1.8 ± 0.23 | 1.0 ± 0.25 | 0.6 ± 0.14 |
| January, 1981 | | | | | | | |
| Yamagata, YAMAGATA | 18.9 | 637 | 2,260 | 4.0 ± 0.46 | 6.3 ± 0.72 | 3.1 ± 0.32 | 1.4 ± 0.14 |
| Wakayama, WAKAYAMA | 51.6 | 2,540 | 4,540 | 5.4 ± 0.56 | 2.1 ± 0.22 | 4.3 ± 0.46 | 1.0 ± 0.10 |
| February, 1981 | | | | | | | |
| Hiroshima, HIROSHIMA | 15.7 | 457 | 1,520 | 1.8 ± 0.28 | 4.0 ± 0.62 | 1.5 ± 0.23 | 1.0 ± 0.15 |

Figure 4 Sampling Locations of Total diet

1. Sapporo
2. Aomori
3. Sendai
4. Akita
5. Yamagata
6. Fukushima
7. Mito
8. Shinjuku
9. Kanazawa
10. Fukui
11. Neyagawa
12. Wakayama
13. Matsue
14. Hiroshima
15. Yamaguchi
16. Nagasaki
17. Naha



## (5)-1 Strontium-90 and Cesium-137 in Rice (producing districts) (from Nov. 1980 to Dec. 1980)

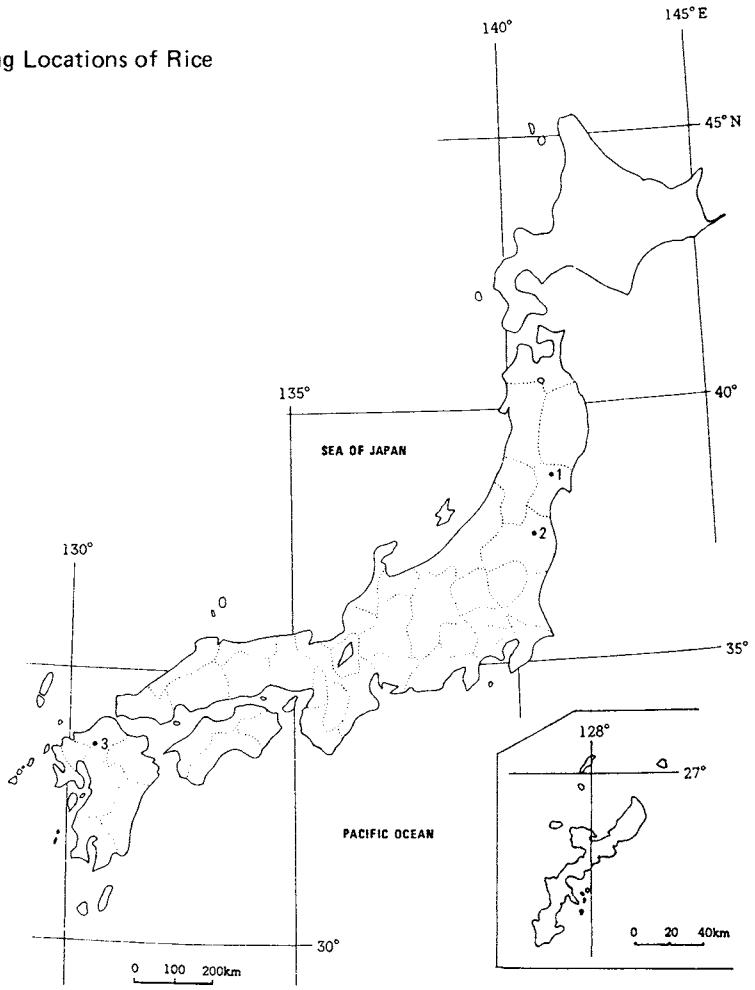
*– continued from No. 54 of this publication –*

### Table (5)-1: Strontium-90 and Cesium-137 in Rice

| Location | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|
| | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| November, 1980 | | | | | | | |
| Fukushima, FUKUSHIMA | 0.410 | 0.0043 | 0.085 | 0.2 ± 0.24 | 3.5 ± 5.5 | 1.3 ± 0.23 | 1.5 ± 0.27 |
| December, 1980 | | | | | | | |
| Kurihara-gun, MIYAGI | 0.516 | 0.0053 | 0.10 | 0.3 ± 0.24 | 5.4 ± 4.6 | 1.4 ± 0.25 | 1.4 ± 0.25 |
| Tsukushino, FUKUOKA | 0.432 | 0.0052 | 0.098 | 0.4 ± 0.25 | 7.9 ± 4.8 | 1.1 ± 0.23 | 1.2 ± 0.24 |

Figure 5-1 Sampling Locations of Rice

1. **Kurihara-gun**
2. **Fukushima**
3. **Tsukushino**



## (5)-2 Strontium-90 and Cesium-137 in Rice (consuming districts) (from Nov. 1980 to Jan. 1981)

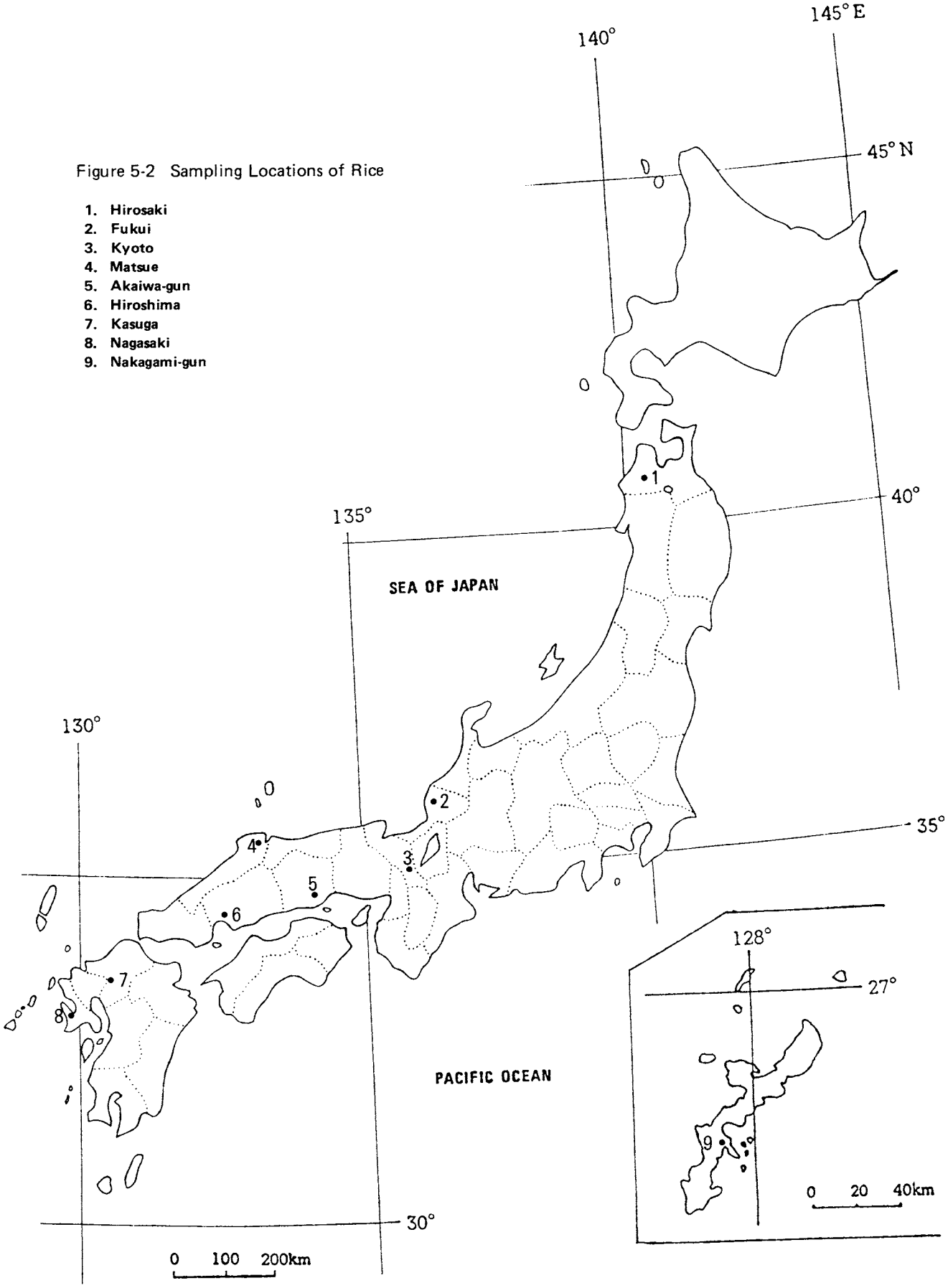
*– continued from No. 54 of this publication –*

### Table (5)-2: Strontium-90 and Cesium-137 in Rice

| Location | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|
| | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| November, 1980 | | | | | | | |
| Fukui, FUKUI | 0.373 | 0.0048 | 0.082 | 0.6 ± 0.23 | 13 ± 4.7 | 1.8 ± 0.24 | 2.2 ± 0.30 |
| Kyoto, KYOTO | 0.584 | 0.0068 | 0.12 | 0.2 ± 0.17 | 2.9 ± 2.6 | 1.6 ± 0.20 | 1.3 ± 0.17 |
| December, 1980 | | | | | | | |
| Matsue, SHIMANE | 0.559 | 0.0063 | 0.13 | 0.9 ± 0.20 | 15 ± 3.1 | 3.6 ± 0.25 | 2.9 ± 0.20 |
| Akaiwa-gun, OKAYAMA | 0.533 | 0.0065 | 0.13 | 0.8 ± 0.28 | 12 ± 4.3 | 1.5 ± 0.27 | 1.1 ± 0.20 |
| Kasuga, FUKUOKA | 0.656 | 0.0067 | 0.14 | 0.1 ± 0.18 | 1.5 ± 2.8 | 5.0 ± 0.31 | 3.5 ± 0.22 |
| Nakagami-gun, OKINAWA | 0.470 | 0.0047 | 0.11 | 0.0 ± 0.27 | 0.0 ± 5.6 | 1.3 ± 0.27 | 1.2 ± 0.25 |
| January, 1981 | | | | | | | |
| Hirosaki, AOMORI | 0.418 | 0.0054 | 0.076 | 0.8 ± 0.27 | 14 ± 4.9 | 2.1 ± 0.29 | 2.7 ± 0.39 |
| Hiroshima, HIROSHIMA | 0.461 | 0.0057 | 0.10 | 0.3 ± 0.26 | 5.3 ± 4.6 | 1.6 ± 0.28 | 1.6 ± 0.27 |
| Nagasaki, NAGASAKI | 0.522 | 0.0062 | 0.11 | 0.05±0.18 | 0.8 ± 3.0 | 2.1 ± 0.22 | 1.9 ± 0.20 |

Figure 5-2 Sampling Locations of Rice

1. Hirosaki
2. Fukui
3. Kyoto
4. Matsue
5. Akaiwa-gun
6. Hiroshima
7. Kasuga
8. Nagasaki
9. Nakagami-gun



## (6)-1 Strontium-90 and Cesium-137 in Milk (producing districts for WHO program) (from Sep. 1980 to Mar. 1981)

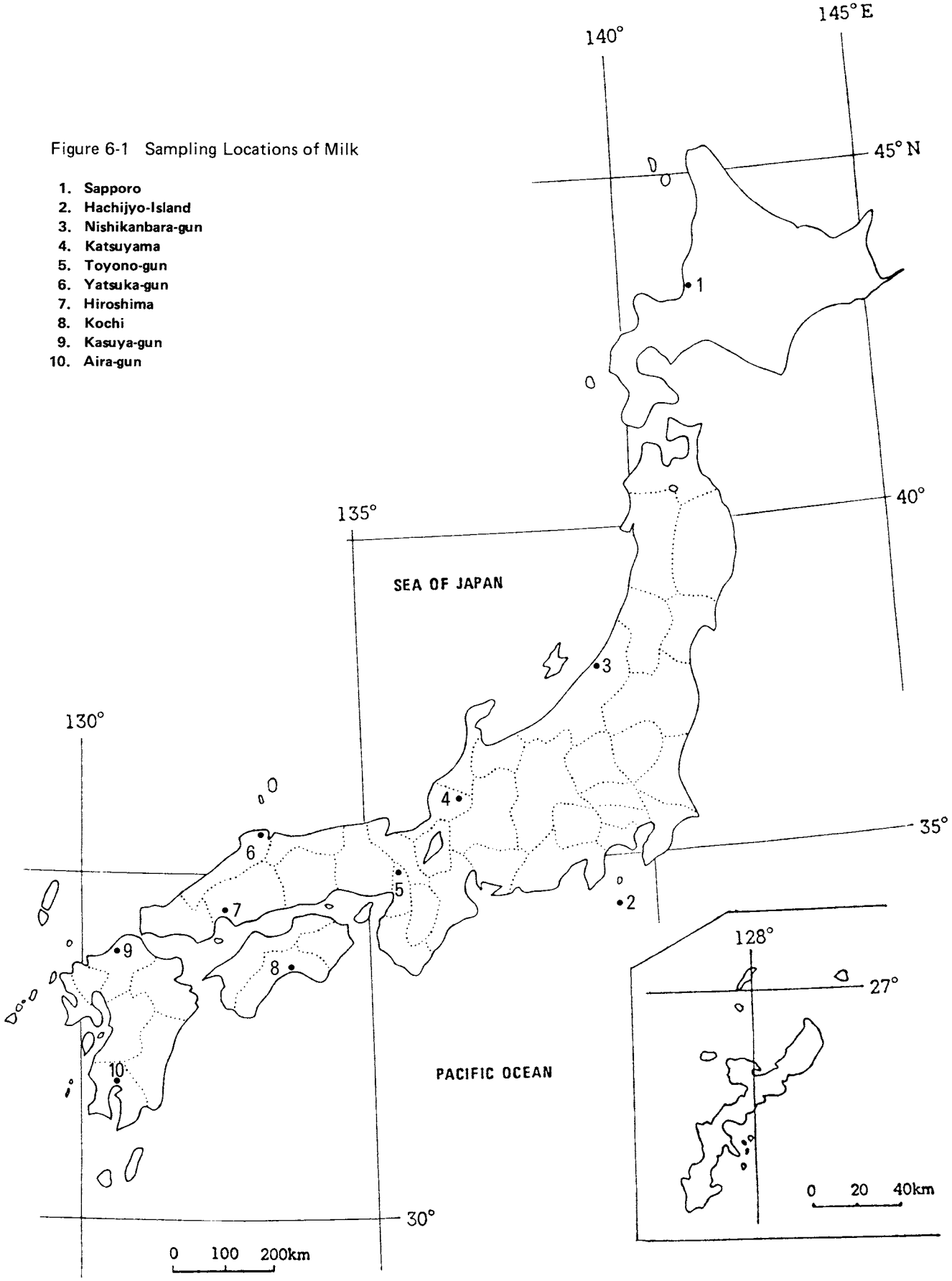
*– continued from No. 54 of this publication –*

### Table (6)-1: Strontium-90 and Cesium-137 in Milk

| 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. |
| September, 1980 | | | | | | | |
| Hiroshima, HIROSHIMA | 5.81 | 0.924 | 1.25 | 0.7 ± 0.18 | 0.7 ± 0.19 | 3.3 ± 0.22 | 2.7 ± 0.18 |
| October, 1980 | | | | | | | |
| Katsuyama, FUKUI | 7.44 | 1.15 | 1.68 | 2.8 ± 0.28 | 2.5 ± 0.24 | 3.9 ± 0.29 | 2.3 ± 0.18 |
| November, 1980 | | | | | | | |
| Toyono-gun, OSAKA | 7.58 | 1.15 | 1.55 | 1.0 ± 0.24 | 0.9 ± 0.21 | 1.3 ± 0.23 | 0.8 ± 0.15 |
| Kasuya-gun, FUKUOKA | 7.55 | 1.13 | 1.62 | 1.1 ± 0.24 | 0.9 ± 0.21 | 0.9 ± 0.19 | 0.6 ± 0.12 |
| December, 1980 | | | | | | | |
| Sapporo, HOKKAIDO | 7.44 | 1.28 | 1.60 | 1.6 ± 0.25 | 1.3 ± 0.20 | 3.9 ± 0.29 | 2.4 ± 0.18 |
| Yatsuka-gun, SHIMANE | 7.37 | 1.15 | 1.55 | 2.6 ± 0.27 | 2.2 ± 0.24 | 7.3 ± 0.36 | 4.7 ± 0.23 |
| Hiroshima, HIROSHIMA | 6.84 | 1.12 | 1.45 | 1.2 ± 0.22 | 1.1 ± 0.20 | 1.8 ± 0.21 | 1.3 ± 0.15 |
| January, 1981 | | | | | | | |
| Toyono-gun, OSAKA | 7.74 | 1.22 | 1.57 | 1.4 ± 0.23 | 1.2 ± 0.18 | 1.3 ± 0.23 | 0.8 ± 0.14 |
| February, 1981 | | | | | | | |
| Sapporo, HOKKAIDO | 7.50 | 1.25 | 1.64 | 1.6 ± 0.24 | 1.3 ± 0.19 | 3.3 ± 0.29 | 2.0 ± 0.18 |
| Hachijyo-Island, TOKYO | 7.23 | 1.10 | 1.61 | 9.8 ± 0.45 | 9.0 ± 0.41 | 28 ± 0.7 | 17 ± 0.4 |
| Nishikanbara-gun, NIIGATA | 7.45 | 1.17 | 1.50 | 1.6 ± 0.23 | 1.4 ± 0.20 | 1.5 ± 0.25 | 1.0 ± 0.17 |
| Katsuyama, FUKUI | 7.08 | 1.11 | 1.55 | 1.1 ± 0.21 | 1.0 ± 0.19 | 9.0 ± 0.39 | 5.8 ± 0.25 |
| Hiroshima, HIROSHIMA | 6.82 | 1.05 | 1.48 | 1.2 ± 0.21 | 1.1 ± 0.20 | 1.5 ± 0.23 | 1.0 ± 0.15 |
| Kochi, KOCHI | 7.25 | 1.15 | 1.61 | 1.1 ± 0.22 | 0.9 ± 0.19 | 1.7 ± 0.23 | 1.1 ± 0.14 |
| Kasuya-gun, FUKUOKA | 6.79 | 1.06 | 1.50 | 0.5 ± 0.17 | 0.5 ± 0.16 | 0.7 ± 0.21 | 0.5 ± 0.14 |
| March, 1981 | | | | | | | |
| Aira-gun, KAGOSHIMA | 7.03 | 1.10 | 1.53 | 2.2 ± 0.28 | 2.0 ± 0.25 | 2.8 ± 0.28 | 1.8 ± 0.19 |

Figure 6-1 Sampling Locations of Milk

1. Sapporo
2. Hachijyo-Island
3. Nishikanbara-gun
4. Katsuyama
5. Toyono-gun
6. Yatsuka-gun
7. Hiroshima
8. Kochi
9. Kasuya-gun
10. Aira-gun



## (6)-2 Strontium-90 and Cesium-137 in Milk (producing districts for domestic program) (Feb. 1981)

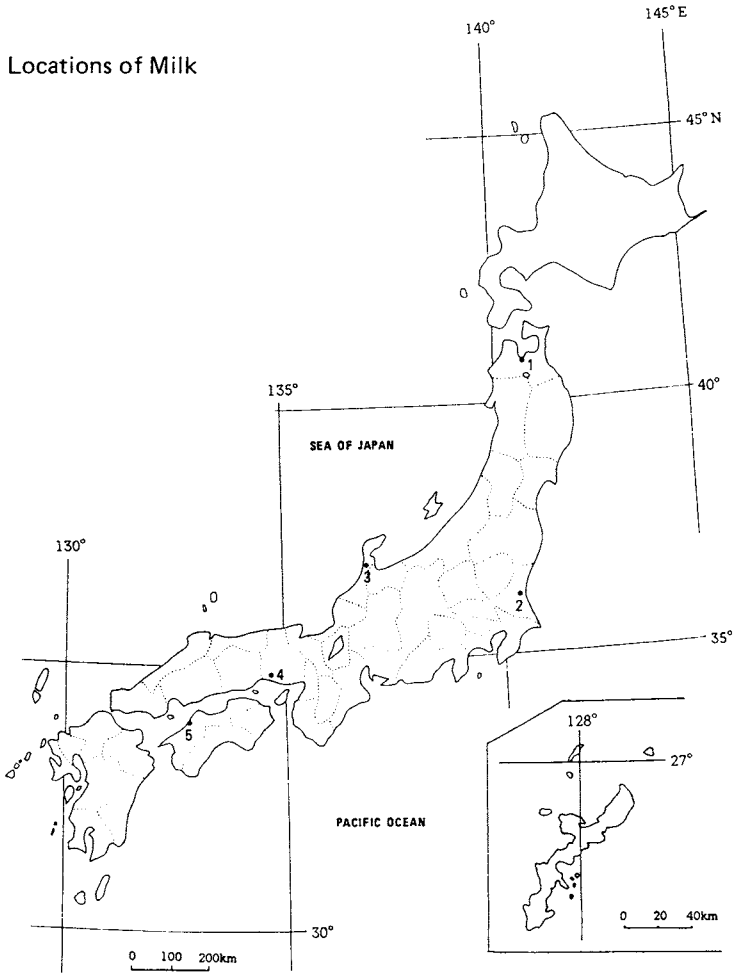
*– continued from No. 54 of this publication –*

### Table (6)-2: Strontium-90 and Cesium-137 in Milk

| 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. |
| (Production) | | | | | | | |
| February, 1981 | | | | | | | |
| Aomori, AOMORI | 7.14 | 1.25 | 1.43 | 5.0 ± 0.34 | 4.0 ± 0.27 | 1.7 ± 0.22 | 1.2 ± 0.16 |
| Mito, IBARAGI | 7.44 | 1.18 | 1.65 | 2.0 ± 0.26 | 1.7 ± 0.22 | 1.4 ± 0.26 | 0.8 ± 0.16 |
| Hakui-gun, ISHIKAWA | 7.72 | 1.24 | 1.66 | 2.4 ± 0.27 | 1.9 ± 0.21 | 2.2 ± 0.25 | 1.4 ± 0.15 |
| Hiemji, HYOGO | 6.84 | 1.16 | 1.48 | 1.7 ± 0.24 | 1.4 ± 0.20 | 0.9 ± 0.19 | 0.6 ± 0.13 |
| Matsuyama, EHIME | 7.53 | 1.21 | 1.51 | 0.9 ± 0.22 | 0.8 ± 0.18 | 1.6 ± 0.23 | 1.0 ± 0.15 |

Figure 6-2 Sampling Locations of Milk

1. **Aomori**
2. **Mito**
3. **Hakui-gun**
4. **Himeji**
5. **Matsuyama**



## (6)-3 Strontium-90 and Cesium-137 in Milk (consuming districts) (from Aug. 1980 to Mar. 1981)

*– continued from No. 54 of this publication –*

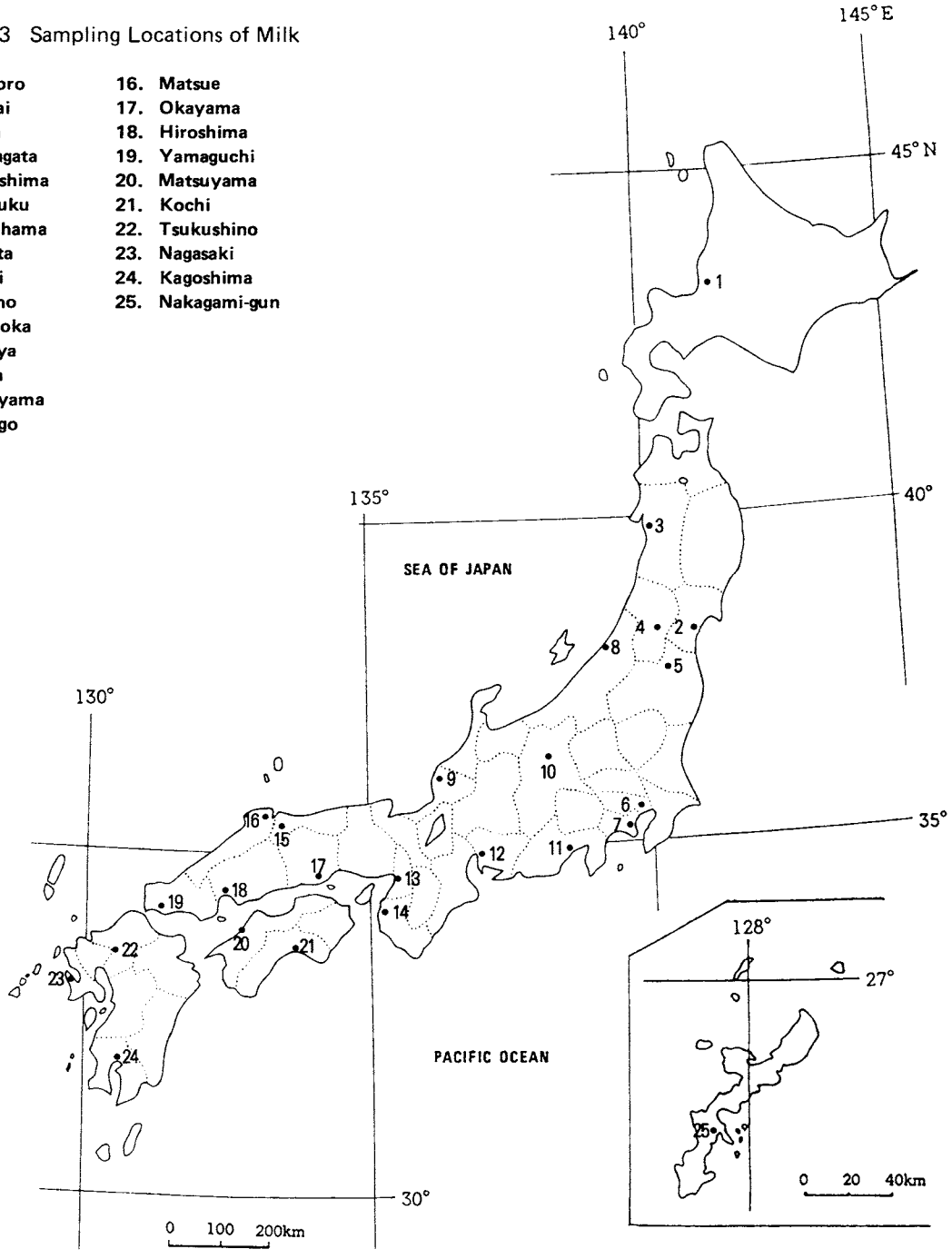
### Table (6)-3: Strontium-90 and Cesium-137 in Milk

| 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. |
| August, 1980 | | | | | | | |
| Fukushima, FUKUSHIMA | 7.13 | 1.11 | 1.60 | 1.4 ± 0.22 | 1.2 ± 0.20 | 3.4 ± 0.26 | 2.1 ± 0.16 |
| September, 1980 | | | | | | | |
| Nakagami-gun, OKINAWA | 6.71 | 1.03 | 1.39 | 0.4 ± 0.17 | 0.4 ± 0.16 | 1.3 ± 0.21 | 0.9 ± 0.15 |
| November, 1980 | | | | | | | |
| Fukui, FUKUI | 7.07 | 1.11 | 1.51 | 1.0 ± 0.21 | 0.9 ± 0.19 | 2.2 ± 0.24 | 1.4 ± 0.16 |
| December, 1980 | | | | | | | |
| Sendai, MIYAGI | 7.16 | 1.14 | 1.49 | 1.0 ± 0.24 | 0.9 ± 0.21 | 1.6 ± 0.22 | 1.1 ± 0.15 |
| Matsue, SHIMANE | 7.55 | 1.26 | 1.59 | 1.6 ± 0.24 | 1.3 ± 0.19 | 3.3 ± 0.27 | 2.1 ± 0.17 |
| Nakagami-gun, OKINAWA | 7.00 | 1.10 | 1.53 | 0.6 ± 0.20 | 0.5 ± 0.18 | 1.3 ± 0.22 | 0.9 ± 0.15 |
| January, 1981 | | | | | | | |
| Sapporo, HOKKAIDO | 7.42 | 1.19 | 1.55 | 3.4 ± 0.32 | 2.9 ± 0.27 | 6.6 ± 0.35 | 4.2 ± 0.23 |
| Akita, AKITA | 7.35 | 1.24 | 1.48 | 3.0 ± 0.30 | 2.4 ± 0.24 | 4.1 ± 0.30 | 2.8 ± 0.20 |
| Osaka, OSAKA | 7.39 | 1.18 | 1.55 | 1.2 ± 0.22 | 1.0 ± 0.18 | 1.7 ± 0.23 | 1.1 ± 0.15 |
| Nagasaki, NAGASAKI | 7.00 | 1.15 | 1.43 | 1.0 ± 0.22 | 0.9 ± 0.19 | 1.8 ± 0.22 | 1.2 ± 0.16 |
| February, 1981 | | | | | | | |
| Yamagata, YAMAGATA | 6.80 | 1.03 | 1.46 | 1.6 ± 0.23 | 1.5 ± 0.23 | 2.1 ± 0.23 | 1.4 ± 0.16 |
| Fukushima, FUKUSHIMA | 7.43 | 1.17 | 1.59 | 1.1 ± 0.23 | 0.9 ± 0.20 | 2.9 ± 0.28 | 1.8 ± 0.17 |
| Shinjuku, TOKYO | 7.02 | 1.10 | 1.56 | 1.5 ± 0.23 | 1.3 ± 0.21 | 5.5 ± 0.37 | 3.5 ± 0.24 |
| Niigata, NIIGATA | 7.69 | 1.15 | 1.61 | 2.5 ± 0.28 | 2.1 ± 0.24 | 5.9 ± 0.37 | 3.7 ± 0.23 |
| Nagano, NAGANO | 7.06 | 1.14 | 1.46 | 1.4 ± 0.24 | 1.2 ± 0.21 | 1.2 ± 0.22 | 0.8 ± 0.15 |
| Shizuoka, SHIZUOKA | 6.82 | 0.995 | 1.51 | 1.0 ± 0.20 | 1.0 ± 0.21 | 2.3 ± 0.25 | 1.5 ± 0.17 |
| Nagoya, AICHI | 6.98 | 1.06 | 1.49 | 1.5 ± 0.24 | 1.4 ± 0.22 | 2.2 ± 0.24 | 1.5 ± 0.16 |
| Wakayama, WAKAYAMA | 7.14 | 0.918 | 1.36 | 1.4 ± 0.24 | 1.5 ± 0.26 | 1.2 ± 0.21 | 0.9 ± 0.16 |
| Yonago, TOTTORI | 7.76 | 1.52 | 2.02 | 2.3 ± 0.31 | 1.5 ± 0.21 | 5.2 ± 0.39 | 2.6 ± 0.19 |
| Okayama, OKAYAMA | 7.22 | 1.14 | 1.59 | 1.8 ± 0.24 | 1.6 ± 0.21 | 4.8 ± 0.30 | 3.0 ± 0.19 |
| Hiroshima, HIROSHIMA | 6.53 | 1.01 | 1.38 | 1.3 ± 0.21 | 1.3 ± 0.21 | 1.0 ± 0.21 | 0.7 ± 0.16 |
| Yamaguchi, YAMAGUCHI | 7.08 | 1.18 | 1.48 | 1.3 ± 0.21 | 1.1 ± 0.18 | 1.4 ± 0.21 | 0.9 ± 0.14 |
| Matsuyama, EHIME | 7.37 | 1.14 | 1.46 | 0.8 ± 0.21 | 0.7 ± 0.18 | 2.7 ± 0.25 | 1.9 ± 0.18 |
| Kochi, KOCHI | 7.02 | 1.10 | 1.53 | 1.5 ± 0.24 | 1.3 ± 0.22 | 1.6 ± 0.21 | 1.1 ± 0.14 |
| Tsukushino, FUKUOKA | 7.22 | 1.26 | 1.54 | 1.0 ± 0.21 | 0.8 ± 0.17 | 1.8 ± 0.23 | 1.1 ± 0.15 |
| Kagoshima, KAGOSHIMA | 6.98 | 1.08 | 1.47 | 1.5 ± 0.24 | 1.4 ± 0.22 | 4.1 ± 0.29 | 2.8 ± 0.20 |

| 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. |
| March, 1981 | | | | | | | |
| Yokohama, KANAGAWA | 6.65 | 1.04 | 1.39 | 1.1 ± 0.21 | 1.0 ± 0.20 | 1.7 ± 0.24 | 1.2 ± 0.17 |

Figure 6-3 Sampling Locations of Milk

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. Osaka
14. Wakayama
15. Yonago
16. Matsue
17. Okayama
18. Hiroshima
19. Yamaguchi
20. Matsuyama
21. Kochi
22. Tsukushino
23. Nagasaki
24. Kagoshima
25. Nakagami-gun



## (7)-1 Strontium-90 and Cesium-137 in Vegetables (producing districts) (from Nov. 1980 to Feb. 1981)

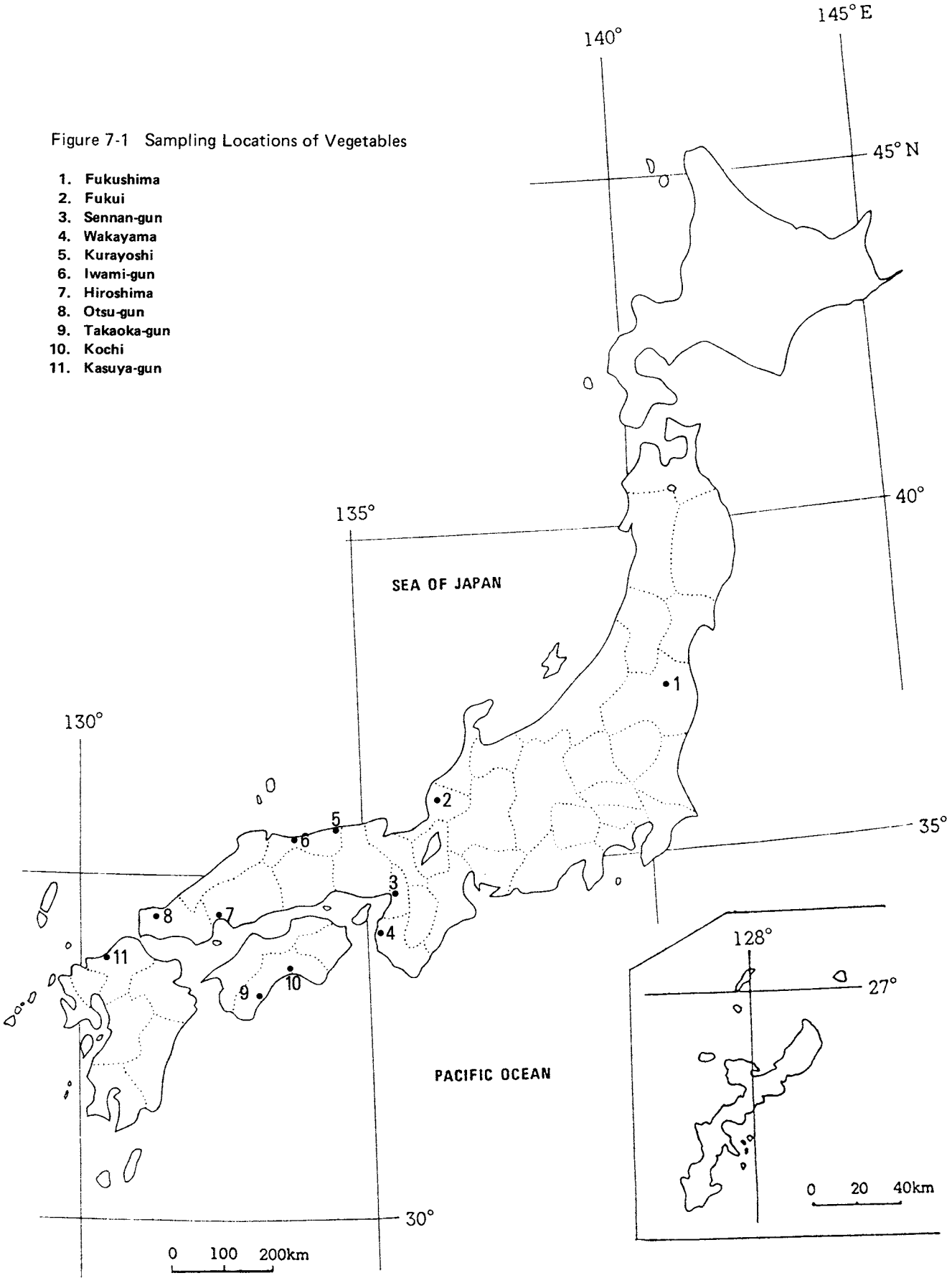
*– continued from No. 54 of this publication –*

### Table (7)-1: Strontium-90 and Cesium-137 in Vegetables

| Location | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|
| | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| (Japanese radish) | | | | | | | |
| November, 1980 | | | | | | | |
| Fukushima, FUKUSHIMA | 0.628 | 0.029 | 0.275 | 4.7 ± 0.36 | 16 ± 1.3 | 6.3 ± 0.34 | 2.3 ± 0.12 |
| Fukui, FUKUI | 0.460 | 0.024 | 0.186 | 7.4 ± 0.52 | 32 ± 2.2 | 2.0 ± 0.28 | 1.1 ± 0.15 |
| Kasuya-gun, FUKUOKA | 0.598 | 0.047 | 0.259 | 3.5 ± 0.29 | 7.4 ± 0.62 | 0.2 ± 0.17 | 0.1 ± 0.06 |
| December, 1980 | | | | | | | |
| Wakayama, WAKAYAMA | 0.547 | 0.024 | 0.264 | 2.2 ± 0.47 | 9.2 ± 2.0 | 0.9 ± 0.32 | 0.3 ± 0.12 |
| Iwami-gun, TOTTORI | 0.642 | 0.026 | 0.293 | 8.3 ± 0.43 | 32 ± 1.6 | 0.3 ± 0.17 | 0.1 ± 0.06 |
| January, 1981 | | | | | | | |
| Takaoka-gun, KOCHI | 0.581 | 0.040 | 0.240 | 16 ± 0.8 | 40 ± 1.9 | 0.1 ± 0.29 | 0.1 ± 0.12 |
| February, 1981 | | | | | | | |
| Hiroshima, HIROSHIMA | 0.442 | 0.028 | 0.196 | 2.4 ± 0.36 | 8.8 ± 1.3 | 0.5 ± 0.24 | 0.3 ± 0.12 |
| Otsu-gun, YAMAGUCHI | 0.655 | 0.035 | 0.282 | 16 ± 0.6 | 48 ± 1.7 | 0.01±0.17 | 0.01±0.06 |
| (Spinach) | | | | | | | |
| November, 1980 | | | | | | | |
| Fukushima, FUKUSHIMA | 1.45 | 0.128 | 0.563 | 0.7 ± 0.32 | 0.5 ± 0.25 | 2.1 ± 0.33 | 0.4 ± 0.06 |
| Fukui, FUKUI | 1.92 | 0.074 | 0.898 | 2.3 ± 0.38 | 3.1 ± 0.51 | 1.0 ± 0.29 | 0.1 ± 0.03 |
| Kurayoshi, TOTTORI | 1.92 | 0.110 | 0.780 | 12 ± 0.6 | 11 ± 0.6 | 6.5 ± 0.44 | 0.8 ± 0.06 |
| Kasuya-gun, FUKUOKA | 1.77 | 0.113 | 0.779 | 13 ± 0.6 | 11 ± 0.6 | 1.4 ± 0.30 | 0.2 ± 0.04 |
| January, 1981 | | | | | | | |
| Kochi, KOCHI | 1.60 | 0.083 | 0.703 | 2.5 ± 0.53 | 3.0 ± 0.64 | 0.8 ± 0.45 | 0.1 ± 0.06 |
| February, 1981 | | | | | | | |
| Hiroshima, HIROSHIMA | 1.47 | 0.059 | 0.577 | 6.3 ± 0.71 | 11 ± 1.2 | 3.0 ± 0.46 | 0.5 ± 0.08 |
| Otsu-gun, YAMAGUCHI | 1.77 | 0.079 | 0.728 | 22 ± 1.2 | 28 ± 1.5 | 2.5 ± 0.58 | 0.3 ± 0.08 |
| (Cabbage) | | | | | | | |
| November, 1980 | | | | | | | |
| Sennan-gun, OSAKA | 0.568 | 0.032 | 0.242 | 3.6 ± 0.32 | 11 ± 1.0 | 0.6 ± 0.15 | 0.3 ± 0.06 |
| (Chinese cabbage) | | | | | | | |
| December, 1980 | | | | | | | |
| Wakayama, WAKAYAMA | 0.729 | 0.023 | 0.226 | 9.3 ± 0.76 | 40 ± 3.3 | 0.6 ± 0.40 | 0.2 ± 0.18 |

Figure 7-1 Sampling Locations of Vegetables

1. Fukushima
2. Fukui
3. Sennan-gun
4. Wakayama
5. Kurayoshi
6. Iwami-gun
7. Hiroshima
8. Otsu-gun
9. Takaoka-gun
10. Kochi
11. Kasuya-gun



## (7)-2 Strontium-90 and Cesium-137 in Vegetables (consuming districts) (from Nov. 1980 to Feb. 1981)

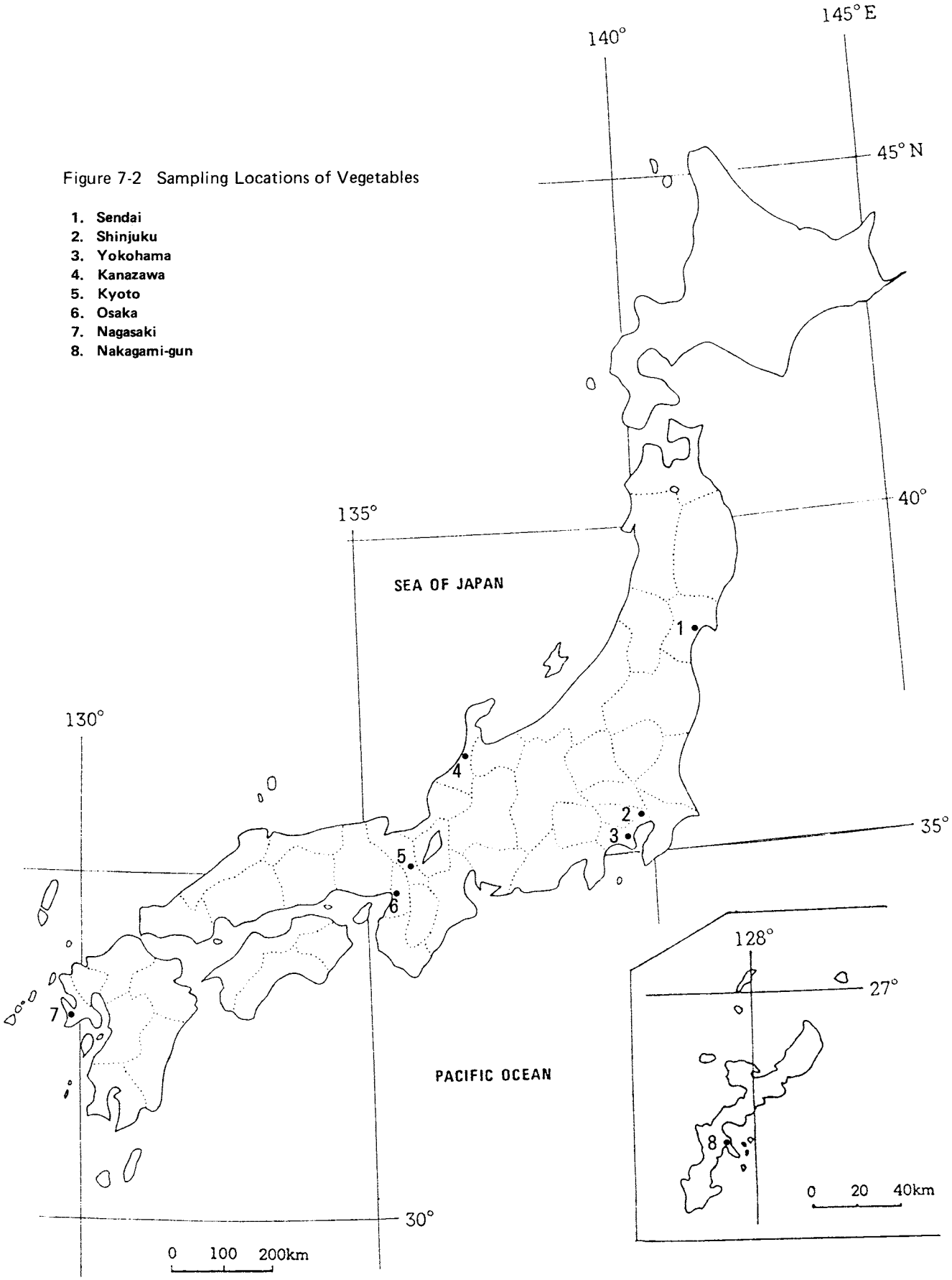
*– continued from No. 54 of this publication –*

### Table (7)-2: Strontium-90 and Cesium-137 in Vegetables

| Location | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|
| | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| (Japanese radish) | | | | | | | |
| November, 1980 | | | | | | | |
| Kanazawa, ISHIKAWA | 0.538 | 0.053 | 0.258 | 10 ± 0.7 | 19 ± 1.3 | 1.4 ± 0.33 | 0.5 ± 0.13 |
| Osaka, OSAKA | 0.524 | 0.020 | 0.252 | 4.2 ± 0.32 | 22 ± 1.6 | 0.5 ± 0.14 | 0.2 ± 0.06 |
| December, 1980 | | | | | | | |
| Sendai, MIYAGI | 0.456 | 0.031 | 0.183 | 5.0 ± 0.44 | 16 ± 1.4 | 0.3 ± 0.21 | 0.2 ± 0.12 |
| Nakagami-gun, OKINAWA | 0.986 | 0.030 | 0.499 | 5.6 ± 0.48 | 19 ± 1.6 | 0.9 ± 0.27 | 0.2 ± 0.05 |
| January, 1981 | | | | | | | |
| Nagasaki, NAGASAKI | 0.588 | 0.030 | 0.280 | 6.1 ± 0.53 | 21 ± 1.8 | 0.3 ± 0.29 | 0.1 ± 0.10 |
| February, 1981 | | | | | | | |
| Yokohama, KANAGAWA | 0.440 | 0.022 | 0.208 | 1.2 ± 0.32 | 5.5 ± 1.5 | 0.1 ± 0.23 | 0.04±0.11 |
| (Spinach) | | | | | | | |
| November, 1980 | | | | | | | |
| Kanazawa, ISHIKAWA | 1.25 | 0.060 | 0.580 | 2.5 ± 0.44 | 4.1 ± 0.74 | 1.8 ± 0.40 | 0.3 ± 0.07 |
| Kyoto, KYOTO | 1.57 | 0.098 | 0.609 | 11 ± 0.7 | 11 ± 0.7 | 0.4 ± 0.30 | 0.1 ± 0.05 |
| Osaka, OSAKA | 1.58 | 0.117 | 0.627 | 6.7 ± 0.57 | 5.7 ± 0.48 | 3.2 ± 0.34 | 0.5 ± 0.05 |
| December, 1980 | | | | | | | |
| Shinjuku, TOKYO | 2.15 | 0.076 | 0.941 | 9.4 ± 0.66 | 12 ± 0.9 | 4.7 ± 0.43 | 0.5 ± 0.05 |
| Nakagami-gun, OKINAWA | 1.78 | 0.097 | 0.558 | 2.9 ± 0.70 | 3.0 ± 0.73 | 1.3 ± 0.51 | 0.2 ± 0.09 |
| January, 1981 | | | | | | | |
| Nagasaki, NAGASAKI | 1.40 | 0.056 | 0.602 | 4.9 ± 0.58 | 8.7 ± 1.0 | 2.5 ± 0.45 | 0.4 ± 0.08 |
| February, 1981 | | | | | | | |
| Yokohama, KANAGAWA | 1.33 | 0.028 | 0.657 | 4.4 ± 0.6 | 16 ± 2.2 | 0.0 ± 0.35 | 0.0 ± 0.05 |

Figure 7-2 Sampling Locations of Vegetables

1. Sendai
2. Shinjuku
3. Yokohama
4. Kanazawa
5. Kyoto
6. Osaka
7. Nagasaki
8. Nakagami-gun



## (8) Strontium-90 and Cesium-137 in Sea fish (from Sep. 1980 to Mar., 1981)

*– continued from No. 54 of this publication –*

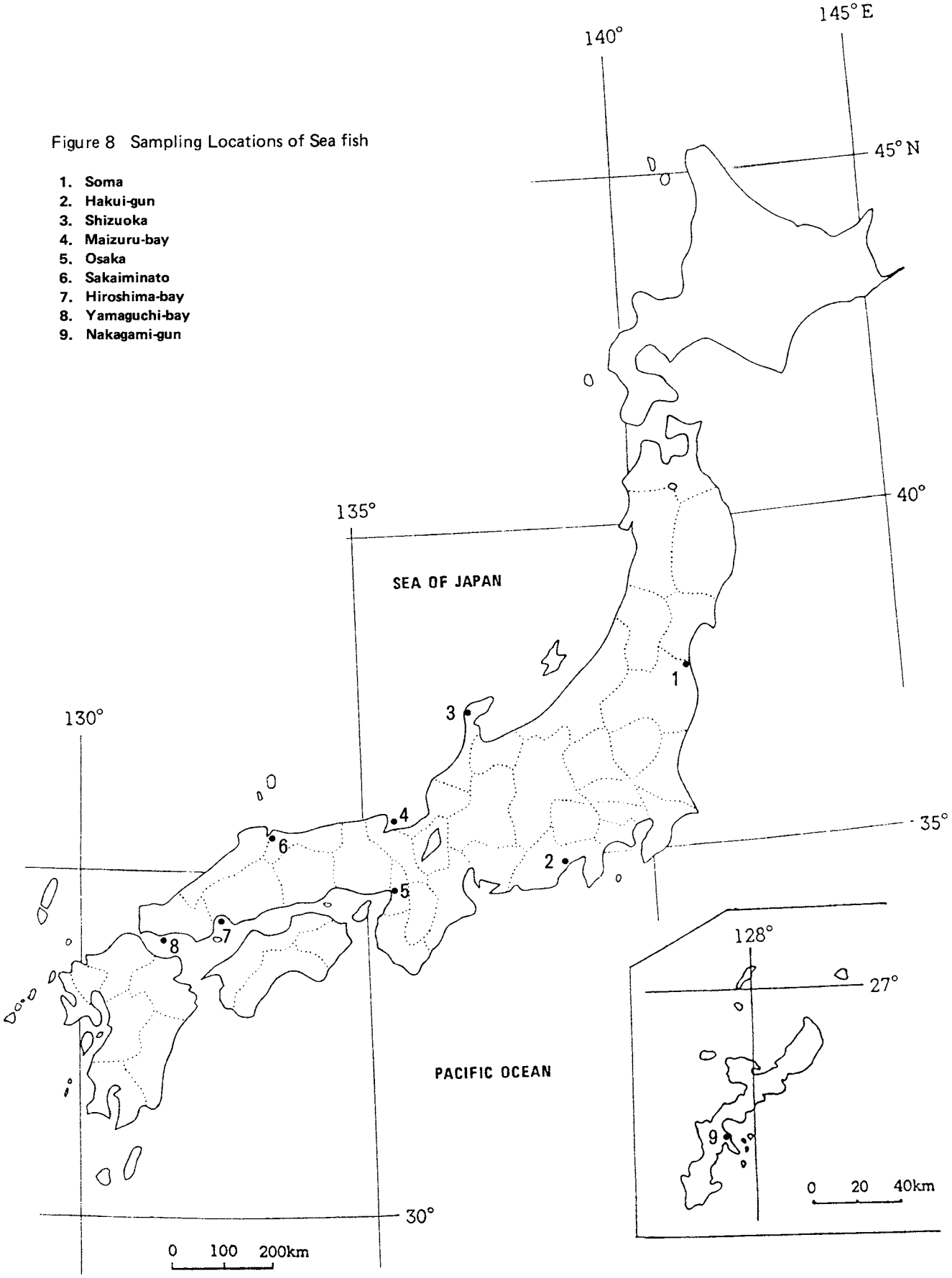
### Table 8: Strontium-90 and Cesium-137 in Sea fish

| Location | Sampling Date | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|---|
| | | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| Lateolabrax japonicus | | | | | | | | |
| Soma, FUKUSHIMA | Feb. 1981 | 1.01 | 6.56 | 31.7 | 0.2 ± 0.24 | 0.2 ± 0.35 | 13 ± 0.6 | 3.8 ± 0.17 |
| Seriola quinqueradiata | | | | | | | | |
| Hakui-gun, ISHIKAWA | Nov. 1980 | 1.21 | 7.76 | 26.7 | 0.3 ± 0.39 | 0.3 ± 0.37 | 13 ± 0.7 | 3.5 ± 0.19 |
| Trachurus trachurus | | | | | | | | |
| Shizuoka, SHIZUOKA | Jan. 1981 | 3.54 | 21.4 | 9.45 | 0.3 ± 0.30 | 0.04 ± 0.04 | 7.4 ± 0.57 | 2.2 ± 0.17 |
| Penumatophorus japonicus | | | | | | | | |
| Maizuru-bay, KYOTO | Dec. 1980 | 2.60 | 19.2 | 12.5 | 0.03 ± 0.31 | 0.01 ± 0.06 | 7.4 ± 0.46 | 2.0 ± 0.13 |
| Osaka, OSAKA | Nov. 1980 | 0.905 | 1.26 | 31.4 | 6.3 ± 0.46 | 55 ± 4.0 | 0.7 ± 0.24 | 0.3 ± 0.08 |
| Sakaiminato, TOTTORI | Jan. 1981 | 1.35 | 5.40 | 23.4 | 0.0 ± 0.27 | 0.0 ± 0.31 | 9.4 ± 0.53 | 2.5 ± 0.14 |
| Pleuronectidae | | | | | | | | |
| Hiroshima-bay, HIROSHIMA | Feb. 1981 | 2.78 | 22.8 | 10.3 | 0.9 ± 0.27 | 0.1 ± 0.04 | 3.5 ± 0.35 | 1.2 ± 0.12 |
| Hexagrammos otakii | | | | | | | | |
| Yamaguchi-bay, YAMAGUCHI | Mar. 1981 | 2.70 | 22.4 | 8.75 | 0.5 ± 0.23 | 0.1 ± 0.04 | 4.9 ± 0.38 | 2.1 ± 0.16 |
| Caesio chrysozonus cuvier | | | | | | | | |
| Nakagami-gun, OKINAWA | Sep. 1980 | 3.21 | 22.3 | 12.8 | 0.7 ± 0.30 | 0.1 ± 0.04 | 8.9 ± 0.52 | 2.1 ± 0.12 |

| Scientific name | English name | Japanese name |
|---|---|---|
| Lateolabrax japonicus | Sea bass (Perch) | Suzuki |
| Seriola quinqueradiata | Yellow-tail | Fukuragi (Buri) |
| Trachurus trachurus | Saurel | Aji |
| Penumatophorus japonicus | Mackerel | Saba |
| Pleuronectidae | Flatfish | Karei |
| Hexagrammos otakii | Rock-trout | Ainame |
| Caesio chrysozonus cuvier | Takasago | Takasago |

Figure 8 Sampling Locations of Sea fish

1. Soma
2. Hakui-gun
3. Shizuoka
4. Maizuru-bay
5. Osaka
6. Sakaiminato
7. Hiroshima-bay
8. Yamaguchi-bay
9. Nakagami-gun



## (9) Strontium-90 and Cesium-137 in Shellfish (Feb. 1981)

*– continued from No. 54 of this publication –*

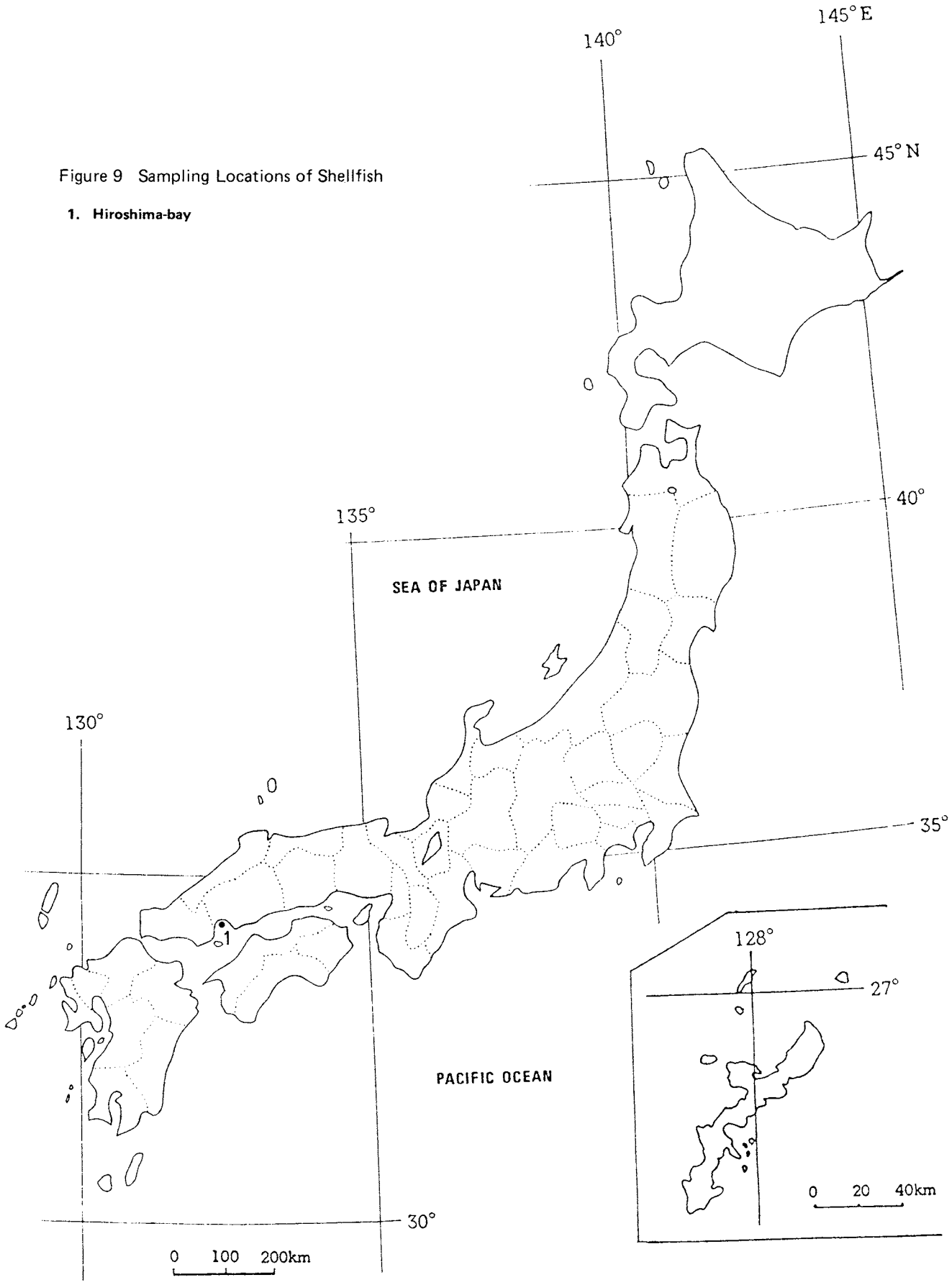
### Table 9: Strontium-90 and Cesium-137 in Shellfish

| Location | Sampling Date | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|---|
| | | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| Ostrea gigas | | | | | | | | |
| Hiroshima-bay, HIROSHIMA | Feb. 1981 | 1.30 | 3.84 | 18.5 | 0.0 ± 0.38 | 0.0 ± 0.75 | 1.7 ± 0.36 | 0.7 ± 0.15 |

| Scientific name | English name | Japanese name |
|---|---|---|
| Ostrea gigas | Oyster | Kaki |

Figure 9 Sampling Locations of Shellfish

**1. Hiroshima-bay**



## (10) Strontium-90 and Cesium-137 in Seaweeds (from Jan. 1981 to Feb. 1981)

*– continued from No. 54 of this publication –*

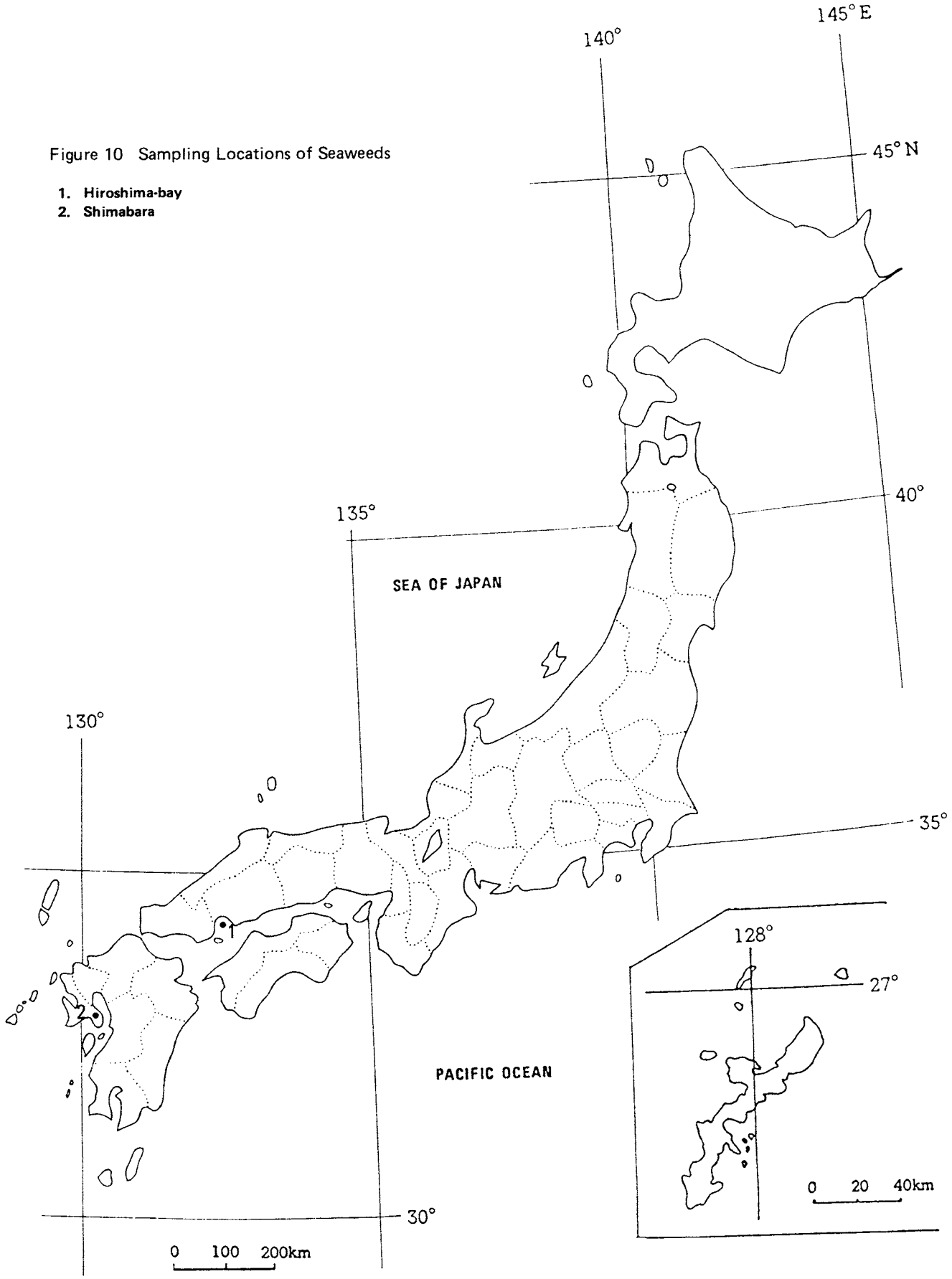
### Table 10: Strontium-90 and Cesium-137 in Seaweeds

| Location | Sampling Date | Component | | | $^{90}Sr$ | | $^{137}Cs$ | |
|---|---|---|---|---|---|---|---|---|
| | | Ash (%) | Ca (%) | K (%) | pCi/kg | S.U. | pCi/kg | C.U. |
| Undaria pinnatifida | | | | | | | | |
| Shimabara, NAGASAKI | Jan. 1981 | 2.97 | 2.48 | 34.2 | 0.7 ± 0.28 | 1.0 ± 0.38 | 1.3 ± 0.29 | 0.1 ± 0.03 |
| Hiroshima-bay, HIROSHIMA | Feb. 1981 | 3.42 | 2.18 | 23.6 | 1.3 ± 0.34 | 1.7 ± 0.45 | 1.7 ± 0.34 | 0.2 ± 0.04 |

| Scientific name | English name | Japanese name |
|---|---|---|
| Undaria pinnatifida | Wakame seaweed | Wakame |

Figure 10 Sampling Locations of Seaweeds

1. **Hiroshima-bay**
2. **Shimabara**



Editted by National Institute of Radiological Sciences, under the supervision of Science and Technology Agency of Japanese Government.