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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

ENVIRONMENTAL RADIOACTIVITY

ISPRA 1964

by

M. de BORTOLI, P. GAGLIONE,
A. MALVICINI and E. VAN DER STRICHT

1965

Joint Nuclear Research Center
Ispra Establishment - Italy

Protection Service
Site Survey and Meteorology

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INTRODUCTION

In this report are summarized the results of the measurements of environmental radioactivity performed by the site survey group of the Protection Service. The personnel of this group, which is supervised by Prof. A. Malvicini, chief of the Protection Service, is the following:

physicist: P. Gaglione chemist: M. de Bortoli

radioactivity measurements: O. Malgarini, E. Lovati
monitoring network and sampling: G. Brughera, L. Pasqualini
chemical laboratory: E. Pecchio, L. Tortora, O. Cadario
secretary: A. Schieppati.

The work is carried out in a chemical laboratory and in a radioactivity measurements laboratory, equipped for gamma and alpha spectrometry and low-level beta counting.

The following reports on the same subject have already been published:

CNI	-	43	Misure di radioattività ambientale, Ispra 1958 - 59
CNI	-	95	Misure di radioattività ambientale, Ispra 1960
EUR	-	223i	Misure di radioattività ambientale, Ispra 1961
EUR	-	481i	Misure di radioattività ambientale, Ispra 1962
EUR	-	2213e	Environmental radioactivity, Ispra 1963

Main object of the measurements performed is the constant knowledge of the radioactivity levels in the environment of the Euratom Ispra Establishment, in order to identify and evaluate incidental radioactive contaminations caused by the Establishment itself.

Since the beginning of the survey the data collected are representative only of the artificial radioactivity produced by weapon testing and of natural radioactivity, both of them contributing, almost entirely, to the irradiation dose of the population in the environs.

The personnel devotes itself almost completely to routine activities, yet efforts are made to improve the techniques and to test new

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methods, with the aim of increasing the quality and the quantity of the work.

During 1964 three important steps have been made on this way:

i) soil analyses were started early in the year;

ii) a spectrometer for the measurement of the cascade gamma emitters in various matrixes was set up in autumn;

iii) in the last weeks of the year were begun the works of centralisation to the building N. 51, were the group is lodged, of the data of air radioactivity from the control stations: the connection, via telephonic cables, will make possible the direct reading, in a room of the building, of the values given by the measuring instruments situated in the stations. The two former topics are discussed more widely in the next chapters.

Starting from 1963 among the activities of the site survey group it was included also the control of the liquid wastes from the decontamination plant for liquids. During 1964 seventeen waste samples were analyzed for gross alpha and beta, gamma emitters and strontium-90.

Mr. E. Van der Stricht, chemist of the site survey group; starting from September 1964 has been transfered to the Directorate for Health and Safety - Bruxelles.

1. AIR RADIOACTIVITY

The control of air radioactivity has been carried out in five Stations situated on the boundary of the Establishment (see Fig. 9). The new stations, which have had been foreseen to be ready late in 1964, owing to delay in construction, will begin to work early in 1965.

The equipment of the stations and the measurements performed are unchanged.

In Tables 1 to 12 are reported the daily values of gross beta radioactivity concentrations in air measured in each station and the daily average values. The latter are represented in the histograms of Figures 1 and 2. The maximum daily value, average of the stations, 4.5 pc/m^3, occurred on January 6; this value is more than 7 times lower than the maximum value measured in 1963, which occurred in January also. The increase in air radioactivity, which is noticed in the last days of October, is due to the chinese burst of the 16th of October. This burst caused also a small contamination of herbage and milk.

Radiochemical separations of strontium-90 and cesium-137 and gamma spectrometry measurements of other radionuclides have been performed on the monthly pooled samples of air filters. The results of these measurements are reported in Table 13, together with the average monthly values of gross beta radioactivity. A plot of strontium-90 and cesium-137 monthly air concentrations is given in Figure 3.

From the data it may be seen that:

i) the average air concentration of strontium-90 during 1964 has been 3.0×10^{-14} c/m^3, value lower than that of 1963 by a factor 1.7;

ii) the average fraction of gross beta radioactivity due to strontium-90 and cesium-137 in 1964 has been 6.6%;

iii) the cesium-137 to strontium-90 ratio (calculated on the yearly average values) has been 1.50.

Environmental radiation levels due to argon-41 discharged from the stack of the Ispra-I Reactor are monitored continuously at the area survey stations. As indicated in Figure 9 these stations are on site at their equipment to measure gamma radiation field is described in Ref.(1).

The highest radiation levels due to argon-41 are recorded at Station 2 (the closest and more downwind to the Reactor) and the monthly values for the years 1963 and 1964 are reported in Figure 3 bis. The yearly average exposure is about 3 mrem, which is negligible compared to the natural radiation level of about 90 mrem/year measured on site.

2. FALLOUT RADIOACTIVITY

Monthly samples of total (dry and wet) fallout are collected on a 4 m^2 area and total beta and gamma spectrometry measurements as well as chemical separations are performed on the dry residue obtained from evaporation.

Gross beta radioactivity, strontium-90, cesium-137 and some other radionuclides deposited at Ispra are given in Tables 14 and 15.

In Figure 4 is represented the histogram of gross beta radioactivity monthly deposition from February 1958 through 1964. The same is made for strontium-90 and cesium-137 in Figures 5 and 6 respectively; moreover, in Figure 5 is plotted the cumulative deposit of strontium-90, which at the end of 1964, attained the value of almost 120 mc/Km^2.

During 1964 the shorter lived nuclides like strontium-89, ruthenium-103 and cerium-141 were no more detectable, excepted a short period following the chinese burst. In the month of December also the amount of zirconium-95 + niobium-95 became negligible.

Strontium-90 deposition, 22.6 mc/Km^2, was about the half of that occurred in 1963 and also precipitation was nearly halved (1060 mm against 1942 mm).

In order to measure the fallout activation products having gamma radiations emitted in cascade a "sum coincidence" spectrometer was set up late in 1964 (2). Direct determination of radionuclides like sodium-22, cobalt-60, yttrium-88 and antimony-124 in fallout samples was thus possible and their concentrations from 1963 through 1964 are reported in Table 15.

Some differences in fallout rates between fission products and activation products may be noticed from the data reported.

3 HERBAGE RADIOACTIVITY

Samples for the control of herbage radioactivity are collected in the following sites: Barza, Brebbia, Ispra, Osmate, Monvalle, Taino and Roccolo. The first four sites are also milk sampling points and the last one is the hill on which is located building N. 51 (see Fig. 10). Moreover five sampling points are located within the Establishment (see Fig. 9); additional samples are collected whenever this is judged necessary. Samples have been collected on a monthly basis during the growing season and each sample (2 Kg fresh wt.) is made up of several sub-samples, collected in different fields at each site, in order to obtain a good representativity.

Samples are dried and submitted to gamma spectrometry measurement; on an ashed aliquot of each sample chemical separations of strontium and cesium and flame photometric determinations of calcium and potassium are performed. Only a few photometric determinations of stable strontium are made on pooled samples to take it into account in the calculations of the chemical recoveries. The results of the measurements together with the values of the fresh matter to dry matter weight ratio are reported in Table 16. From the latter data the concentrations in fresh herbage may be inferred.

4. RADIOACTIVITY OF MILK AND DAIRY PRODUCTS

For the monitoring of the milk produced in the environs of the Establishment samples are collected in the dairies of the four villages: Barza, Brebbia, Ispra and Osmate (see map in Fig. 10) and, moreover, for comparison purposes, in the two milk supply stations of Varese and Milano. Two one liter samples are collected weekly and the measurements are performed on the pooled monthly samples.

The dried milk is submitted to gamma spectrometry by which cesium-137 and potassium are determined. On an ashed aliquot of each sample chemical separations of strontium and cesium and flame photometric determinations of calcium and potassium are performed. In Tables 17

to 22 the data obtained are reported. A plot of strontium-90 in the milk of the zone of Ispra (average values of the four sites) and in that of Milano from 1960 through 1964 is given in Figure 7.

In Figure 8 may be found a plot of sodium-22 average concentration in the milk of the zone of Ispra from 1963 through 1964. These measurements were performed by direct gamma spectrometry. More detailed information on the movement of sodium-22 from fallout through food chains are given in a paper to be published (3).

Two series of cheese samples were collected during 1964; part of these samples were produced in Italy and part abroad. Cheese samples are submitted to the same measurements performed on milk samples. The data obtained are reported in Table 23.

5. RADIOACTIVITY OF WATERS

Waters are sampled on a monthly basis in 23 points including lakes, streams, wells and tapwater. Five liter samples are evaporated and beta counted; flame photometric measurements of potassium on each sample are made to provide subtraction of beta radioactivity due to potassium-40. In Table 24 are given the geographic coordinates of the sampling points and in Tables 25 and 26 the radioactivity data for the lake "Maggiore" and the other points respectively.

Quarterly collections of large volumes of water (400 to 500 liters) are performed in the four nearest lakes to the Establishment, in order to measure the concentrations of strontium-90, cesium-137 and other radionuclides. The data obtained are reported in Tables 27 and 28. Making a comparison of strontium-90 and cesium-137 concentrations with those found in 1963 it may be noticed that both radionuclides have not appreciably decreased, despite the marked reduction in fallout rate. Moreover a cesium-137 to strontium-90 ratio of roughly 1, or smaller, is constantly observed in lake waters.

A control of sewer waters is carried out within the Establishment: 27 100 ml samples are collected daily and the dry residue counted for gross alpha and beta radioactivity.

6. STRONTIUM-90 AND CESIUM-137 IN FISHES

Quarterly 2.5 Kg samples of three fish species are taken in the four nearest lakes whenever made available by fishers. Samples are submitted to the same procedure adopted for milk samples. In Tables 29 to 32 the data obtained are reported.

7. STRONTIUM-90 IN CALF-BONES

Femour samples of 39 calves, about two months old and milk fed, have been collected and their strontium-90 content has been measured. The data are reported in Table 33.

Strontium-90 levels during 1964 have been about the same found late in 1963.

8. STRONTIUM-90 AND CESIUM-137 IN VEGETABLES

Vegetables from the most important production zones of Italy are sampled fortnightly at the market of Milano.

Each sample dried and ground is submitted to gamma spectrometry measurement, whereas chemical separations of strontium and cesium are performed on the yearly pooled samples of each species.

The results of the measurements are reported in Table 34.

9. SOIL RADIOACTIVITY

Early in 1964 several soil samples (10 cm depth) were collected and analyzed for strontium-90, cesium-137, calcium, potassium and stable strontium through the method developed during 1963 (4). With this method the sample is brought into solution by means of hot hydrochloric acid; strontium carrier is then separated through solvent extraction and ion exchange

procedures and yttrium-90 daughter beta counted. Cesium-137 is separated by adsorption on ammonium phosphomolybdate layer (5) and measured by gamma spectrometry.

Calcium and potassium determinations are performed by flame photometry on sample aliquots dissolved in hydrofluoric acid.

The data obtained are reported in Table 35.

The map in Figure 10 shows the distribution of soil sampling sites, which were selected on the basis of meteorological and geological considerations, in order to evaluate, besides the contamination levels, also the influence of rainfall and of the nature of the soil on its artificial radioactivity content. Within the Establishment several soil samples are also collected and controlled by gamma spectrometry to detect incidental contaminations. Six of these on-site samples are submitted to the complete analysis adopted for the off-site samples.

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Table 1

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JANUARY 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	2.05	2.13	1.97	1.88	1.70	1.94	
2	1.98	1.88	1.98	1.95	1.88	1.93	
3	1.56	1.48	1.38	1.37	1.38	1.43	
4	1.38	1.25	1.33	1.07	1.15	1.23	
5	1.96	2.38	2.18	1.70	1.92	2.02	
6	4.62	4.90	4.60	3.95	4.24	4.46	
7	4.50	4.60	4.48	3.65	4.17	4.28	
8	2.94	2.98	2.83	2.53	2.66	2.78	
9	3.06	2.80	2.86	2.55	2.73	2.80	
10	2.67	2.45	2.50	2.41	2.36	2.47	1.6
11	0.76	0.68	0.69	0.70	0.70	0.70	8.4
12	0.08	0.10	0.10	0.04	0.10	0.08	15.8
13	0.10	0.03	-	0.04	0.09	0.06	14.4
14	0.14	0.09	0.06	-	-	0.09	0.4
15	0.36	0.23	0.32	0.30	0.34	0.31	
16	1.08	1.00	1.04	0.85	0.97	0.98	
17	1.46	1.35	1.37	1.30	-	1.37	
18	1.62	1.55	1.59	1.44	1.48	1.53	
19	2.28	2.32	2.31	2.18	2.18	2.25	
20	2.23	2.42	1.85	1.76	1.95	2.04	
21	2.54	1.23	1.16	1.30	1.21	1.48	
22	3.54	3.60	-	3.40	3.55	3.52	
23	2.95	3.07	3.06	2.80	2.80	2.93	
24	2.66	2.60	2.62	2.40	2.51	2.55	
25	2.60	2.60	2.56	2.55	2.60	2.58	
26	1.57	1.53	1.58	1.46	1.50	1.52	
27	2.10	2.00	2.13	1.70	-	1.98	
28	2.25	2.54	2.35	2.25	2.26	2.35	
29	2.02	2.04	2.05	1.85	2.00	1.99	
30	1.80	1.66	1.95	1.15	1.53	1.62	
31	1.66	1.82	1.80	1.60	1.74	1.72	
Av. value	2.01	1.97	1.95	1.80	1.91	1.90	
Min. value	0.08	0.03	0.06	0.04	0.09	0.06	
Max. value	4.62	4.90	4.60	3.95	4.24	4.46	
Total precipit.							40.6

- = Measurement not performed.

Table 2

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

FEBRUARY 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	1.93	2.00	1.90	1.74	1.90	1.89	
2	3.08	3.00	2.97	2.72	2.90	2.93	
3	2.32	2.10	2.20	2.08	2.20	2.18	
4	2.62	2.72	2.87	2.55	2.50	2.65	
5	1.22	2.30	2.16	2.05	2.12	1.97	
6	1.19	1.14	1.15	1.10	1.29	1.17	
7	0.85	0.83	0.90	0.80	0.85	0.84	
8	1.46	1.37	1.40	1.30	1.39	1.38	
9	2.09	2.06	2.05	2.05	1.98	2.04	
10	1.14	1.06	1.12	1.00	1.16	1.09	
11	1.43	1.46	1.47	1.34	0.90	1.32	
12	1.05	0.88	0.92	0.97	1.02	0.97	
13	1.14	1.14	1.08	1.10	1.14	1.12	
14	1.09	1.08	1.06	1.00	0.96	1.04	
15	0.62	0.63	0.64	0.51	0.56	0.59	14.6
16	0.50	0.52	0.52	0.47	0.50	0.50	1.2
17	0.07	0.06	0.04	0.04	0.04	0.05	11.6
18	0.35	0.32	0.34	0.23	0.23	0.29	
19	1.38	1.34	1.40	0.95	1.18	1.25	0.8
20	1.60	1.48	1.53	1.44	1.56	1.52	
21	2.48	2.35	2.50	2.27	2.37	2.39	
22	2.14	2.08	2.20	1.94	2.10	2.09	
23	2.18	2.25	2.17	2.00	2.06	2.13	
24	2.30	2.07	2.12	2.12	2.03	2.13	1.8
25	0.70	0.60	0.73	0.64	0.73	0.68	20.2
26	0.33	0.12	0.40	0.33	0.35	0.30	0.8
27	0.13	0.12	0.16	0.13	0.14	0.13	3.0
28	0.20	0.18	0.16	0.18	0.18	0.18	3.6
29	0.05	0.04	0.07	0.04	0.05	0.05	16.6
Av. value	1.29	1.28	1.31	1.21	1.25	1.27	
Min. value	0.05	0.04	0.04	0.04	0.04	0.05	
Max. value	3.08	3.00	2.97	2.72	2.90	2.93	
Total precipit.							74.2

Table 3

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

MARCH 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	0.37	0.40	0.34	0.31	0.38	0.36	
2	1.40	1.38	1.29	1.20	1.22	1.30	
3	1.22	1.24	1.17	1.08	1.17	1.18	
4	1.53	1.57	1.53	1.39	1.56	1.52	
5	0.50	0.48	0.48	0.45	0.48	0.48	30.2
6	0.65	0.70	0.62	0.68	0.61	0.65	1.0
7	0.92	0.95	0.92	0.82	0.88	0.90	1.2
8	0.78	0.76	0.75	0.75	0.73	0.75	1.2
9	0.46	0.42	0.45	0.35	0.44	0.42	4.4
10	0.78	0.71	0.72	0.68	0.68	0.71	
11	1.68	1.63	1.57	1.37	1.60	1.57	
12	1.88	1.82	1.90	1.90	1.80	1.86	12.4
13	0.43	0.39	0.42	0.38	0.38	0.40	4.4
14	0.19	0.16	0.19	0.20	0.16	0.18	
15	0.14	0.09	0.09	0.07	0.12	0.10	5.4
16	0.16	0.17	0.13	0.14	0.14	0.15	
17	0.73	0.74	0.72	0.71	0.69	0.72	
18	0.66	0.70	0.66	0.64	0.63	0.66	0.2
19	0.65	0.67	0.62	0.62	0.55	0.62	
20	0.08	0.10	0.10	0.10	0.09	0.09	13.2
21	0.16	0.13	0.14	0.07	0.13	0.12	3.8
22	1.72	1.71	1.65	1.64	1.74	1.69	
23	1.38	1.55	1.42	1.40	1.52	1.45	
24	1.63	1.53	1.41	1.48	1.42	1.49	
25	1.18	1.02	1.01	1.12	1.07	1.08	4.2
26	0.13	0.09	0.14	0.14	0.13	0.12	17.6
27	0.04	0.04	0.04	0.04	0.06	0.04	19.8
28	0.04	0.07	0.04	0.05	0.05	0.05	23.0
29	0.20	0.20	0.17	0.14	0.19	0.18	1.6
30	0.58	0.61	0.57	0.64	0.56	0.59	25.4
31	0.58	0.60	0.58	0.40	0.50	0.53	4.6
Av. value	0.73	0.73	0.70	0.67	0.69	0.70	
Min. value	0.04	0.04	0.04	0.04	0.05	0.04	
Max. value	1.88	1.82	1.90	1.90	1.80	1.86	
Total precipit.							169.6

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

APRIL 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value$_3$ pc/m^3	Precipitation mm
1	1.90	2.10	2.00	1.82	1.96	1.95	
2	0.31	0.27	0.27	0.24	0.21	0.26	48.0
3	0.84	0.80	0.81	0.68	0.82	0.79	1.0
4	2.18	2.04	2.06	2.06	1.99	2.07	0.2
5	0.62	0.71	0.64	0.68	0.63	0.66	5.2
6	0.78	0.84	-	0.74	0.81	0.79	7.2
7	1.34	1.35	1.32	1.21	1.33	1.31	1.8
8	2.10	2.10	2.16	1.96	1.92	2.04	
9	1.48	1.42	1.42	1.27	1.30	1.37	
10	1.61	1.48	1.55	1.29	1.42	1.47	
11	1.73	1.76	1.67	1.48	1.60	1.64	
12	1.66	1.58	1.60	1.44	1.54	1.56	
13	2.15	1.93	1.95	1.89	1.95	1.97	
14	1.99	2.03	1.44	1.83	1.91	1.84	0.8
15	2.02	2.13	2.02	1.90	1.87	1.99	0.4
16	1.80	1.87	1.80	1.83	1.70	1.80	2.8
17	2.22	2.40	2.40	2.16	2.20	2.28	
18	2.68	2.84	2.92	2.76	2.76	2.79	7.0
19	0.66	0.73	0.62	0.50	0.52	0.60	38.6
20	0.22	0.26	0.25	0.23	0.26	0.24	34.6
21	1.53	1.54	1.47	1.38	1.56	1.49	4.6
22	2.38	2.25	2.16	2.17	2.25	2.24	0.2
23	2.14	2.07	2.16	2.01	1.91	2.06	0.2
24	1.56	1.68	1.58	1.60	1.58	1.60	
25	1.50	1.51	1.51	1.47	1.49	1.50	
26	2.06	2.08	2.06	1.82	2.00	2.00	
27	2.76	2.68	2.72	2.56	2.58	2.66	
28	2.90	2.84	2.74	2.58	2.70	2.75	
29	2.05	1.92	1.90	1.97	1.90	1.95	
30	1.04	1.00	0.99	0.92	0.90	0.97	0.2
Av. Value	1.67	1.67	1.66	1.55	1.59	1.62	
Min. value	0.22	0.26	0.25	0.23	0.21	0.24	
Max. value	2.90	2.84	2.92	2.76	2.76	2.79	
Total precipit.							152.8

- = Measurement not performed.

Table 5

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

MAY 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	1.56	1.52	1.47	1.42	1.56	1.50	1.0
2	2.50	2.48	2.44	2.20	2.22	2.37	
3	2.44	2.18	2.38	2.14	2.28	2.28	
4	2.40	2.43	2.50	2.22	2.32	2.37	0.2
5	2.18	2.24	2.04	2.30	2.24	2.20	
6	2.40	2.40	2.56	2.18	2.26	2.36	
7	1.97	1.94	1.93	1.80	1.91	1.91	
8	2.17	2.22	2.18	2.03	2.03	2.13	
9	1.49	1.47	1.42	1.38	1.43	1.44	16.4
10	1.94	1.96	1.87	1.75	1.82	1.87	1.2
11	1.79	1.92	1.75	1.72	1.79	1.79	0.2
12	1.90	1.85	1.84	1.58	1.64	1.76	
13	2.68	2.50	2.52	2.30	2.40	2.48	
14	2.18	2.08	2.06	2.01	2.04	2.08	
15	1.89	1.96	1.86	1.96	1.95	1.93	
16	3.15	3.44	3.34	3.03	3.05	3.20	
17	2.50	2.64	2.73	2.23	2.42	2.50	
18	3.10	3.20	3.16	3.00	3.08	3.11	0.2
19	3.06	3.07	3.00	3.00	2.90	3.01	
20	1.90	1.93	1.84	1.82	1.86	1.87	
21	1.94	2.18	1.83	1.91	1.86	1.94	
22	1.78	1.92	1.83	1.94	1.84	1.86	1.0
23	1.98	2.08	1.88	2.08	2.05	2.01	
24	1.91	2.14	1.97	2.02	2.14	2.04	
25	0.76	0.79	0.74	0.77	0.75	0.76	34.8
26	2.20	2.20	2.18	1.93	2.10	2.12	
27	1.71	1.80	1.62	1.60	1.67	1.68	9.0
28	1.22	1.24	1.21	1.12	1.17	1.19	2.6
29	1.36	1.41	-	1.07	1.28	1.28	0.2
30	1.42	1.46	-	1.26	1.33	1.36	
31	1.54	1.61	-	1.59	1.60	1.58	1.6
Av. value	2.04	2.08	2.08	1.92	1.97	2.00	
Min. value	0.76	0.79	0.74	0.77	0.75	0.76	
Max. value	3.15	3.44	3.34	3.03	3.08	3.20	
Total precipit.							68.

- = Measurement not performed.

Table 5

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JUNE 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	1.65	1.68	1.67	1.66	1.67	1.66	15.6
2	2.28	2.32	2.14	2.12	2.22	2.21	18.6
3	2.45	2.46	2.44	2.38	2.52	2.45	
4	2.78	2.76	2.73	2.70	2.76	2.74	
5	2.90	2.82	2.73	2.90	2.70	2.81	
6	3.05	3.10	3.00	2.90	2.90	2.99	0.4
7	2.80	2.80	2.76	2.66	2.68	2.74	
8	3.50	3.38	3.52	3.52	3.44	3.47	
9	2.70	2.72	2.84	2.46	2.60	2.66	
10	2.38	2.40	2.38	2.22	-	2.35	
11	2.48	2.50	2.53	2.18	2.40	2.42	
12	3.05	3.17	3.08	2.83	2.94	3.01	
13	3.04	3.10	2.97	2.80	2.97	2.98	
14	1.17	1.15	1.07	1.11	1.07	1.11	2.8
15	1.00	0.98	1.01	1.00	0.99	1.00	19.4
16	1.45	1.50	1.43	1.41	1.46	1.45	
17	1.30	1.26	1.32	1.16	1.21	1.25	
18	1.16	1.26	1.26	1.07	1.17	1.18	
19	0.68	0.73	0.60	0.54	0.56	0.62	33.4
20	0.93	0.93	0.92	0.97	0.96	0.94	10.6
21	1.32	1.29	1.28	1.30	1.27	1.29	9.8
22	2.22	2.38	2.28	2.26	2.40	2.31	0.6
23	3.22	3.08	3.07	2.93	2.97	3.05	
24	2.28	2.30	2.29	2.26	2.26	2.28	9.6
25	1.47	1.46	1.50	1.36	1.40	1.44	0.4
26	1.40	1.46	1.36	1.38	1.36	1.39	1.2
27	1.40	1.59	1.39	1.44	1.44	1.45	2.8
28	1.33	1.33	1.30	1.20	1.18	1.27	
29	2.18	2.05	2.00	2.03	2.10	2.07	
30	2.80	2.68	2.70	2.56	2.68	2.68	
Av. value	2.07	2.08	2.05	1.97	2.00	2.04	
Min. value	0.68	0.73	0.60	0.54	0.56	0.62	
Max. value	3.50	3.38	3.52	3.52	3.44	3.47	
Total precipit.							125.2

- = Measurement not performed.

Table 7

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JULY 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	3.04	3.00	2.93	2.75	2.86	2.91	
2	2.40	2.42	2.38	2.30	2.30	2.36	
3	2.14	2.10	2.06	2.00	2.00	2.06	
4	2.06	2.03	2.03	1.97	2.00	2.02	0.8
5	1.50	1.52	1.40	1.41	1.39	1.44	2.8
6	1.82	1.80	1.80	1.62	1.72	1.75	
7	1.23	1.26	1.21	1.16	1.26	1.22	3.6
8	1.80	1.66	1.66	1.46	1.58	1.63	0.2
9	2.00	1.94	1.91	1.95	1.93	1.94	1.2
10	0.80	0.79	0.77	0.79	0.77	0.78	
11	1.03	1.14	1.11	1.02	1.07	1.07	
12	0.92	0.94	0.92	0.84	0.90	0.91	
13	1.07	1.11	1.09	1.04	1.08	1.08	
14	1.00	1.06	1.00	1.00	1.00	1.01	
15	1.15	1.13	1.12	1.00	1.08	1.09	
16	1.66	1.51	1.58	1.47	1.59	1.56	
17	1.49	1.53	1.50	1.38	1.43	1.46	
18	1.68	1.74	1.69	1.47	1.50	1.61	
19	1.37	1.38	1.22	1.34	1.28	1.32	
20	1.29	1.15	1.16	1.10	1.20	1.18	
21	1.34	1.34	1.24	1.30	1.25	1.29	
22	1.20	1.22	1.21	1.12	1.24	1.20	
23	1.26	1.28	1.19	1.19	1.26	1.23	1.2
24	1.52	1.45	1.42	1.39	1.48	1.45	
25	1.51	1.53	1.52	1.47	1.41	1.49	
26	1.36	1.37	1.36	1.22	1.22	1.30	
27	1.31	1.28	1.26	1.23	1.28	1.27	
28	0.88	0.88	0.92	0.86	0.88	0.88	
29	0.85	0.83	0.80	0.82	0.86	0.83	0.2
30	0.95	0.91	0.90	0.80	0.91	0.89	1.6
31	1.11	1.02	1.06	1.05	1.07	1.06	1.0
Av. value	1.44	1.42	1.40	1.33	1.38	1.39	
Min. value	0.80	0.79	0.77	0.79	0.77	0.78	
Max. value	3.04	3.00	2.93	2.75	2.86	2.91	
Total precipit.							12.6

Table 8

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

AUGUST 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	1.46	1.44	1.46	1.30	1.40	1.41	
2	0.60	0.56	0.55	0.54	0.52	0.55	
3	1.00	1.04	1.04	0.93	0.98	1.00	
4	1.72	1.65	1.62	1.56	1.60	1.63	
5	1.66	1.66	1.62	1.58	1.53	1.61	
6	1.72	1.72	1.63	1.58	1.60	1.65	
7	1.36	1.36	1.42	1.35	0.90	1.28	0.2
8	1.27	1.28	1.28	1.23	1.28	1.27	21.2
9	0.94	0.98	0.91	0.82	0.94	0.92	1.8
10	0.64	0.60	0.61	0.61	0.62	0.62	
11	0.90	0.89	0.85	0.82	0.80	0.85	
12	0.80	0.78	0.80	0.74	0.79	0.78	2.2
13	1.02	1.04	1.06	1.02	1.09	1.04	
14	1.00	1.00	0.98	0.90	0.96	0.97	
15	0.52	0.45	0.46	0.40	0.42	0.45	17.4
16	0.58	0.54	0.62	0.48	0.52	0.55	0.2
17	0.68	0.65	0.65	0.58	0.64	0.64	
18	0.56	0.52	0.50	0.51	0.53	0.52	24.8
19	0.54	0.57	-	0.50	0.58	0.54	0.2
20	0.57	0.58	0.54	0.54	0.50	0.54	
21	0.34	0.30	0.32	0.32	0.30	0.31	18.2
22	0.52	0.56	0.50	0.50	0.50	0.51	0.2
23	0.36	0.29	0.31	0.32	0.31	0.32	
24	0.58	0.62	0.58	0.55	0.57	0.58	
25	0.90	0.90	0.86	0.78	0.81	0.85	
26	1.13	1.13	1.10	0.97	1.02	1.07	0.2
27	1.02	0.95	1.02	0.94	0.93	0.97	
28	0.90	0.89	0.98	0.81	0.84	0.88	0.2
29	0.70	0.60	0.69	0.62	0.64	0.65	14.2
30	0.60	0.61	0.58	0.62	0.60	0.60	0.2
31	0.68	0.68	0.63	0.64	0.78	0.68	
Av. value	0.88	0.87	0.88	0.81	0.83	0.85	
Min. value	0.34	0.29	0.31	0.32	0.30	0.31	
Max. value	1.72	1.72	1.63	1.58	1.60	1.65	
Total precipit.							101.2

- = Measurement not performed.

Table 9

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

SEPTEMBER 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation mm
1	0.88	0.92	0.86	0.87	0.84	0.87	
2	1.15	1.08	1.08	0.93	1.04	1.05	
3	0.90	0.92	0.86	0.83	0.90	0.88	0.2
4	0.72	0.72	0.69	0.66	0.70	0.70	
5	0.59	0.56	0.55	0.55	0.55	0.56	5.6
6	0.32	0.32	0.33	0.29	0.33	0.32	3.0
7	0.36	0.38	0.36	0.38	0.41	0.38	0.4
8	0.55	0.55	0.58	0.60	0.57	0.57	
9	0.65	0.63	0.65	0.53	0.61	0.61	
10	0.54	0.48	0.51	0.46	0.46	0.49	
11	0.48	0.45	0.48	0.43	0.39	0.45	0.2
12	0.49	0.52	0.50	0.42	0.46	0.48	
13	0.42	0.45	0.39	0.43	0.43	0.42	14.6
14	0.49	0.50	0.47	0.36	0.41	0.45	4.4
15	0.50	0.50	0.46	0.42	0.40	0.46	
16	0.64	0.62	0.57	0.59	0.62	0.61	0.4
17	0.44	0.50	0.46	0.45	0.40	0.45	2.4
18	0.45	0.42	0.44	0.39	0.43	0.43	
19	0.56	0.53	0.53	0.44	0.48	0.51	
20	0.50	0.47	0.45	0.42	0.48	0.46	4.4
21	0.48	0.48	0.47	0.46	0.50	0.48	
22	0.78	0.76	0.76	0.70	0.72	0.74	
23	0.74	0.74	0.71	0.60	0.62	0.68	
24	0.99	0.98	0.98	0.76	0.92	0.93	0.2
25	1.20	1.22	1.20	0.97	0.93	1.10	
26	1.07	1.07	1.08	0.86	0.90	1.00	0.2
27	1.07	1.09	1.09	0.94	0.94	1.03	0.2
28	0.91	0.93	0.88	0.92	0.86	0.90	0.2
29	0.89	0.68	0.77	0.62	0.84	0.76	
30	0.78	0.78	0.72	0.68	0.75	0.74	0.2
Av. value	0.68	0.68	0.66	0.60	0.63	0.65	
Min. value	0.32	0.32	0.33	0.29	0.33	0.32	
Max. value	1.20	1.22	1.20	0.97	1.04	1.10	
Total precipit.							36.6

Table 10

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

OCTOBER 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation
1	0.79	0.65	0.73	0.65	0.73	0.71	0.4
2	0.30	0.32	0.44	0.27	0.32	0.33	8.6
3	0.27	0.28	0.23	0.25	0.25	0.26	28.4
4	0.40	0.35	0.31	0.32	0.35	0.35	13.0
5	0.33	0.29	0.32	0.30	0.29	0.31	
6	0.31	0.34	0.27	0.27	0.28	0.29	
7	0.43	0.40	0.39	0.39	0.40	0.40	1.0
8	0.16	0.16	0.15	0.15	0.15	0.15	23.2
9	0.37	0.37	0.31	0.33	0.33	0.34	
10	0.45	0.41	0.43	0.41	0.44	0.43	0.2
11	0.36	0.41	0.40	0.31	0.39	0.37	
12	0.21	0.19	0.21	0.17	0.17	0.19	34.6
13	0.26	0.26	0.27	0.23	0.22	0.24	3.8
14	0.29	0.31	0.32	0.32	0.29	0.31	
15	0.22	0.25	0.21	0.22	0.24	0.23	1.8
16	0.25	0.25	0.26	0.24	0.25	0.25	0.4
17	0.23	0.24	0.21	0.23	0.24	0.23	
18	0.21	0.21	0.21	0.20	0.21	0.21	
19	0.15	0.14	0.16	0.13	0.13	0.14	
20	0.19	0.17	0.16	0.18	0.18	0.18	
21	0.12	0.16	0.19	0.12	0.12	0.14	
22	0.15	0.16	0.16	0.15	0.13	0.15	0.2
23	0.24	0.22	0.30	0.22	0.28	0.25	0.6
24	1.34	1.24	1.10	1.16	1.28	1.22	6.0
25	3.40	3.20	3.08	2.88	2.93	3.10	6.6
26	2.30	2.20	2.20	2.38	2.16	2.25	
27	1.08	1.01	1.02	1.00	0.98	1.02	12.0
28	2.10	1.82	2.06	1.80	1.76	1.91	2.2
29	1.58	1.50	1.53	1.53	1.60	1.55	6.2
30	0.97	0.86	0.86	0.78	0.99	0.89	
31	1.50	1.40	1.41	1.14	1.24	1.34	
Av. value	0.68	0.64	0.64	0.60	0.62	0.63	
Min. value	0.12	0.14	0.15	0.12	0.12	0.14	
Max. value	3.40	3.20	3.08	2.88	2.93	3.10	
Total precipit.							149.2

Table 11

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA

NOVEMBER 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation
1	1.37	1.26	1.36	1.16	1.20	1.27	
2	1.30	1.27	1.36	1.12	1.26	1.26	0.2
3	0.62	0.57	0.55	0.58	0.58	0.58	6.2
4	0.51	0.42	0.46	0.44	0.42	0.45	1.2
5	0.55	0.56	0.52	0.48	0.47	0.51	0.2
6	0.44	0.46	0.42	0.36	0.38	0.41	
7	0.66	0.61	0.62	0.66	0.64	0.64	0.2
8	0.70	0.80	0.70	0.62	0.64	0.69	2.2
9	0.13	0.10	0.13	0.10	0.10	0.11	13.4
10	0.06	0.06	0.09	0.06	0.06	0.07	
11	0.08	0.09	0.06	0.06	0.07	0.07	0.2
12	0.10	0.13	0.14	0.08	0.12	0.11	
13	0.16	0.15	0.16	0.17	0.19	0.17	0.2
14	0.16	0.17	0.16	0.20	0.18	0.17	0.2
15	0.35	0.37	0.35	0.39	0.36	0.36	0.2
16	0.26	0.25	0.27	0.26	0.29	0.27	
17	0.21	0.19	0.19	0.21	0.19	0.20	0.2
18	0.18	0.19	0.14	0.16	0.15	0.16	
19	0.23	0.25	0.26	0.20	0.21	0.23	
20	0.19	0.21	0.20	0.21	0.16	0.19	0.4
21	0.25	0.23	0.24	0.24	0.22	0.24	
22	0.21	0.18	0.30	0.21	0.20	0.22	0.2
23	0.27	0.27	0.28	0.25	0.28	0.27	0.4
24	0.24	0.28	0.27	0.22	0.25	0.25	
25	0.18	0.18	0.18	0.16	0.16	0.17	
26	0.18	0.15	0.16	0.18	0.15	0.16	
27	0.19	0.19	0.16	0.17	0.19	0.18	
28	0.05	0.04	0.05	0.04	0.04	0.04	23.4
29	0.06	0.04	0.04	0.03	0.03	0.04	21.0
30	0.21	0.21	0.22	0.28	0.24	0.23	
Av. value	0.34	0.33	0.33	0.31	0.31	0.32	
Min. value	0.05	0.04	0.04	0.03	0.03	0.04	
Max. value	1.37	1.27	1.36	1.16	1.26	1.27	
Total precipit.							70.0

Table 12

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY IN AIR AT ISPRA DECEMBER 1964

Day	Station 1 pc/m^3	Station 2 pc/m^3	Station 3 pc/m^3	Station 4 pc/m^3	Station 5 pc/m^3	Average value pc/m^3	Precipitation
1	0.34	0.35	0.30	0.32	0.37	0.34	
2	0.46	0.42	0.41	0.38	0.39	0.41	0.2
3	0.46	0.47	0.47	0.46	0.42	0.46	
4	0.17	0.16	0.18	0.16	0.20	0.17	
5	0.16	0.16	0.16	0.17	0.20	0.17	
6	0.46	0.42	0.46	0.40	0.41	0.43	
7	0.33	0.32	0.39	0.31	0.32	0.33	
8	0.38	0.34	0.36	0.29	0.42	0.36	
9	0.36	0.34	0.33	0.31	0.31	0.33	
10	0.38	0.34	0.35	0.30	0.27	0.33	
11	0.35	0.32	0.35	0.30	0.30	0.32	
12	0.36	0.29	0.33	0.30	0.28	0.31	
13	0.31	0.28	0.30	0.28	0.27	0.29	
14	0.38	0.37	0.40	0.35	0.40	0.38	
15	0.16	0.14	0.14	0.14	0.14	0.14	9.6
16	0.05	0.06	0.06	0.04	0.04	0.05	20.6
17	0.07	0.06	0.05	0.06	0.05	0.06	1.4
18	0.33	0.32	0.30	0.33	0.29	0.31	2.0
19	0.18	0.23	0.15	0.16	0.11	0.17	15.6
20	0.30	0.34	0.28	0.26	0.25	0.29	4.6
21	0.65	0.40	0.43	0.71	0.90	0.62	2.2
22	0.48	0.66	0.44	0.39	0.72	0.54	
23	0.16	0.13	0.13	0.11	0.13	0.13	
24	0.18	0.13	0.12	0.18	0.17	0.16	
25	0.23	0.19	0.16	0.17	0.26	0.20	
26	0.27	0.26	0.24	0.24	0.23	0.25	
27	0.18	0.16	0.13	0.15	0.12	0.15	0.6
28	0.12	0.14	0.13	0.09	0.14	0.12	4.4
29	0.33	0.39	0.34	0.32	0.32	0.34	
30	0.46	0.50	0.52	0.54	0.55	0.51	
31	0.46	0.37	0.38	0.40	0.50	0.42	
Av. value	0.31	0.29	0.28	0.28	0.31	0.29	
Min. value	0.05	0.06	0.05	0.04	0.04	0.05	
Max. value	0.65	0.66	0.52	0.71	0.90	0.62	
Total precipit.							61.2

MONTHLY AVERAGE CONCENTRATIONS OF RADIONUCLIDES IN AIR (pc/m^3)

1954

Month	Gross beta	Sr^{90}	Cs^{137}	Zr^{95} + Nb^{95}	Ce^{144}	Ru^{106}	Mn^{54}	Sb^{125}
January	1.90	0.037	0.056	0.15	0.65	0.22	0.049	0.038
February	1.27	0.027	0.038	0.080	0.42	0.14	0.031	0.035
March	0.70	0.016	0.025	0.031	0.25	0.085	0.017	0.035
April	1.62	0.042	0.063	0.060	0.53	0.18	0.041	0.042
May	2.00	0.056	0.081	0.072	0.74	0.22	0.050	0.063
June	2.04	0.060	0.095	0.047	0.72	0.22	0.051	0.066
July	1.39	0.047	0.070	0.027	0.50	0.16	0.036	0.041
August	0.85	0.029	0.044	0.012	0.30	0.093	0.021	0.022
September	0.65	0.024	0.034	u.	0.18	0.055	0.011	0.018
October	0.63	0.009	0.015	$\leq$ 0.010	0.08	0.024	$\leq$ 0.010	0.010
November	0.32	0.005	0.008	$\leq$ 0.010	0.04	0.013	$\leq$ 0.010	$\leq$ 0.010
December	0.29	0.008	0.013	u.	0.07	0.020	$\leq$ 0.010	$\leq$ 0.010

u. = Undetectable.

GROSS BETA RADIOACTIVITY, STRONTIUM-90, CESIUM-137 IN FALLOUT

1964

Month	Gross beta K^{40} equivalent			Strontium-90		Cesium-137		Precipitation	Days with
	$mc/Km^{2(x)}$	$mc/Km^{2(xx)}$	$pc/l^{(x)}$	mc/Km^2	pc/l	mc/Km^2	pc/l	mm	precipitation
January	30	28	740	1.3	32.0	1.9	46.8	40.6	5
February	22	21	300	0.44	5.9	0.68	9.2	74.2	10
March	50	49	290	1.9	11.2	3.2	18.9	169.6	18
April	150	146	980	6.9	45.2	10.3	67.4	152.8	15
May	85	83	1250	3.5	51.3	5.2	76.2	68.2	8
June	75	73	600	4.1	32.8	5.7	45.6	125.2	13
July	18	17	1430	1.0	79.3	1.5	119.0	12.6	9
August	27	25	270	1.6	15.8	2.7	26.6	101.2	14
September	4.6	4.5	130	0.33	9.2	0.57	15.6	36.6	15
October	30	24	200	1.1	7.4	1.9	13.1	149.2	18
November	9.0	7.9	130	0.29	4.1	0.48	6.9	70.0	17
December	5.0	4.7	82	0.16	2.6	0.28	4.6	61.2	9
Total				22.62		34.41		1061.4	

(x) = Values in this column are extrapolated to last day of collection month.
(xx) = Values in this column are extrapolated to midpoint of next month.

RADIONUCLIDES IN FALLOUT

(mc/Km^2) ±

1964

Month	Zr^{95} + Nb^{95}	Ru^{106}	Mn^{54}	Sb^{125}	Ce^{144}	Be^{7}
January	4.2	6.2	1.7	1.2	20	1.7
February	1.2	2.7	0.52	0.50	7	0.95
March	4.0	9.2	2.1	1.9	24.6	3.4
April	8.2	26	6.9	6.3	81	8.0
May	2.6	16	3.3	3.8	48	4.3
June	2.3	14	3.2	3.8	45	5.5
July	0.50	3.2	0.60	0.80	11	-
August	0.50	4.4	1.2	1.5	13	-
September	u.	1.0	0.20	0.28	3.3	-
October	0.90	3.3	0.83	0.72	10	-
November	0.50	0.7	0.21	0.25	2.9	-
December	u.	0.4	0.09	0.14	1.5	-

± = Values are extrapolated to last day of collection month.
u. = Undetectable.
- = Measurement not performed.

RADIONUCLIDES IN FALLOUT

(mc/Km^2) *

1963 - 1964

Month		Na^{22}	Co^{60}	Y^{88}	Sb^{124}
January	1963	-	-	-	-
February		-	-	-	-
March		0.014	0.026	-	-
April		0.040	0.076	-	0.25
May		0.052	0.100	-	-
June		0.074	0.136	-	0.33
July		0.064	0.124	-	0.41
August		0.032	0.057	-	0.10
September		-	-	-	-
October		-	-	-	-
November		0.032	0.042	0.043	0.16
December		-	-	-	-
January	1964	-	-	-	-
February		0.004	0.006	-	-
March		-	-	-	-
April		0.052	0.065	0.082	0.28
May		0.029	0.036	0.042	0.09
June		0.033	0.040	0.034	0.13
July		-	-	-	-
August		-	-	-	-
September		-	-	-	-
October		0.011	0.012	0.004	-
November		-	-	-	-
December		-	-	-	-

* = Values are extrapolated to last day of collection month.
- = Measurement not performed.

Table 16

STRONTIUM 90 AND CESIUM-137 IN HERBAGE (*)

1964

Sampling site	Sampling date	R(**)	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K	Mn^{54} pc/g
Barza	16-4	5.46	6.0	6.2	970	8.8	30.0	290	4.9
Brebbia	20-4	6.90	1.4	11.8	120	3.7	34.0	110	3.3
Ispra	16-4	6.78	3.8	5.4	700	3.8	32.9	120	3.6
Monvalle	16-4	7.20	2.6	6.2	420	3.8	17.5	220	2.6
Osmate	16-4	7.41	2.6	3.8	680	2.1	42.0	50	2.8
Roccolo	20-4	5.12	-	14.0	-	7.3	23.6	310	7.2
Taino	16-4	6.06	3.3	11.4	290	3.5	34.3	100	2.7
Barza	14-5	5.56	3.2	4.7	680	3.6	29.6	120	3.0
Brebbia	14-5	5.20	5.5	5.7	960	4.7	19.8	240	3.3
Ispra	14-5	6.66	5.7	7.3	780	4.6	30.8	150	4.0
Monvalle	14-5	5.06	5.1	8.5	600	7.3	16.3	450	4.1
Osmate	14-5	5.80	5.2	5.4	960	4.3	27.9	150	5.6
Roccolo	14-5	3.73	5.0	11.6	430	4.2	23.6	180	-
Taino	14-5	6.02	6.2	14.1	440	5.0	27.7	180	3.7

(*) = Values are given per weight unity of dry matter.
(**) = Weight ratio of fresh matter to dry matter.
- = Measurement not performed.

STRONTIUM-90 AND CESIUM-137 IN HERBAGE (±)

1964

Sampling site	Sampling date	R(±±)	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K	Mn^{54} pc/g
Barza	16-6	6.06	7.4	15.0	490	17.5	19.8	880	3.7
Brebbia	16-6	5.41	9.5	18.0	530	7.2	17.0	420	4.9
Ispra	16-6	7.41	5.9	14.0	420	5.6	31.0	180	3.7
Monvalle	16-6	5.71	5.2	13.6	380	5.2	22.6	230	2.7
Osmate	16-6	5.00	3.0	5.2	580	3.0	22.0	140	2.6
Taino	16-6	4.49	6.1	10.4	580	4.9	23.2	210	3.7
Barza	9-7	4.70	7.9	12.2	650	3.7	22.0	170	3.3
Brebbia	9-7	5.80	10	16.2	620	3.6	20.8	170	2.0
Ispra	9-7	4.76	5.2	16.2	320	5.4	18.0	300	4.3
Osmate	9-7	5.20	6.7	20.0	340	6.0	13.2	450	2.1
Monvalle	9-7	6.06	5.9	15.4	380	6.0	10.1	590	-
Taino	9-7	5.90	5.2	16.2	320	3.5	28.6	120	2.6

(±) = Values are given per weight unity of dry matter.
(±±) = Weight ratio of fresh matter to dry matter.
- = Measurement not performed.

STRONTIUM-90 AND CESIUM-137 IN HERBAGE (±)

1964

Sampling site	Sampling date	R (±±)	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K	Mn^{54} pc/g
Barza	13- 8	4.55	13	20.4	640	6.5	14.0	460	4.3
Brebbia	13- 8	7.15	3.8	16.0	240	3.6	22.5	160	1.6
Ispra	13- 8	5.34	4.2	14.4	290	3.8	16.3	230	1.5
Osmate	13- 8	5.90	3.9	15.2	260	3.4	11.6	290	1.3
Monvalle	13- 8	4.50	3.8	14.4	260	2.7	18.0	150	1.8
Taino	13- 8	4.45	3.1	16.8	180	2.1	17.0	120	1.1
Barza	18- 9	5.50	3.3	18.4	180	3.5	13.4	260	0.97
Brebbia	18- 9	5.70	3.6	17.6	200	1.9	17.6	110	0.75
Ispra	18- 9	5.70	4.1	13.6	300	2.2	25.9	85	1.3
Osmate	18- 9	4.55	2.1	5.2	400	0.99	31.5	31	0.85
Monvalle	18- 9	4.40	3.7	18.0	210	2.6	10.0	260	1.1
Taino	18- 9	3.50	3.0	10.0	300	1.5	16.6	90	1.4
Barza	21-10	4.16	4.4	15.6	280	5.2	11.9	440	1.9
Brebbia	21-10	4.40	6.0	18.0	330	4.2	8.6	490	1.7
Ispra	21-10	5.40	3.5	13.2	270	2.2	23.0	96	0.86
Osmate	21-10	3.13	3.8	12.4	310	2.3	15.6	150	1.7
Monvalle	21-10	5.00	3.8	10.0	380	3.8	12.0	320	1.7
Taino	21-10	4.08	5.1	16.4	310	2.2	16.1	140	1.8

(±) = Values are given per weight unity of dry matter.
(±±) = Weight ratio of fresh matter to dry matter.

STRONTIUM-90 AND CESIUM-137 IN MILK - BARZA

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	120	1.23	98	450	1.84	240	0.400
February	113	1.10	103	440	1.85	240	0.430
March	130	1.18	110	480	1.80	270	0.407
April	91	1.08	84	540	1.81	300	0.280
May	98	1.22	80	320	1.75	180	0.444
June	88	1.31	67	310	1.75	180	0.372
July	79	1.27	62	210	1.68	130	0.477
August	74	1.30	57	180	1.57	110	0.518
September	52	1.13	46	160	1.74	94	0.490
October	67	1.17	57	140	1.73	81	0.704
November	113	1.15	98	310	1.79	170	0.577
December	102	1.23	83	270	1.84	160	0.520

Table 17

STRONTIUM-90 AND CESIUM-137 IN MILK - BREBBIA

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	99	1.15	86	840	1.65	510	0.168
February	102	1.15	89	800	1.60	500	0.178
March	84	1.23	68	870	1.78	490	0.139
April	97	1.18	82	690	1.70	410	0.200
May	78	1.20	65	540	1.72	310	0.210
June	87	1.25	70	540	1.71	320	0.219
July	83	1.15	72	520	1.56	330	0.218
August	72	1.25	58	470	1.56	300	0.193
September	61	1.30	47	300	1.53	200	0.235
October	82	1.33	62	400	1.64	240	0.258
November	83	1.22	68	390	1.71	230	0.296
December	62	1.07	58	350	1.67	210	0.276

Table 18

STRONTIUM-90 AND CESIUM-137 IN MILK - ISPRA

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	100	1.20	83	890	1.66	540	0.154
February	85	1.18	72	780	1.63	480	0.150
March	90	1.13	80	800	1.75	460	0.174
April	90	1.22	74	800	1.65	490	0.151
May	81	1.22	66	660	1.61	410	0.161
June	93	1.17	79	660	1.68	390	0.203
July	68	1.26	54	570	1.70	340	0.159
August	68	1.17	58	480	1.60	300	0.193
September	51	1.15	44	470	1.65	290	0.152
October	48	1.10	44	380	1.63	230	0.192
November	58	1.17	41	430	1.61	270	0.152
December	64	1.40	46	440	1.68	260	0.177

Table 1

STRONTIUM-90 AND CESIUM-137 IN MILK - MILANO

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	43	1.16	37	230	1.64	140	0.264
February	39	1.18	33	230	1.64	140	0.236
March	41	1.17	35	230	1.64	140	0.250
April	35	1.14	31	200	1.69	120	0.258
May	28	1.33	21	130	1.61	81	0.259
June	28	1.10	25	140	1.52	92	0.272
July	33	1.23	27	150	1.59	95	0.284
August	23	1.16	20	100	1.63	61	0.328
September	22	1.34	16	78	1.68	46	0.348
October	22	1.17	19	86	1.65	52	0.365
November	25	1.14	22	100	1.70	59	0.373
December	24	1.24	19	95	1.67	57	0.330

Table 20

STRONTIUM-90 AND CESIUM-137 IN MILK - OSMATE

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	100	1.20	83	650	1.65	390	0.213
February	88	1.18	75	600	1.69	360	0.208
March	86	1.23	70	800	1.74	460	0.152
April	94	1.15	82	710	1.66	430	0.190
May	96	1.25	77	440	1.63	270	0.285
June	105	1.25	84	480	1.60	300	0.280
July	90	1.12	80	360	1.60	230	0.348
August	77	1.27	61	310	1.56	200	0.305
September	63	1.05	60	210	1.62	130	0.461
October	63	1.25	50	320	1.65	190	0.263
November	68	1.22	56	250	1.62	150	0.374
December	60	1.23	49	290	1.69	170	0.288

Table 21

STRONTIUM-90 AND CESIUM-137 IN MILK - VARESE

1964

Month	Sr^{90} pc/l	Ca g/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K g/l	Cs^{137} pc/g K	$\frac{\text{pc } Sr^{90}/\text{g Ca}}{\text{pc } Cs^{137}/\text{g K}}$
January	47	1.18	40	250	1.70	150	0.266
February	61	1.30	47	340	1.69	200	0.235
March	50	1.20	42	330	1.70	190	0.221
April	49	1.28	38	300	1.68	180	0.211
May	55	1.26	44	290	1.60	180	0.244
June	57	1.26	45	260	1.64	160	0.281
July	70	1.27	55	290	1.55	190	0.290
August	45	1.30	35	190	1.57	120	0.292
September	39	1.22	32	160	1.60	100	0.320
October	46	1.35	34	200	1.60	130	0.261
November	49	1.15	43	220	1.65	130	0.331
December	50	1.20	42	240	1.69	140	0.300

Table 22

STRONTIUM-90 AND CESIUM-137 IN CHEESE (*)

1964

Quality and origin	Sampling date	Sr^{90} pc/Kg	Ca g/Kg	Sr^{90} pc/g Ca	Cs^{137} pc/Kg	K g/Kg	Cs^{137} pc/g K
Caciotta toscana (Toscana)	February	520	8.70	60	200	1.4	140
Bel Paese (Lombardia)	"	290	7.50	39	220	1.2	180
Olandese (Holland)	"	590	10.6	56	350	1.1	320
Fontina V. d'Aosta (Piemonte)	"	490	8.7	56	330	1.6	210
Grana (Emilia)	"	65	10.8	6	80	1.0	80
Caciotta romana (Lazio)	"	600	11.0	55	260	1.2	220
Emmenthal (Germany)	"	180	7.1	25	230	1.2	190
Emmenthal (Switzerland)	"	1 350	11.8	110	420	1.1	380
Caciotta sarda (Sardegna)	"	185	10.5	18	140	1.2	120
Camembert (France)	"	74	1.8	41	130	2.0	65
Gruenland (Switzerland)	"	230	4.1	56	120	0.82	150
Caciotta toscana (Toscana)	June	390	7.62	51	220	1.6	140
Bel Paese (Lombardia)	"	260	6.85	38	150	1.2	130
Olandese (Holland)	"	520	10.6	49	150	1.2	130
Fontina V. d'Aosta (Piemonte)	"	230	8.65	27	190	1.4	140
Grana (Emilia)	"	74	12.2	6.1	70	1.2	58
Caciotta romana (Lazio)	"	550	8.10	68	260	1.0	260
Caprino (Piemonte)	"	49	1.4	35	120	1.6	75

(*) = Concentrations are given per Kilogram of fresh weight.

GEOGRAPHIC COORDINATES OF WATER SAMPLING POINTS

	Name of site	Latitude N	Longitude E (Greenwich)	Altitude a. s. l. (m)
	Lakes			
P 1	Maggiore Center of the Lake	45° 54' 26"	8° 34' 31"	193
P 2	Maggiore Zenna	46° 06' 00"	8° 44' 10"	193
P 3	Maggiore Sasso Galletto	45° 55' 40"	8° 37' 53"	193
P 4	Maggiore Laveno	45° 54' 26"	8° 37' 00"	193
P 5	Maggiore Ispra	45° 48' 50"	8° 36' 25"	193
P 6	Maggiore Sesto Calende	45° 43' 22"	8° 37' 36"	193
P 7	Maggiore Acque Nere Mouth	45° 49' 33"	8° 37' 23"	193
P 8	Maggiore Ranco	45° 48' 06"	8° 33' 08"	193
P 9	Maggiore Baveno	45° 54' 30"	8° 30' 30"	193
P 10	Monate	45° 48' 07"	8° 38' 55"	266
P 11	Varese	45° 49' 00"	8° 43' 08"	238
P 12	Comabbio	45° 46' 48"	8° 41' 38"	243
	Rivers			
P 13	Acque Nere I	45° 49' 30"	8° 37' 23"	194
P 14	Acque Nere II	45° 48' 50"	8° 38' 28"	207
P 15	Tresa	45° 59' 40"	8° 44' 00"	200
P 16	Boesio	45° 54' 20"	8° 37' 30"	200
P 17	Toce	45° 55' 58"	8° 29' 39"	433
P 18	Novellino	45° 49' 00"	8° 37' 25"	200
	Drinkable Waters			
P 19	Farm Vicina	45° 48' 35"	8° 37' 13"	213
P 20	Farm Casello	45° 48' 40"	8° 37' 10"	213
P 21	Farm Gabriella	45° 48' 10"	8° 36' 30"	216
P 22	Fontanone	45° 48' 06"	8° 37' 40"	230
P 23	Roccolo	45° 48' 11"	8° 37' 36"	247

BETA RADIOACTIVITY SUBTRACTED POTASSIUM-40 IN THE WATER OF THE LAKE "MAGGIORE"

pc/l

1964

Sampling point			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
P1	Center of the lake	(surface)	5.6	4.6	4.1	8.8	11	8.5	5.8	7.1	5.4	5.4	5.3	4.0	6.30
P1	Center of the lake	m 25	8.1	15	3.5	8.8	7.3	6.2	5.0	4.4	3.5	4.8	4.7	4.4	6.31
P1	Center of the lake	m 50	5.8	5.3	2.8	7.9	5.7	4.0	6.8	3.9	2.7	2.9	3.0	2.3	4.42
P2	Zenna	(surface)	7.0	3.9	3.5	10	7.6	8.5	6.3	6.4	6.1	4.4	5.4	3.6	6.06
P3	Sasso Galletto	"	5.2	4.1	4.2	15	7.2	11	7.9	7.1	6.7	4.6	5.4	4.1	6.87
P4	Laveno	"	5.6	5.2	2.9	5.9	5.9	9.8	8.5	7.6	6.0	4.1	5.7	4.5	5.97
P5	Porto Ispra	"	6.8	4.3	4.9	7.1	8.5	8.9	10	7.0	5.9	3.1	4.5	4.8	6.32
P6	Sesto Calende	"	10	5.6	6.4	5.1	8.6	11	10	10	5.0	4.7	4.9	4.3	7.13
P7	Acque Nere Mouth	"	6.9	4.8	5.0	19	9.5	9.3	7.3	6.3	4.5	4.8	4.2	6.2	7.32
P8	Ranco	(surface)	5.8	4.8	4.2	7.4	7.8	11	10	7.1	5.2	5.2	5.2	5.7	6.62
P8	Ranco	m 25	6.4	5.4	4.1	5.2	1.7	8.1	5.5	3.5	3.2	1.3	4.7	4.9	4.50
P8	Ranco	m 50	5.6	5.7	3.4	3.5	5.9	4.4	3.9	3.0	2.7	5.0	1.9	4.1	4.09
P9	Baveno	(surface)	11	12	5.7	4.6	7.3	13	11	8.2	5.5	5.8	5.5	4.8	7.87
Average value			6.91	6.21	4.21	8.33	7.23	8.75	7.54	6.05	4.80	4.32	4.65	4.44	

Table 25

BETA RADIOACTIVITY SUBTRACTED POTASSIUM-40 IN LAKES, STREAMS AND WELLS

NEAR TO THE ISPRA ESTABLISHMENT pc/l

1964

	Sampling point	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
	Lakes													
P10	Monate	25	15	20	24	26	28	23	21	19	13	16	15	20.42
P11	Varese	22	18	18	18	17	20	21	20	13	14	14	10	17.08
P12	Comabbio	39	23	24	28	27	31	25	25	20	19	21	17	24.92
	Rivers													
P13	Acque Nere I	6.5	7.3	3.2	7.0	15	17	14	6.2	3.5	4.5	2.7	4.0	7.57
P14	Acque Nere II	10	6.6	3.7	3.4	19	36	8.7	7.0	2.7	6.1	3.1	3.0	9.11
P15	Tresa	8.7	6.1	5.6	6.1	9.9	12	11	11	8.6	7.1	7.7	6.0	8.32
P16	Boesio	3.7	1.9	1.0	10	2.3	1.3	<0.5	3.3	1.1	<0.5	<0.5	<0.5	2.38
P17	Toce	8.0	2.9	3.5	4.3	5.5	16	12	4.2	2.4	2.7	1.9	1.3	5.39
P18	Novellino	5.7	5.7	11	110	8.8	18	4.6	3.2	3.2	3.4	8.3	3.9	15.48
	Drinkable Waters													
P19	Farm Vicina	<0.5	3.6	20	2.0	9.0	3.3	8.1	2.0	1.2	<0.5	<0.5	2.4	4.40
P20	Farm Casello	2.7	1.6	1.9	1.3	2.4	1.0	0.6	0.8	0.6	<0.5	2.6	1.5	1.45
P21	Farm Gabriella	1.3	0.5	0.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.52
P22	Fontanone	0.7	0.9	<0.5	1.4	<0.5	1.0	<0.5	<0.5	<0.5	6.0	<0.5	<0.5	1.07
P23	Roccolo	6.3	3.2	3.6	3.5	5.7	5.7	3.6	2.5	5.5	3.7	3.6	3.2	4.17

Table 26

STRONTIUM-90 AND CESIUM-137 IN LAKE WATERS

1964

Name of the lake	Sampling date	Sr^{90} pc/l	Ca mg/l	Sr^{90} pc/g Ca	Cs^{137} pc/l	K mg/l	Cs^{137} pc/g K
"Maggiore"	23- 3	0.66	20.0	33	0.60	1.60	380
"	14- 6	1.5	19.2	78	1.5	1.84	820
"	10- 9	1.7	18.0	95	1.0	1.60	630
"	11-12	1.2	21.0	57	0.65	1.60	410
"Monate"	18- 3	4.5	10.5	430	2.0	0.90	2 220
"	3- 6	6.6	10.8	610	3.5	1.10	3 180
"	14- 9	7.0	10.0	700	2.9	1.00	2 900
"	10-12	4.8	10.0	480	1.6	1.20	1 300
"Comabbio"	18- 3	7.2	26.4	270	1.5	1.53	980
"	9- 6	7.9	27.2	290	2.6	1.80	1 440
"	11- 9	7.9	25.0	320	1.7	1.80	950
"	9-12	8.2	30.0	270	1.1	1.70	650
"Varese"	20- 3	4.4	41.5	110	1.6	2.00	800
"	4- 6	4.5	30.0	150	2.5	2.30	1 090
"	9- 9	4.5	17.5	260	1.3	2.10	620
"	9-12	5.0	36.0	140	0.90	2.00	450

Table 27

Table 28

CONCENTRATIONS OF RADIONUCLIDES IN LAKE WATERS

1964

pc/l

Name of the lake	Sampling date	$Zr^{95} + Nb^{95}$	Ru^{106}	Ce^{144}	Mn^{54}	Sb^{125}
"Maggiore"	23- 3	0.15	1.6	0.58	0.08	0.38
"	14- 6	0.30	3.2	2.0	0.25	1.1
"	10- 9	u.	2.1	0.70	0.10	0.98
"	11-12	u.	1.4	u.	u.	0.56
"Monate"	18- 3	0.20	5.6	0.71	0.25	1.8
"	3- 6	0.63	8.1	5.4	0.51	2.9
"	14- 9	u.	5.0	0.75	0.10	2.8
"	10-12	u.	3.7	u.	0.12	1.8
"Comabbio"	18- 3	0.70	7.8	2.0	0.25	2.1
"	9- 6	0.45	8.8	3.0	0.47	2.9
"	11- 9	u.	5.5	1.7	0.50	2.3
"	9-12	u.	3.6	u.	0.29	1.4
"Varese"	20- 3	0.60	6.2	1.9	0.34	1.4
"	4- 6	0.65	7.7	4.1	0.40	2.3
"	9- 9	u.	5.2	2.9	0.23	2.2
"	9-12	u.	3.3	u.	0.53	1.0

u. = Undetectable.

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "MAGGIORE"

1964

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	4- 3	0.17	15.0	11	3.3	2.90	1 140
Scardinius erith.	4- 3	0.30	14.1	21	1.5	3.05	490
Gobio gobio	10- 4	0.35	15.6	23	1.1	2.80	390
Perca fluviatilis	11- 6	0.20	14.0	14	2.3	3.43	670
Scardinius erith.	11- 6	0.40	14.0	29	1.0	3.08	320
Gobio gobio	11- 6	0.31	13.7	23	0.80	3.13	240
Perca fluviatilis	10- 9	0.54	13.3	41	3.2	2.99	1 070
Scardinius erith.	10- 9	0.68	13.1	52	0.90	3.26	280
Gobio gobio	10- 9	0.32	13.1	24	0.44	3.35	130
Perca fluviatilis	9-12	0.23	12.1	19	2.1	3.10	680
Scardinius erith.	9-12	0.41	12.6	33	1.2	3.25	370
Gobio gobio	-	-	-	-	-	-	-

- = Measurement not performed.

Table 29

Table 30

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "COMABBIO"

1964

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	5- 3	1.1	15.8	70	5.4	3.20	1 690
Scardinius erith.	5- 3	0.83	14.8	56	2.1	3.12	670
Gobio gobio	-	-	-	-	-	-	-
Perca fluviatilis	11- 6	0.88	17.1	51	6.3	3.63	1 740
Scardinius erith.	11- 6	1.1	20.9	53	1.9	3.10	610
Gobio gobio	11- 6	0.87	13.5	64	1.4	3.30	420
Perca fluviatilis	11- 9	1.9	13.8	140	4.3	3.10	1 390
Scardinius erith.	11- 9	1.4	20.9	67	2.3	3.62	640
Gobio gobio	11- 9	1.2	13.7	88	1.5	3.56	420
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	9-12	1.2	15.0	80	1.5	3.2	470
Gobio gobio	-	-	-	-	-	-	-

- = Measurement not performed.

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "MONATE"

1964

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	4- 3	0.95	17.4	55	14.3	3.30	4 330
Scardinius erith.	4- 3	2.4	15.7	150	4.9	3.38	1 450
Gobio gobio	-	-	-	-	-	-	-
Perca fluviatilis	11- 6	0.95	17.2	55	7.1	3.53	2 000
Scardinius erith.	11- 6	2.8	17.3	160	4.1	3.32	1 240
Gobio gobio	11- 6	2.4	15.7	150	7.5	3.44	2 180
Perca fluviatilis	14- 9	1.7	16.5	100	23.5	3.41	6 900
Scardinius erith.	14- 9	3.0	15.7	190	3.3	3.33	990
Gobio gobio	14- 9	2.7	14.1	190	7.4	3.85	1 920
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	10-12	2.1	13.8	150	2.5	3.10	810
Gobio gobio	-	-	-	-	-	-	-

- = Measurement not performed.

Table 31

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "VARESE"

1964

Biological species	Sampling date	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca	Cs^{137} pc/g	K mg/g	Cs^{137} pc/g K
Perca fluviatilis	4- 3	0.56	13.4	42	3.5	3.05	1 150
Scardinius erith.	4- 3	0.74	14.5	51	2.2	3.06	720
Gobio gobio	-	-	-	-	-	-	-
Perca fluviatilis	13- 6	0.51	13.7	37	3.5	3.50	1 000
Scardinius erith.	13- 6	0.59	16.5	36	1.8	3.10	580
Gobio gobio	13- 6	0.35	10.2	34	0.92	3.17	290
Perca fluviatilis	9- 9	0.90	17.2	52	2.6	3.30	790
Scardinius erith.	9- 9	1.0	19.8	51	1.3	3.10	420
Gobio gobio	9- 9	0.92	16.5	56	0.72	2.90	250
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	9-12	0.96	13.7	70	1.1	3.00	370
Gobio gobio	9-12	0.51	15.6	33	0.54	3.00	180

- = Measurement not performed.

Table 32

STRONTIUM-90 IN CALF BONES

1964

Sampling site	Sampling date	Age	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca
Brebbia	17-2	2 months	15.0	168	90
Capronno	17-2	2 "	19.0	165	115
Angera	20-2	2 "	5.8	118	49
Ispra	20-2	2 "	9.7	140	69
Ispra	20-2	2 "	6.8	151	45
Brebbia	20-2	2 "	9.4	133	70
Ispra	20-2	2 "	9.5	129	74
Capronno	20-2	2 "	14.0	162	86
Quassa	22-4	2 "	14.8	142	104
Barzola	22-4	2 "	15.1	155	97
Brebbia	23-4	2 "	9.6	149	64
Capronno	23-4	2 "	13.3	131	102
Angera	29-4	2 "	12.9	137	94
Osmate	29-4	2 "	20.6	183	113
Cadrezzate	29-4	2 "	15.6	158	99
Besozzo	29-4	2 "	15.0	140	107
Angera	11-6	2 "	12.6	132	96
Capronno	16-6	2 "	4.5	142	32
Ispra	16-6	2 "	12.8	158	81
Cadrezzate	16-6	2 "	16.6	164	101

STRONTIUM-90 AND CESIUM-137 IN VEGETABLES (*)

1964

Species	Sr^{90} pc/Kg	Ca g/Kg	Sr^{90} pc/g Ca	Cs^{137} pc/Kg	K g/Kg	Cs^{137} pc/g K
Spinach - "Spinacia Olearia"	76	1.38	55	81	6.80	12
Silver Beet - "Beta Vulgaris"	59	0.77	77	98	4.14	24
Lettuce - "Lactuca Sativa"	35	0.26	130	62	2.83	22
Catalogna (local name)	40	0.65	62	47	4.47	11
Lettuce - "Lactuca Scariola"	17	0.28	61	29	2.60	11
Chard - "Beta Vulgaris"	74	0.80	93	84	4.55	18
Chicory - "Cichorium Intybus"	40	0.50	80	48	3.50	14
Endive - "Cichorium Endivia"	31	0.36	86	80	2.87	28
Turnip Leaves - "Brassica Rapa"	72	1.75	41	64	4.47	14
Cabbage - "Brassica Oleracea Capitata".	90	1.18	76	79	4.84	16
Curly Endive - "Cichorium Endivia"	49	0.44	110	43	2.86	15

(*) = All the values are referred to fresh matter and are obtained from pooled samples made up, for each species, with about 20 samples collected during the year.

STRONTIUM-90 IN CALF BONES

1964

Sampling site	Sampling date	Age	Sr^{90} pc/g	Ca mg/g	Sr^{90} pc/g Ca
Monvalle	2- 7	2 months	19.3	130	148
Osmate	2- 7	2 "	17.5	162	108
Brebbia	2- 7	2 "	3.7	101	37
Capronno	8- 8	2 "	18.6	169	110
Cadrezzate	8- 8	2 "	25.6	155	170
Barza	8- 8	2 "	13.6	144	94
Ispra	8- 8	2 "	10.1	166	61
Cadrezzate	14- 9	2 "	7.8	120	65
Malgesso	14- 9	2 "	11.8	149	79
Brebbia	14- 9	2 "	15.3	135	110
Capronno	14- 9	2 "	20.6	193	110
Ispra	20-10	2 "	10.5	153	69
Osmate	20-10	2 "	15.9	157	100
Capronno	20-10	2 "	8.6	93	93
Taino	20-10	2 "	15.0	166	90
Angera	3-11	2 "	13.0	138	94
Taino	3-11	2 "	16.0	141	110
Osmate	3-11	2 "	17.1	151	110
Capronno	3-11	2 "	9.5	163	58

Table 34

STRONTIUM-90 AND CESIUM-137 IN SOILS

1964

Sampling site	Sampling date	Strontium-90		Ca	Cesium-137		K
		pc/g	mc/Km^2	mg/g	pc/g	mc/Km^2	mg/g
Diga Miorina	12-3	0.86	67	5.3	1.1	88	19.3
V. Borghi	12-3	1.5	81	5.4	2.2	117	15.5
Ispra	13-3	1.1	55	3.6	2.2	113	15.1
Taino	13-3	1.2	74	5.4	1.8	114	15.2
Monvalle	13-3	0.95	66	5.2	1.2	84	14.6
Osmate	13-3	0.78	54	5.7	1.7	117	16.5
Brebbia	13-3	0.99	79	5.0	1.5	120	15.4
Travedona	13-3	0.77	67	5.0	1.6	139	18.1
Malgesso	13-3	0.95	67	5.3	1.4	99	15.1
Pallanza	16-3	1.2	78	10	1.9	128	14.0
Parruzzaro	16-3	0.84	62	4.2	1.2	88	19.6
Solcio	16-3	0.85	80	4.0	0.87	82	22.7
Angera	16-3	0.55	58	4.3	0.86	90	14.8
Barza	16-3	0.83	71	6.3	0.86	73	15.5

Table 35

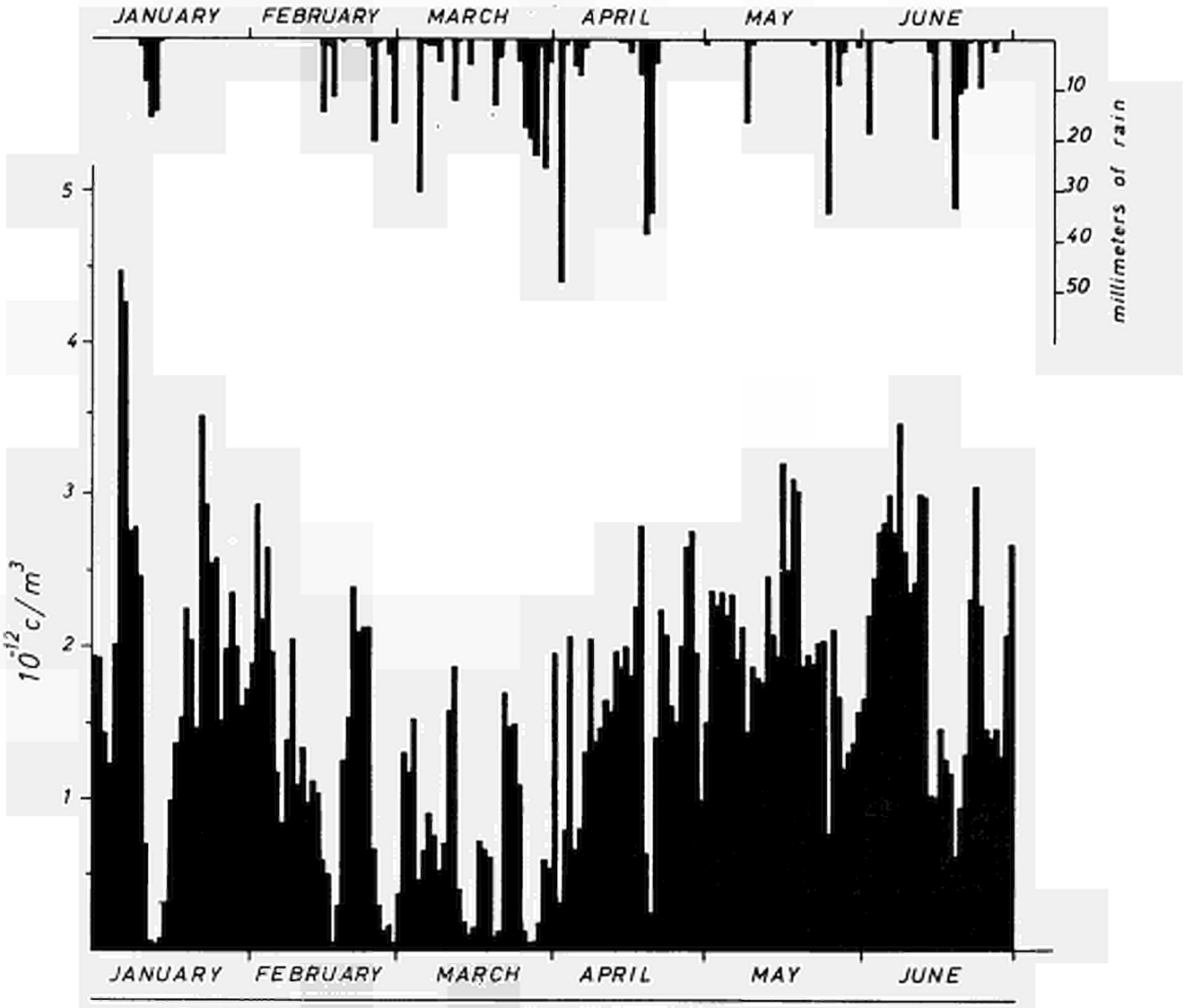


FIG. 1 - *Daily average concentrations of gross beta radioactivity in air at Ispra.*

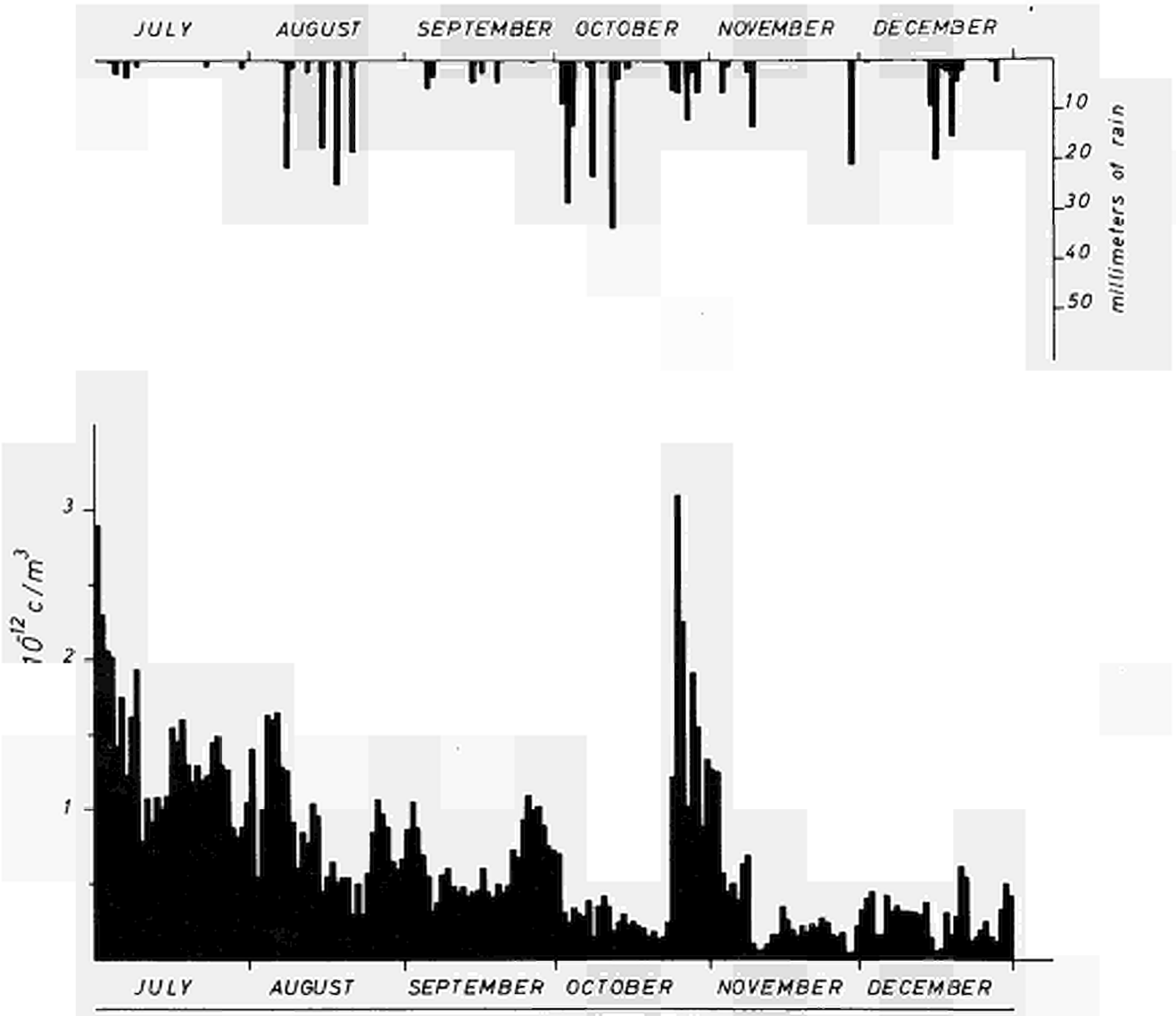


FIG. 2 – Daily average concentrations of gross beta radioactivity in air at Ispra.

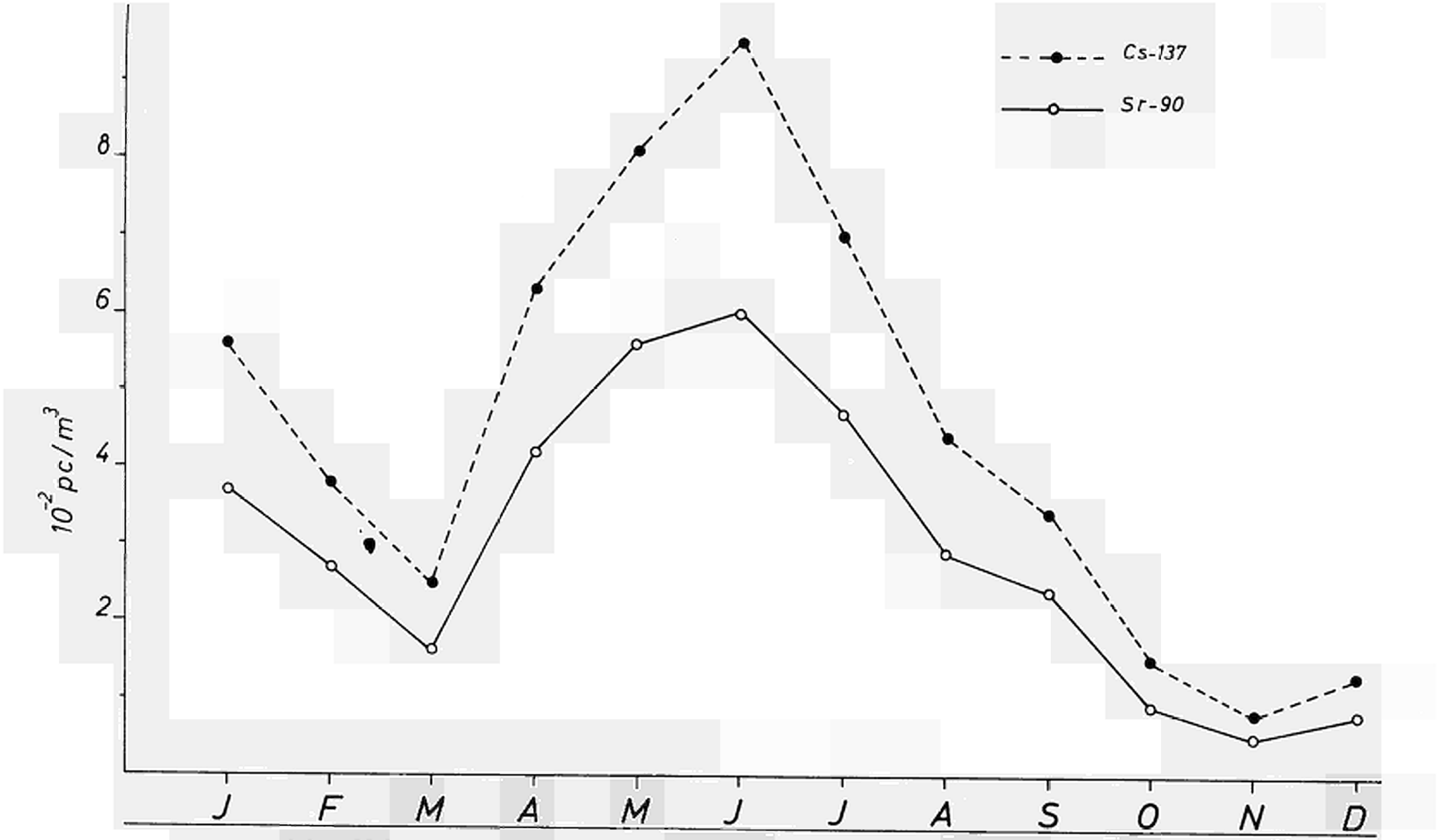


FIG. 3 - Monthly average concentrations of Strontium-90 and Cesium-137 in air at Ispra.

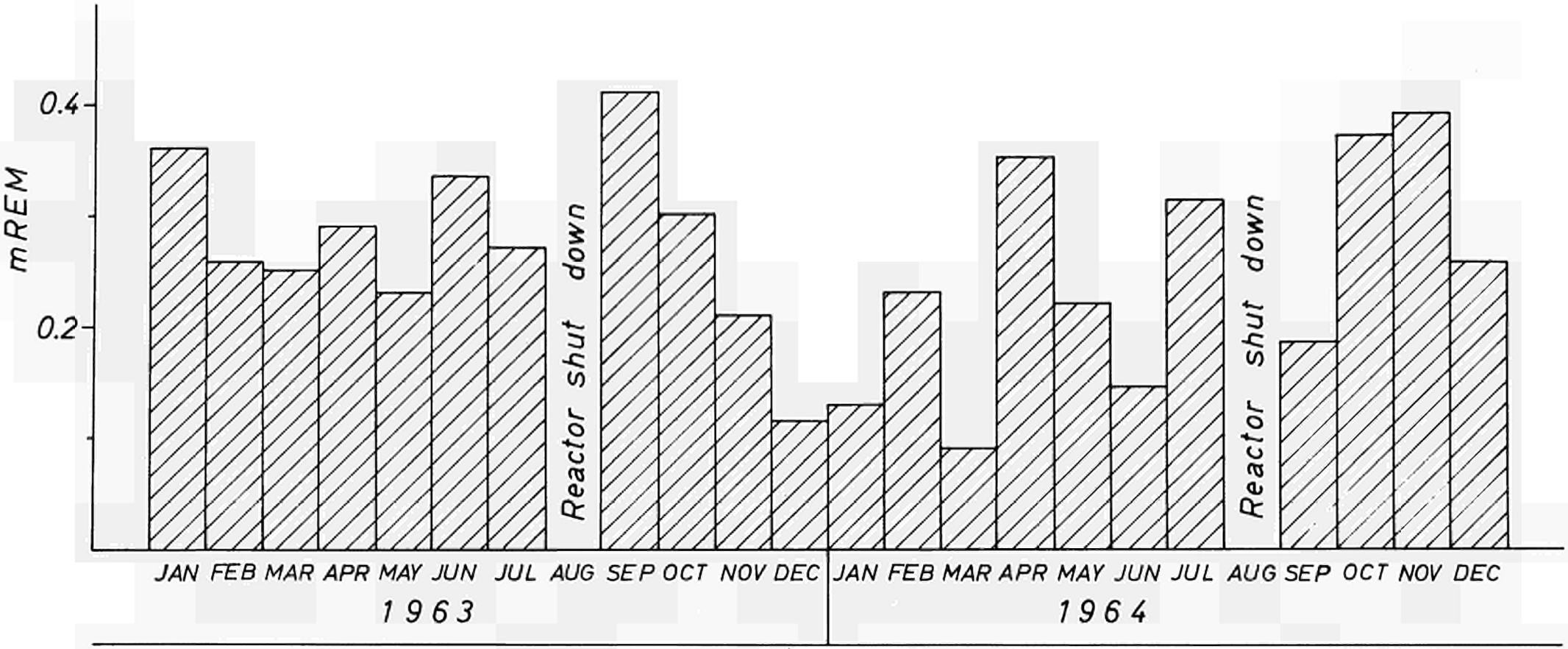


FIG. 3bis - Monthly radiation dose due to Argon-41 at Station 2.

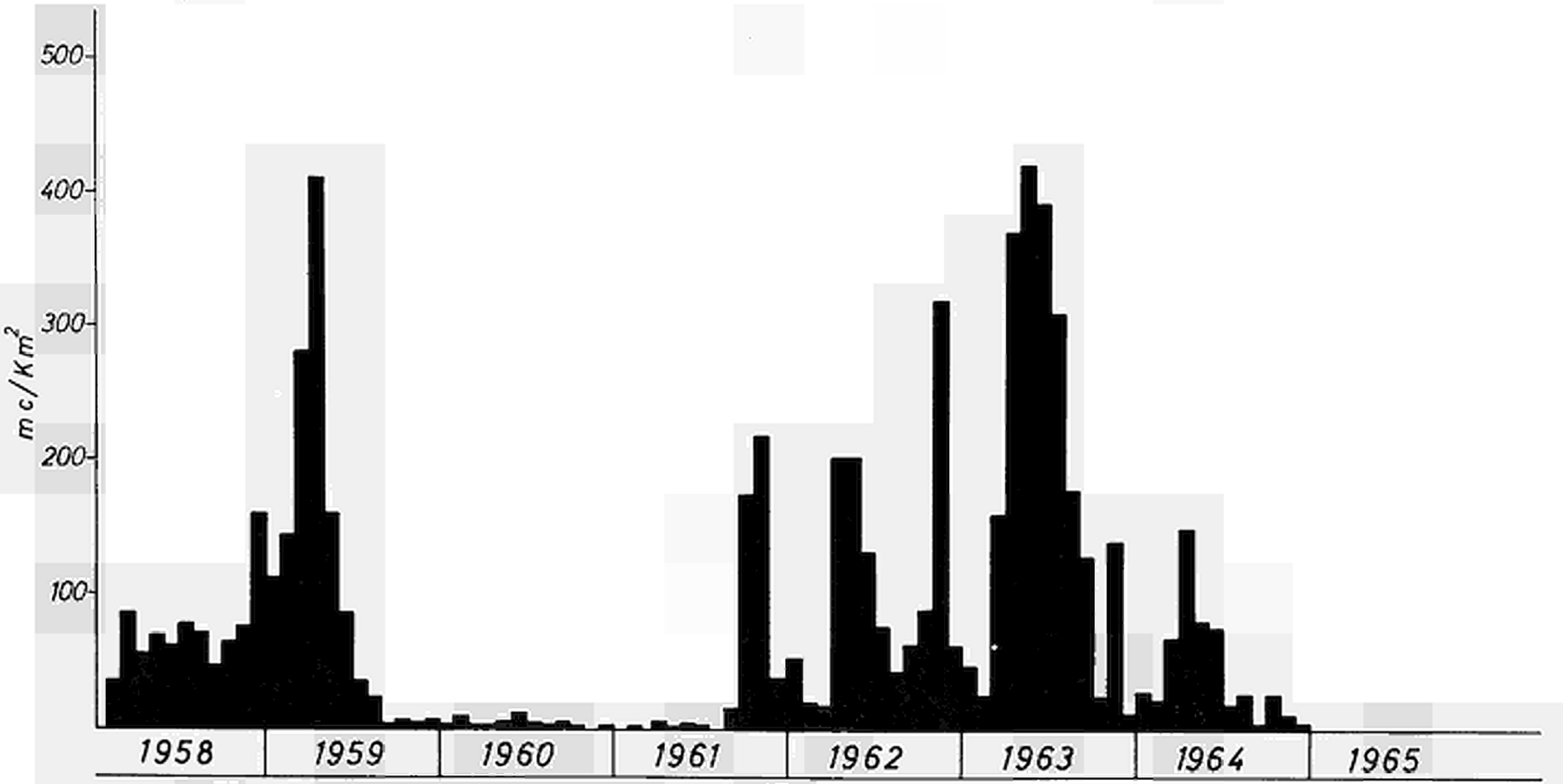


FIG. 4 – Gross beta radioactivity monthly deposition at Ispra

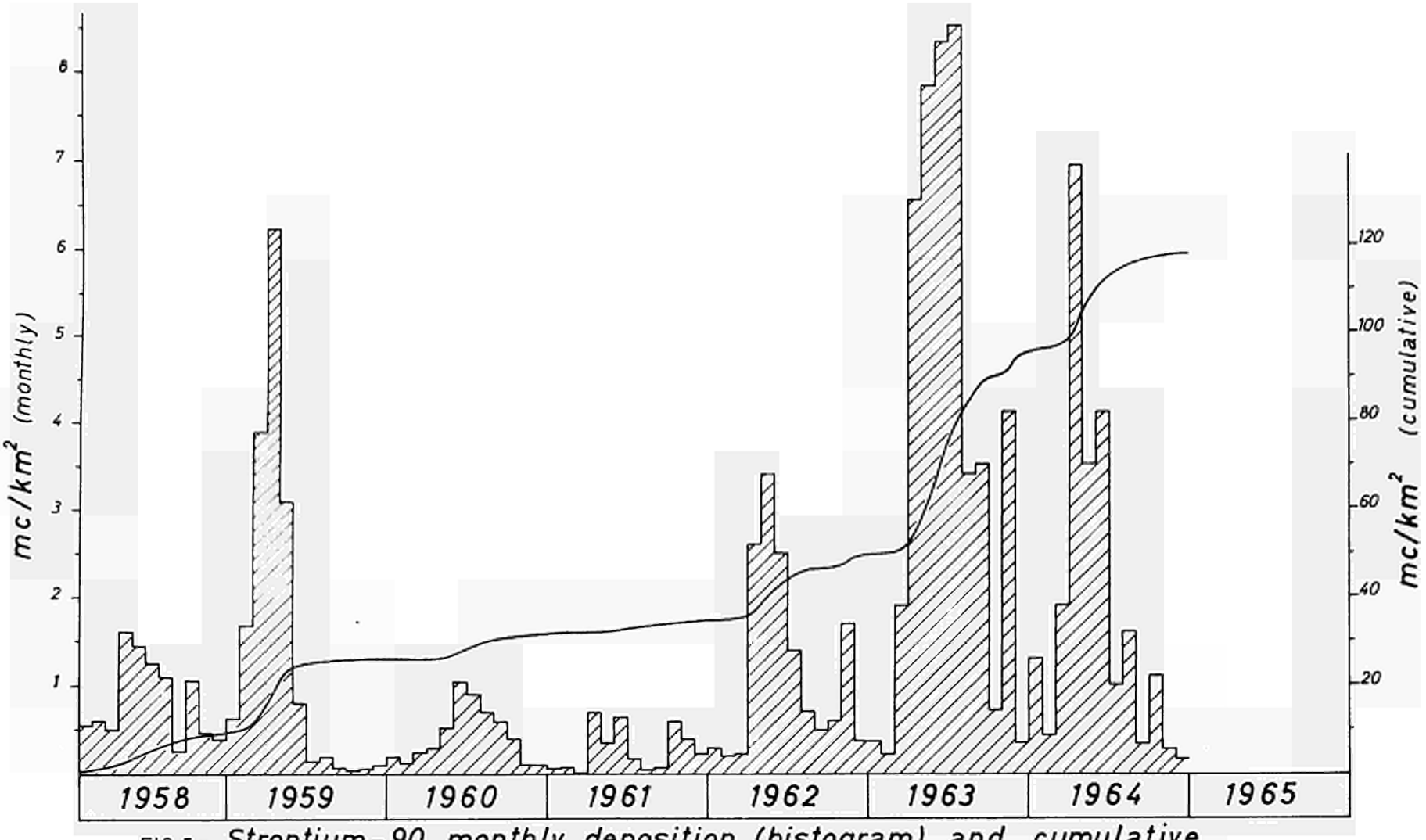


FIG.5 - Strontium-90 monthly deposition (histogram) and cumulative deposit (solid line) at Ispra.

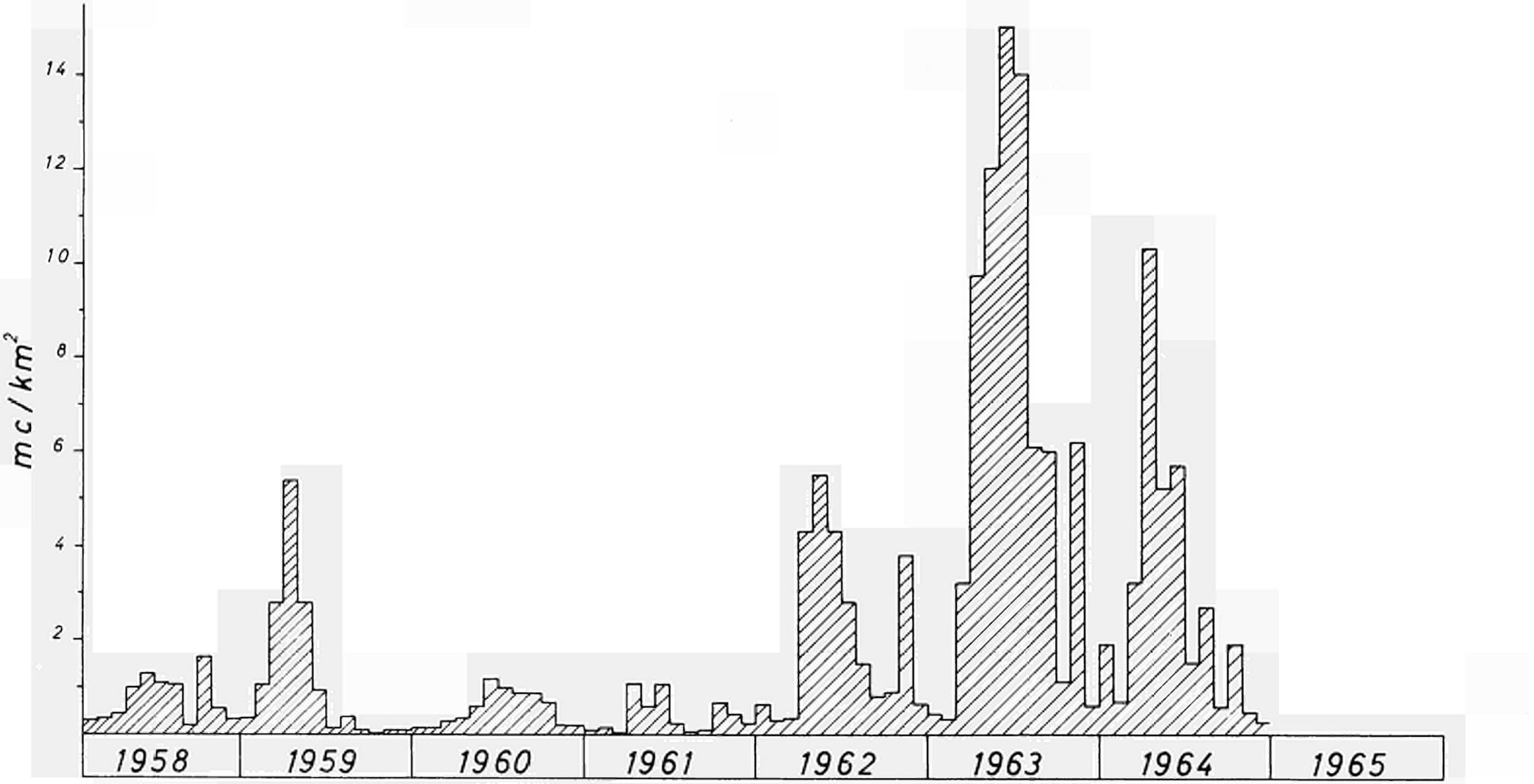


FIG. 6 – Cesium-137 monthly deposition at Ispra

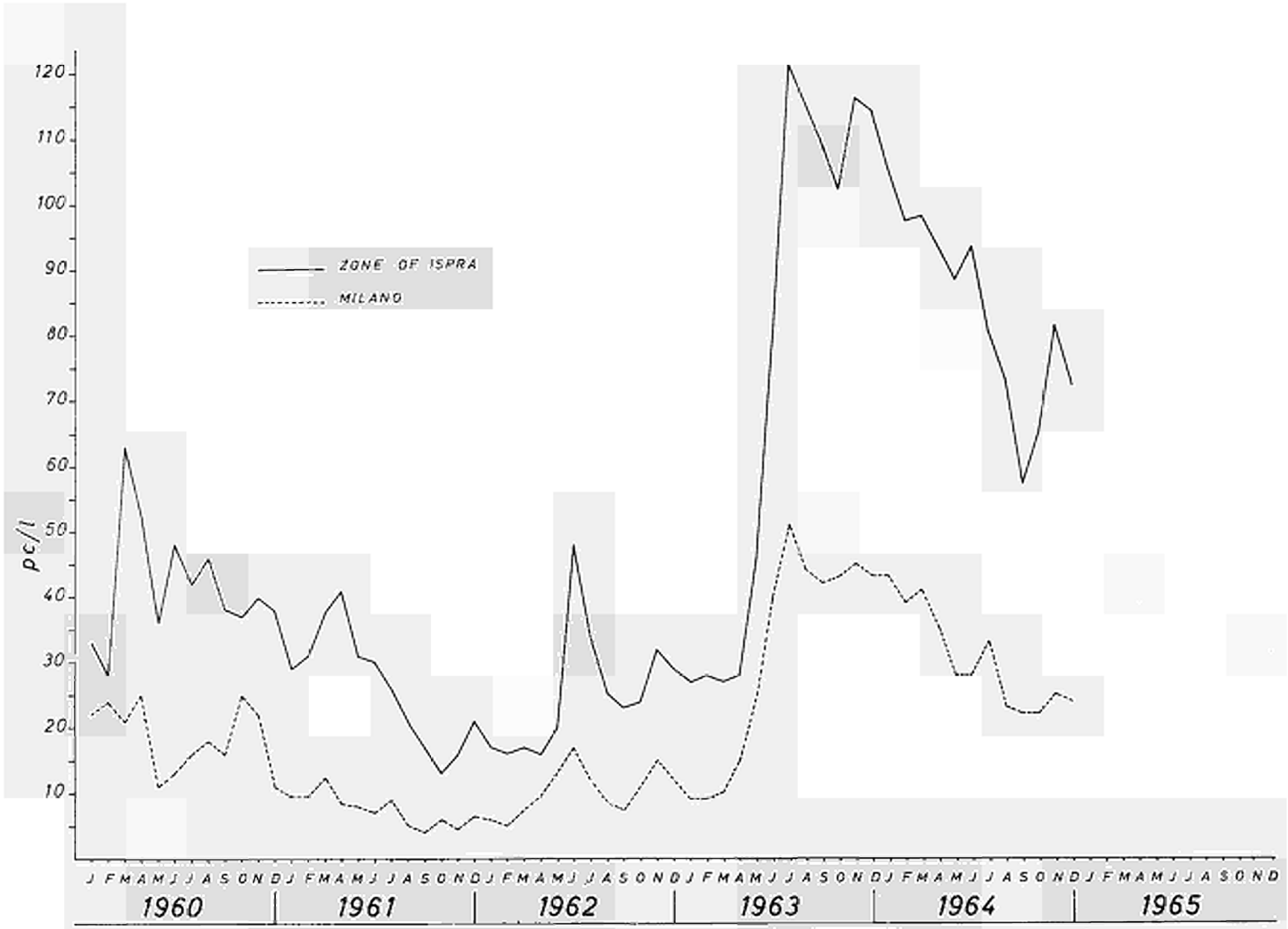


FIG. 7 - Monthly Strontium-90 in the milk of Ispra and Milano

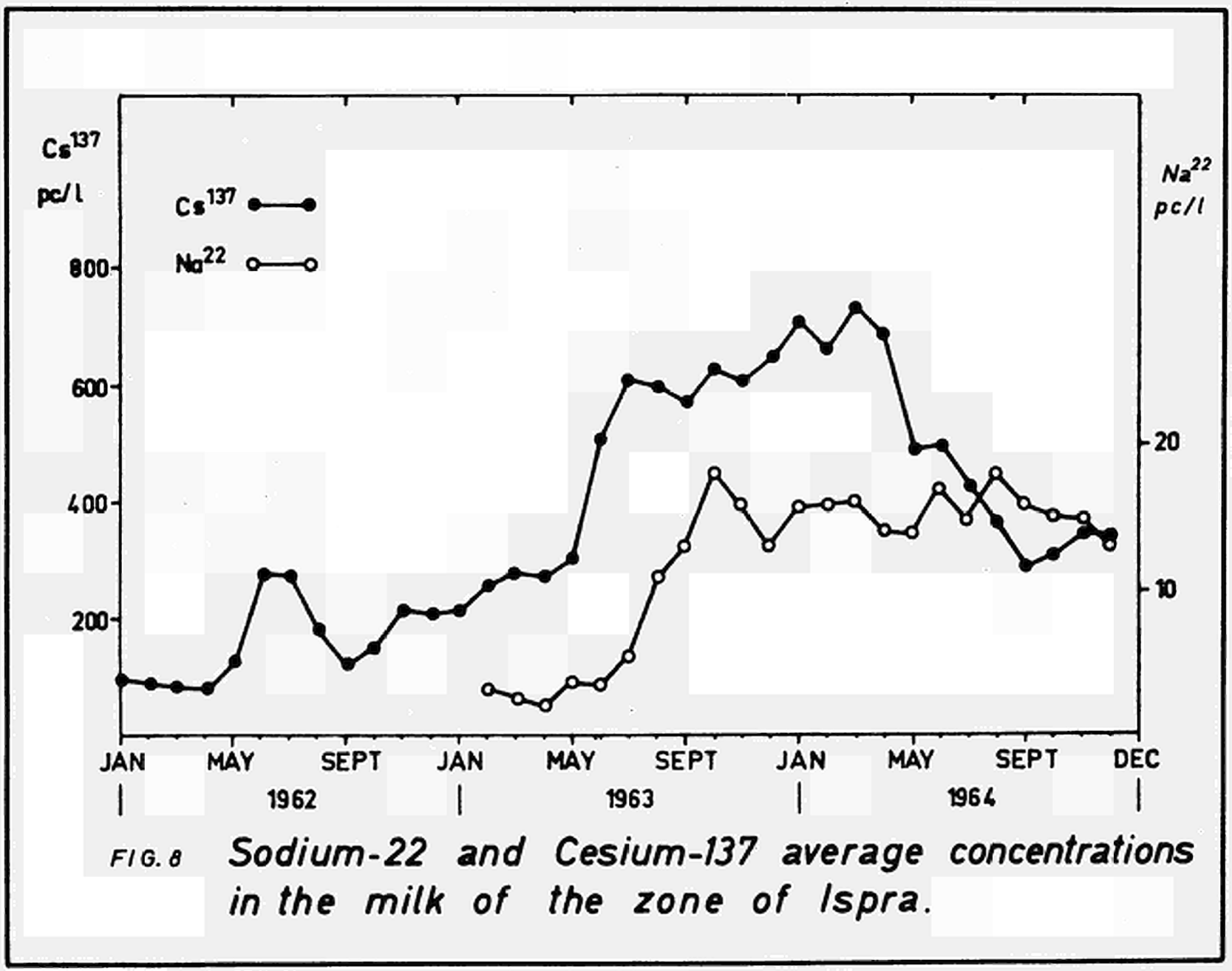


FIG. 8 *Sodium-22 and Cesium-137 average concentrations in the milk of the zone of Ispra.*

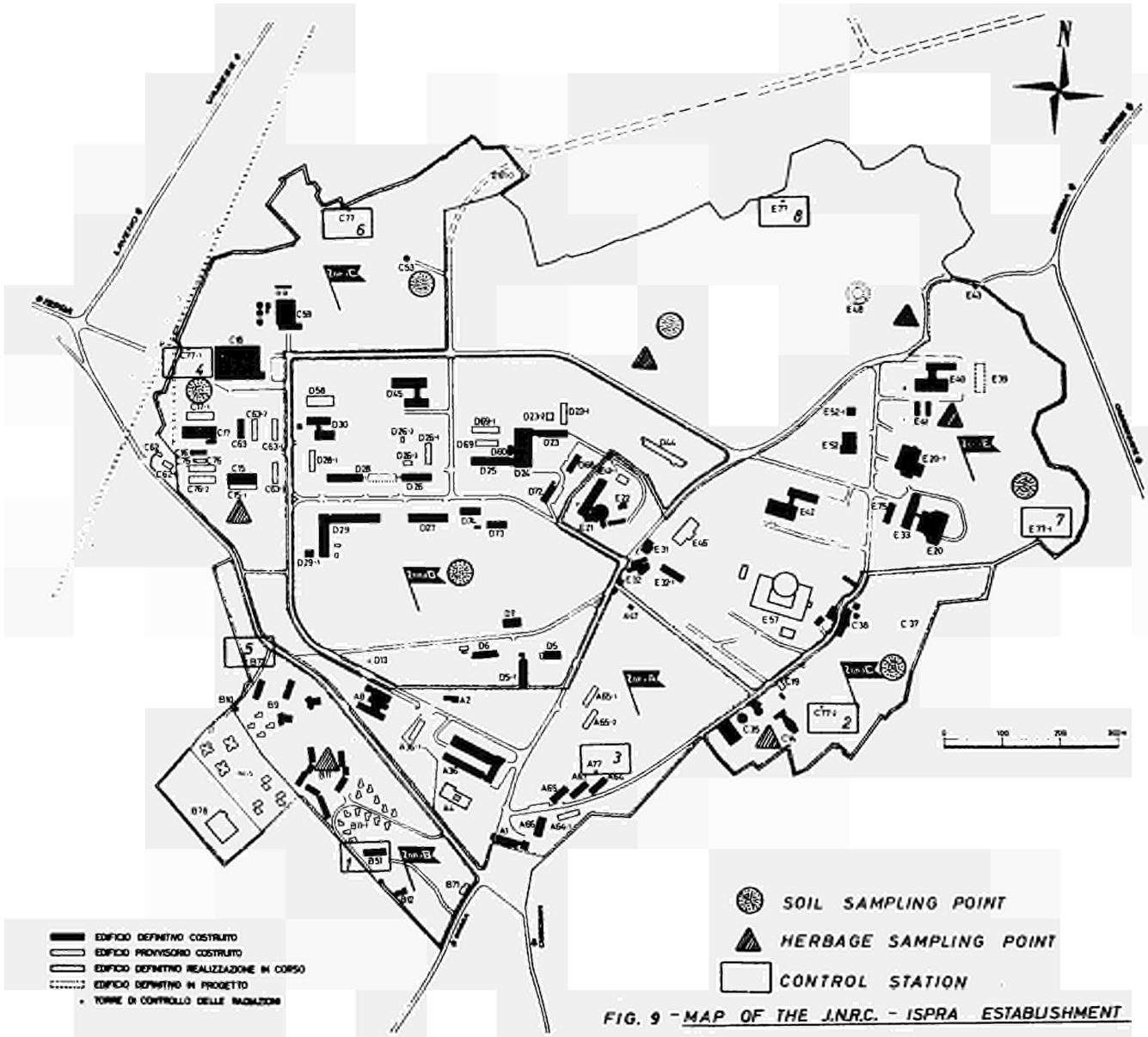


FIG. 9 - MAP OF THE J.N.R.C. - ISPRA ESTABLISHMENT

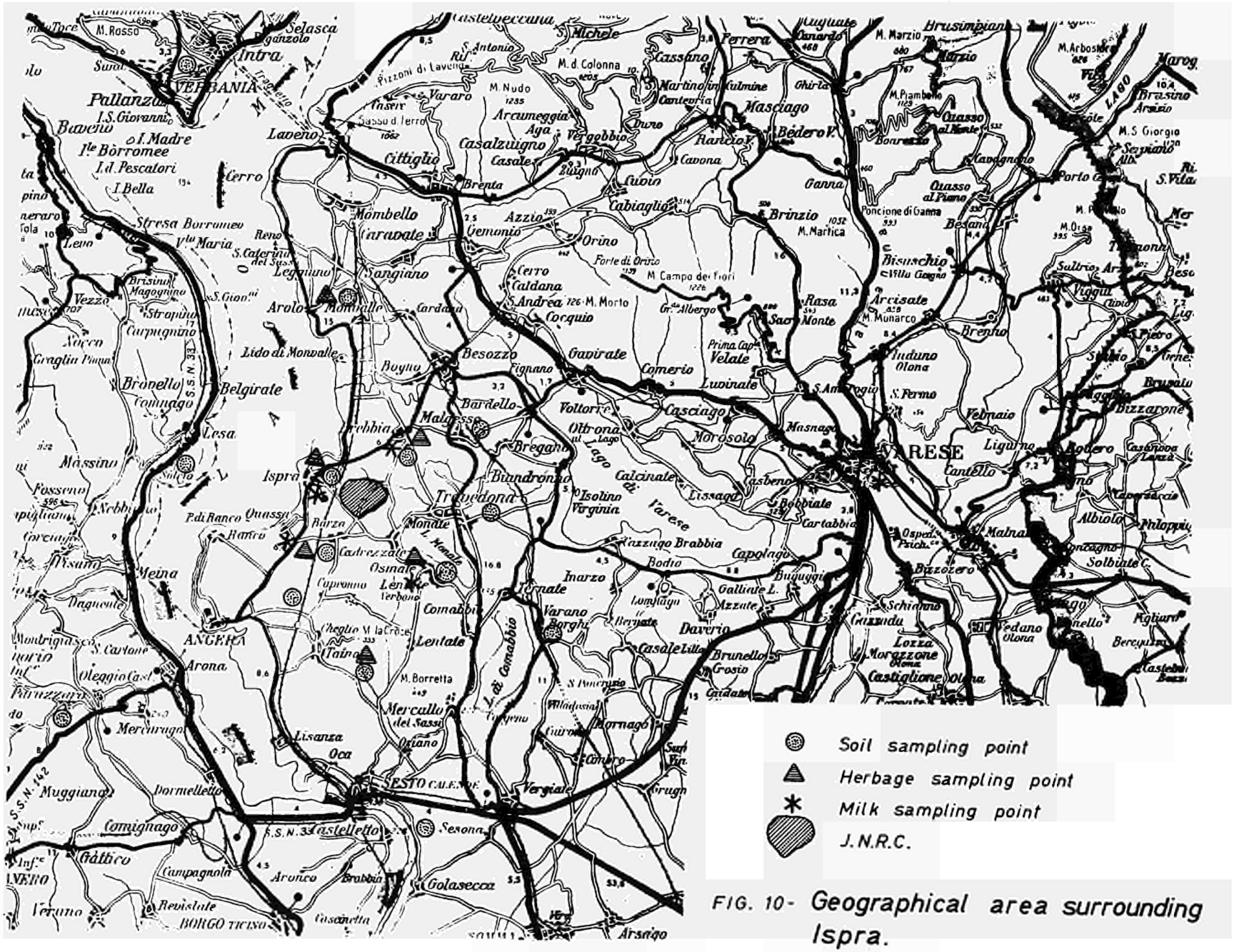
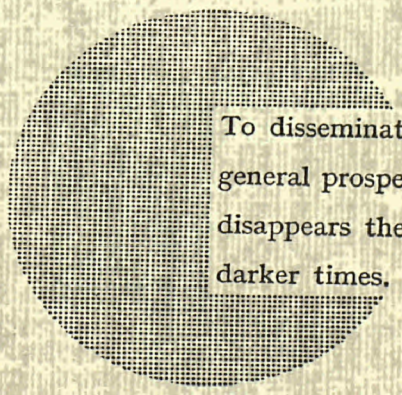


FIG. 10- Geographical area surrounding Ispra.



To disseminate knowledge is to disseminate prosperity — I mean general prosperity and not individual riches — and with prosperity disappears the greater part of the evil which is our heritage from darker times.

Alfred Nobel

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