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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

ENVIRONMENTAL RADIOACTIVITY

ISPRA 1965

by

M. de BORTOLI, P. GAGLIONE and A. MALVICINI

1966

Joint Nuclear Research Center

Ispra Establishment - Italy

Protection

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SUMMARY

In this report are briefly described the measurements of environmental radioactivity performed during 1965 by the site survey group of the Protection Service.

Data are given on the concentrations of strontium-90, cesium-137 and other radionuclides in fallout, air, soil, waters, herbage, animal bones and foods.

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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:

responsible for Site and Meteorology Section: P. Gaglione

responsible for the chemical laboratory: M. de Bortoli

radioactivity measurements: O. Malgarini, E. Lovati

chemical laboratory: E. Pecchio, L. Tortora, O. Cadario

air monitoring stations: M. Tramontana

sampling: G. Brughera, L. Pasqualini

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

EUR - 2509e Environmental radioactivity, Ispra 1964

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 radioactive contaminations caused by the Establishment itself.

(°) Manuscript received on April 12, 1966

The results obtained from the surveillance program indicate that, also for the calendar year 1965, the environmental radiation exposure for the persons living in the neighbourhood of the Establishment was due, almost exclusively, to natural sources and world-wide fallout.

During 1965 improvement of the radiological monitoring program has materialized in the following realisations:

i) completion of the telemetering network for air radioactivity;

ii) adaptation and equipment of a vehicle as "mobile station". This unit, in radio communication with the central laboratory, is foreseen to begin its activity early in 1966. The equipment is conceived for measurements of the gamma radiation field, the artificial contamination of atmospheric dust and the wind speed and direction. Moreover, a lead shielding allows beta counting and gamma spectrometry with a relatively low background;

iii) installation of column collectors in six of the area survey stations.

The first and the last topic are discussed more extensively in the two following paragraphs.

The symbol Ci has been adopted in this report, for the unity of activity (Curie), in the place of the symbol c, used up to now.

1. AIR RADIOACTIVITY

Three new stations became operational during 1965 (see map in Figure 12): one of these, placed on the torrent Novellino, near the fence, will be equipped for the radioactivity control of the water wasted from the Establishment, as this torrent is by far the main stream leaving the Center. The station, however, is equally used for air radioactivity control.

All the stations are actually connected, via telephonic cables, to the building N. 51, where the group works.

At the end of 1965 only five stations, however, were equipped with instruments for the measurement (and transmission) of the gamma radiation field.

During the year in three stations instruments have been placed for the instantaneous measurement of the alpha and beta activity collected on continuously moving paper filter. The detector of these instruments consists of a double scintillator (ZnS + plastic phosphor) coupled to a photomultiplier tube and alpha - beta pulses discrimination is made electronically. Because of the fairly constant ratio between the alpha and beta activity due to the decay products of the naturally radioactive gases in air, the instruments can detect relatively small artificial contaminations, which cause a change of the ratio. Also these data are transmitted to the central room, where recording is provided for all the signals converging from the stations, including wind speed and direction from station N. 1, on the roof of the building (see Figure 1).

In Tables 1 to 12 are given the daily values of gross beta radioactivity concentrations in each station and the daily average values. The latter are represented also in the histograms of Figures 2 and 3.

Radiochemical determinations of strontium-90, cesium-137, plutonium-239 and gamma spectrometry measurements are performed on the pooled monthly samples (6 to 8 thousands cubic meters of air). The results of these measurements are reported in Table 13 and in the graphs of Figure 4.

Concerning plutonium-239, the measurements, started in 1964, were continued during the last year. The samples are obtained by radiochemical separation and electrodeposition and are measured by alpha spectrometry in a Frish grid ionisation chamber (see Figure 5).

Monthly air concentrations down to mid 1961 and technique details may be found elsewhere (1).

The exposition dose, essentially due to the argon-41 discharged from the stack of the Ispra-1 reactor and measured at the survey stations, attained the maximum value of about 1 mR integrated over the whole year.

2. RADIOACTIVITY OF ATMOSPHERIC PRECIPITATION AND DEPOSITION

Monthly samples of total (dry and wet) deposition are collected by stainless steel pots with a total area of 4 m^2. Gross beta counting and gamma spectrometry measurements, as well as radiochemical determinations of strontium-90 and cesium-137, are performed on the dry residue obtained after evaporation.

Gross beta radioactivity, strontium-90 and cesium-137 deposited in the last year are given in Table 14, whereas the same from 1958 are represented in the histograms of Figures 6 to 8. The values for other measured radionuclides are reported in Table 15.

Column collectors were placed, during 1965, in six of the eight stations for the control of air radioactivity. They consist of a plastic pot (0.23 m^2 collecting area), connected to a filter and then to an ion-exchange column (cationic and anionic resin). A wood housing, heated during winter months, contains the column and the filter to prevent freezing. The exhausted rain water is controlled by gross beta measurements and the resin and filters are processed separately to get information about the fraction of strontium-90 and cesium-137 retained by each of them. The data for the first months seem to indicate that a large fraction of both radionuclides may remain in the filter and that the activity obtained by the whole column collector is equal or slightly lower than that collected by the pots. Much more data are needed, however, before drawing conclusions.

The fallout samples from May to August showed evidence for the presence of fresh fission products from the Chinese burst (May 1965).

3. RADIOACTIVITY OF WATERS

Water samples are taken monthly in twenty-three stations including lakes, streams, wells and tapwater. In two stations of the lake Maggiore water is collected also at 25 and 50 m depths, by means of a Nansen bottle. Five liter samples are evaporated and beta counted. Flame photometric measurements of potassium are made on each sample to allow subtraction of beta radioactivity due to potassium-40. In Tables 16 to 18 are given the geographic coordinates of the stations and the values of beta radioactivity for the lake Maggiore and for the other waters.

Large samples (400 - 500 liters) are collected quarterly in the four lakes near to the Establishment and the concentrations of individual radionuclides determined by gamma spectrometry and radiochemical procedures.

The data obtained are reported in Tables 19 and 20.

A control of sewer waters within the Establishment is carried out through the collection of twenty-nine 100 ml samples, which are evaporated and counted for gross alpha and gross beta activity.

4. SOIL RADIOACTIVITY

The control of soil radioactivity around the Establishment is performed yearly by collection of samples in fourteen stations (see Figure 13) and analysis for specific radionuclides. Each sample is made up of ten cores, 10 cm in diameter and 10 cm deep, with a total area of 780 cm^2. After mixing and sieving, the sample are submitted to gamma spectrometry and processed for strontium-90 and cesium-137 determinations. The 1965 samples were, moreover, analysed for their natural radioactivity content: i.e. radium-226 and thorium-232, besides potassium-40, which was already determined routinely.

Natural radioactivity shows no large variations among the different sites and the average concentrations found are as follows: radium-226 0.72 pCi/g, thorium-232 10.8 p.p.m. and potassium 17.4 mg/g. The average values of the strontium-90 and cesium-137 contamina-

tion were 91 and 135 mCi/Km^2, respectively. The data are given in Tables 21 and 22.

During 1965 the vertical profile of the contamination was studied in two stations, collecting 5 cm layers down to 20 cm. The results of this measurements are shown in Figure 9. It may be seen that there is a certain difference in the profile between the two sites; however on the average, the first 10 cm layer accounts for about 80% of the strontium-90 and about 85% of cesium-137 found in the first 20 cm layer. The natural radioactivity shows, as expected, no variations with depth.

Further details on the radioactivity of the soil at Ispra may be found elsewhere (2).

5. HERBAGE RADIOACTIVITY

Herbage is controlled in six stations outside the Establishment and in five stations within it (see maps in Figures 12 and 13). The former, which are also soil sampling stations, are located near the following villages: Barza, Brebbia, Ispra, Monvalle, Osmate and Taino. Samples of 2 Kg fresh weight are collected monthly during the growing season (April to October), by random cutting of several sub-samples in different fields at each site, in order to improve representativity. The samples are dried and submitted to gamma spectrometry; radiochemical separation for strontium-90 and cesium-137 are performed on ashed aliquots. Besides calcium and potassium concentrations, determined on each sample, stable strontium also is measured by flame photometry on few pooled samples.

The data on herbage content of strontium-90, cesium-137, calcium and potassium are reported in Tables 23 to 25.

The presence of fresh fission products, due to the Chinese burst, was evident in all the herbage samples collected in the months of May, June and July.

6. STRONTIUM-90 AND CESIUM-137 IN MILK

Milk is sampled in the dairies of four villages (Barza, Brebbia, Ispra and Osmate) and, moreover, for comparison purposes, in the milk supply stations of Varese and Milano at the rate of one liter twice a week. Gamma spectrometry and radiochemical separations are performed on the pooled monthly samples. In Tables 26 to 31 are given the data of strontium-90, cesium-137, calcium and potassium concentrations.

A plot of strontium-90 in the milk of the zone of Ispra (average of the four sites mentioned above) and in that of Milano from 1960 through 1965 is given in Figure 10.

In Figure 11 are plotted the values of sodium-22 and cesium-137 concentration in the milk of the zone of Ispra. The trend for 1965 confirms, for the passage of the two radionuclides from fallout to milk, the pattern found during 1963 and 1964 (3).

7. STRONTIUM-90 AND CESIUM-137 IN FISHES

Three biological species from the four lakes Maggiore, Monate, Comabbio and Varese have been analysed for strontium-90 and cesium-137 and the data are reported in Tables 32 to 35. The samples are supplied, on a quarterly basis, directly by the fishers of the lakes and submitted to the same procedure adopted for milk samples. As in the preceding years, some samples were not available, particularly in winter, owing to fishing difficulties.

R e m a r k In this report the name "Gobio gobio" has been replaced by that of "Eupomotis gibbosus". This does not mean that the specimens of another biological species have been sampled, but merely that, after careful study, it appeared that the correct name of the species being sampled is "Eupomotis gibbosus".

Therefore, the data of "Gobio gobio" referred to in the preceding annual reports, are dealing with the species "Eupomo-

tis gibbosus".

With the last quarterly collection, two additional samples of "Perca fluviatilis" have been taken, one from the lake Maggiore and one from the lake Varese. These fishes have been divided into five parts (skin, head, bones, muscle and intestine) and each analysed as routine samples. The data obtained are reported in Tables 36 and 37. It may be noticed that for this species, which, among those sampled, is the most important from a dietary point of view, the edible part, namely muscle, contains about 2% of the total strontium-90 and about 60% of the total cesium-137.

The distribution of the two radionuclides within the body of the species considered is practically the same, despite the difference of a factor about two in the calcium and strontium concentrations of the lakes.

More of these measurements are planned in order to have reliable estimates of the strontium-90 and cesium-137 intake by fishery products.

8. OTHER ACTIVITIES

a) Strontium-90 in calf-bones

Bone (femour) samples of calves, about two months old and milk fed, have been collected during 1965 and measured for strontium-90 content.

Strontium-90 concentrations are given in Tables 38 and 39. Data are in pCi/g ash, instead of pCi/g fresh weight, as in the previous reports, because it appears that the data on specific activity of ashes are more reliable than those of fresh matter. Moreover, as the calcium concentration in ashes has been found nearly constant during 1964 and 1965 (standard deviation of the mean about 5.5% on eighty samples), averaging 370 mg/g, it has been decided to assume this value for the calculation of the strontium-90 activity relative to calcium concentration and to perform no more measurements of calcium in bones.

b) Strontium-90 and cesium-137 in vegetables

Samples of some of the vegetable species available to the city of Milano are taken fortnighthly and submitted to gamma spectrometry measurements. At the end of the year, aliquots of the individual samples are pooled together to give an yearly average for each species. Such pooled samples are processed for strontium-90 and cesium-137 determinations.

The results of the measurements are reported in Table 40.

c) Strontium-90 and cesium-137 in total diet

Between the 10^{th} of December 1964 and the 11^{th} of January 1965, a composite sample of total diet was collected at the canteen of the Establishment, in order to prepare an intercomparison sample for distribution to other laboratories. The wet fresh weight of the meals sampled was about 135 Kg (31 Kg dry matter) and the analyses were performed in quintuplicate on 500 g aliquots, which fortuitously represented approximately the average daily intake of an individual.

The average concentrations in the dry matter, found in this laboratory, were:

Sr^{90}	Ca	Cs^{137}	K
pCi/Kg	mg/g	pCi/Kg	mg/g
76.5	1.98	394	6.78

d) Control of liquid effluents

During the last year thirty-three samples of processed liquid wastes from the decontamination plant were analysed before discharge in the Novellino torrent. Each sample is controlled by gross alpha, gross beta and gamma spectrometry measurements. On yearly pooled samples and, if necessary, also on particular samples, analyses for specific radionuclides are performed. The results indicate that, during 1965 the activity of the discharged wastes was due almost exclusively to cobalt-60.

In order to study the retention of radionuclides by the bottom sediments of the Novellino torrent, samples of sand and silt have been taken in some points of the water-course during 1965. Gamma spectrometry measurements performed on these samples have shown the presence of a small activity of cobalt-60.

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ACKNOWLEDGMENTS

Thanks are due to Mr. G. Bollini of the Meteorology group for the drawings contained in this report.

Table 1

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JANUARY 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.35	0.39	0.39	0.38	0.38	0.38	0.8
2	0.32	0.27	0.25	0.25	0.25	0.27	0.4
3	0.19	0.16	0.17	0.13	0.17	0.16	
4	0.26	0.24	0.27	0.24	0.28	0.26	
5	0.42	0.40	0.38	0.35	0.37	0.38	
6	0.38	0.32	0.39	0.36	0.39	0.39	
7	0.42	0.42	0.35	0.33	0.32	0.37	
8	0.34	0.30	0.35	0.32	0.33	0.33	
9	0.30	0.30	0.35	0.26	0.31	0.30	
10	0.29	0.28	0.31	0.31	0.29	0.30	
11	0.19	0.20	0.19	0.19	0.20	0.19	
12	0.24	0.26	0.24	0.23	0.26	0.25	
13	0.30	0.32	0.26	0.25	0.30	0.29	
14	0.37	0.40	0.38	0.32	0.38	0.37	
15	0.33	0.28	0.30	0.26	0.29	0.29	
16	0.28	0.30	0.29	0.26	0.28	0.28	
17	0.42	0.37	0.42	0.40	0.43	0.41	0.2
18	0.39	0.44	0.36	0.39	0.40	0.40	0.2
19	0.27	0.28	0.26	0.26	0.27	0.27	4.0
20	0.30	0.27	0.30	0.30	0.30	0.29	
21	0.30	0.33	0.30	0.30	0.32	0.31	
22	0.27	0.19	0.26	0.24	0.28	0.25	
23	0.19	0.21	0.17	0.19	0.18	0.19	
24	0.16	0.18	0.20	0.18	0.18	0.18	
25	0.31	0.22	0.29	0.25	0.27	0.27	
26	0.26	0.29	0.30	0.24	0.30	0.28	
27	0.26	0.23	0.26	0.29	0.24	0.26	3.0
28	0.03	0.04	0.03	0.04	0.02	0.03	36.6
29	0.02	0.03	0.04	0.04	0.03	0.03	8.2
30	0.04	0.04	0.05	0.04	0.04	0.04	12.6
31	0.05	0.03	0.04	0.03	0.04	0.04	7.8
Av. value	0.27	0.26	0.26	0.25	0.26	0.26	
Min. value	0.02	0.03	0.03	0.03	0.02	0.03	
Max. value	0.42	0.44	0.42	0.40	0.43	0.41	
Total precipit.							73.8

Table 2

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

FEBRUARY 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.36	0.35	0.36	0.32	0.34	0.35	0.4
2	0.67	0.68	0.64	0.66	0.68	0.67	
3	0.31	0.31	0.32	0.31	0.34	0.32	
4	0.40	0.40	0.37	0.33	0.35	0.37	
5	0.48	0.47	0.48	0.48	0.46	0.47	
6	0.43	0.44	0.43	0.34	0.40	0.41	
7	0.27	0.28	0.27	0.26	0.29	0.27	
8	0.29	0.28	0.26	0.26	0.27	0.27	
9	0.30	0.28	0.30	0.35	0.34	0.31	
10	0.24	0.23	0.22	0.22	0.24	0.23	
11	0.23	0.24	0.27	0.33	0.28	0.27	
12	0.26	0.21	0.22	0.24	0.28	0.24	
13	0.28	0.27	0.24	0.26	0.27	0.26	
14	0.20	0.22	0.20	0.22	0.24	0.22	
15	0.22	0.21	0.20	0.18	0.20	0.20	
16	0.42	0.38	0.35	0.38	0.40	0.39	
17	0.22	0.22	0.18	0.20	0.21	0.21	
18	0.28	0.32	0.25	0.25	0.25	0.27	
19	0.24	0.28	0.28	0.32	0.34	0.29	
20	0.18	0.18	0.17	0.18	0.17	0.18	0.2
21	0.19	0.19	0.17	0.16	0.20	0.18	1.0
22	0.34	0.32	0.35	0.30	0.32	0.33	
23	0.40	0.35	0.35	0.29	0.31	0.34	
24	0.28	0.28	0.28	0.18	0.31	0.27	
25	0.54	0.60	0.53	0.50	0.51	0.54	
26	0.50	0.51	0.46	0.44	0.48	0.48	
27	1.38	1.38	1.36	-	1.36	1.37	
28	0.86	0.84	0.78	-	0.74	0.80	
Av. value	0.38	0.38	0.37	0.31	0.38	0.38	
Min. value	0.18	0.18	0.17	0.16	0.17	0.18	
Max. value	1.38	1.38	1.36	0.66	1.36	1.37	
Total precipit.							1.6

- = Measurement not performed.

Table 3

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

MARCH 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.36	0.27	0.29	0.30	0.30	0.30	20.4
2	0.05	0.08	0.06	0.06	0.06	0.06	25.4
3	0.32	0.28	0.32	0.28	0.28	0.30	
4	0.36	0.36	0.36	0.30	0.33	0.34	
5	0.33	0.46	0.34	0.29	0.35	0.35	4.2
6	0.28	0.29	0.28	0.26	0.32	0.29	
7	0.28	0.25	0.24	0.24	0.27	0.26	
8	0.29	0.30	0.27	0.24	0.24	0.27	
9	0.30	0.31	0.28	0.28	0.30	0.29	
10	0.30	0.32	0.31	0.30	0.29	0.30	
11	0.44	0.44	0.43	0.43	0.48	0.44	
12	0.55	0.56	0.51	0.51	0.51	0.53	
13	0.56	0.57	0.53	0.53	0.54	0.55	
14	0.53	0.60	0.47	0.52	0.58	0.54	1.2
15	0.34	0.39	0.36	0.34	0.35	0.36	1.8
16	0.23	0.20	0.20	0.20	0.23	0.21	
17	0.15	0.14	-	0.12	0.14	0.14	0.2
18	0.18	0.22	0.21	0.19	0.17	0.19	2.0
19	0.20	0.22	0.20	0.20	0.24	0.21	0.8
20	0.25	0.26	0.24	0.26	0.21	0.24	
21	0.28	0.28	0.28	0.29	0.29	0.28	
22	0.26	0.28	0.25	0.28	0.25	0.26	1.0
23	0.02	0.02	0.03	0.03	0.02	0.02	88.0
24	0.19	0.17	0.18	0.15	0.16	0.17	0.4
25	0.36	0.42	0.33	0.34	0.36	0.36	
26	0.31	0.30	0.28	0.25	0.26	0.28	
27	0.20	0.20	0.26	0.18	0.19	0.21	
28	0.26	0.26	0.20	0.22	0.22	0.23	
29	0.26	0.26	0.26	0.22	0.26	0.25	
30	0.29	0.31	0.31	0.28	0.27	0.29	
31	0.39	0.36	0.33	0.33	0.36	0.35	
Av. value	0.29	0.30	0.29	0.27	0.28	0.29	
Min. value	0.02	0.02	0.03	0.03	0.02	0.02	
Max. value	0.56	0.60	0.53	0.53	0.58	0.55	
Total precipit.							145.4

- = Measurement not performed.

Table 4

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

APRIL 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.64	0.62	0.62	0.54	0.62	0.61	
2	0.58	0.58	0.52	0.47	0.56	0.54	
3	0.58	0.59	0.60	0.54	0.60	0.58	
4	0.45	0.44	0.41	0.44	0.43	0.43	
5	0.42	0.44	0.46	0.43	0.45	0.44	0.2
6	0.58	0.58	0.60	0.49	0.55	0.56	1.0
7	0.60	0.60	0.62	0.51	0.54	0.57	
8	0.40	0.35	0.39	0.31	0.34	0.36	6.0
9	0.20	0.22	0.18	0.18	0.23	0.20	0.2
10	0.32	0.34	0.33	0.29	0.34	0.32	
11	0.46	0.48	0.44	0.48	0.46	0.46	
12	0.58	0.74	0.76	1.02	1.10	0.84	
13	0.76	0.68	0.78	0.98	1.28	0.90	
14	0.53	0.59	0.49	0.48	0.63	0.54	
15	0.44	0.44	0.42	0.41	0.42	0.43	
16	0.34	0.34	0.32	0.34	0.34	0.34	
17	0.74	0.70	0.76	0.68	0.70	0.72	
18	0.26	0.27	0.28	0.26	0.26	0.27	
19	0.35	0.36	0.33	0.28	0.34	0.33	8.4
20	0.26	0.26	0.24	0.22	0.24	0.24	5.8
21	0.13	0.10	0.14	0.12	0.12	0.12	
22	0.12	0.12	0.12	0.12	0.10	0.12	
23	0.14	0.14	0.14	0.16	0.16	0.15	
24	0.13	0.15	0.14	0.14	0.14	0.14	
25	0.15	0.15	0.14	0.15	0.16	0.15	3.0
26	0.22	0.24	0.24	0.20	0.25	0.23	0.2
27	0.44	0.44	0.46	0.42	0.44	0.44	
28	0.38	0.46	0.43	0.37	0.40	0.41	
29	0.39	0.40	0.34	0.38	0.40	0.38	0.2
30	0.30	0.33	0.31	0.32	0.34	0.32	
Av. value	0.40	0.40	0.40	0.39	0.43	0.40	
Min. value	0.12	0.10	0.12	0.12	0.10	0.12	
Max. value	0.76	0.74	0.78	1.02	1.28	0.90	
Total precipit.							25.0

Table 5

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

MAY 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.42	0.44	0.43	0.39	0.42	0.42	
2	0.34	0.36	0.29	0.30	0.33	0.32	6.8
3	0.35	0.36	0.35	0.27	0.28	0.32	
4	0.25	0.24	0.27	0.28	0.25	0.26	10.2
5	0.13	0.16	0.12	0.13	0.16	0.14	0.2
6	0.40	0.42	0.44	0.44	0.42	0.42	
7	0.52	0.50	0.50	0.50	0.48	0.50	
8	0.40	0.43	0.44	0.40	0.39	0.41	
9	0.34	0.36	0.34	0.32	0.32	0.34	
10	0.96	0.92	0.94	0.87	0.86	0.91	
11	0.88	0.85	0.86	0.84	0.88	0.86	
12	1.06	0.80	0.74	0.71	-	0.83	
13	0.44	0.44	0.48	0.40	0.44	0.44	
14	0.50	0.48	0.44	0.43	0.45	0.46	
15	-	0.58	0.54	0.52	0.54	0.54	
16	0.56	0.56	0.58	0.54	0.54	0.56	
17	0.60	0.60	0.56	0.58	0.62	0.59	1.6
18	0.53	0.58	0.54	0.54	0.54	0.55	15.8
19	0.19	0.19	0.18	0.18	0.18	0.18	1.0
20	0.26	0.26	0.26	0.25	0.27	0.26	11.4
21	0.22	0.22	0.21	0.21	0.21	0.21	0.2
22	0.15	0.16	0.15	0.15	0.17	0.16	
23	0.28	0.33	0.28	0.26	0.32	0.29	
24	0.33	2.55	0.32	0.30	0.25	0.75	1.8
25	0.40	0.36	0.60	0.42	0.37	0.43	28.0
26	0.44	0.38	0.43	0.31	0.62	0.44	18.0
27	0.31	0.42	0.30	0.28	0.45	0.35	0.4
28	0.19	0.22	0.20	0.18	0.18	0.19	
29	0.68	0.80	0.72	0.20	0.24	0.53	0.2
30	0.42	0.46	0.54	0.42	0.46	0.46	13.6
31	0.30	0.22	0.25	0.25	0.31	0.27	21.2
Av. value	0.43	0.50	0.43	0.38	0.40	0.43	
Min. value	0.13	0.16	0.12	0.13	0.16	0.14	
Max. value	1.06	2.55	0.94	0.87	0.88	0.91	
Total precipit.							130.4

- = Measurement not performed.

Table 6

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JUNE 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.38	0.33	0.40	0.40	0.36	0.37	0.8
2	0.60	0.46	0.56	0.56	0.50	0.54	4.2
3	0.13	0.12	0.12	0.10	0.11	0.12	16.8
4	0.14	0.09	0.13	0.10	0.18	0.13	2.6
5	0.28	0.26	0.24	0.27	0.28	0.27	3.6
6	1.04	0.49	0.46	0.40	0.38	0.55	3.4
7	0.39	0.41	0.50	0.38	0.50	0.44	23.0
8	0.46	0.35	0.51	0.30	0.35	0.39	20.0
9	0.29	0.27	0.23	0.56	0.28	0.33	
10	0.83	0.50	0.52	0.52	0.62	0.60	
11	1.02	1.02	0.90	0.92	1.00	0.97	
12	0.92	0.94	1.05	0.90	0.92	0.95	
13	0.70	0.72	0.76	0.60	0.56	0.67	0.4
14	1.34	1.10	1.00	1.00	1.08	1.10	0.2
15	1.22	0.92	0.80	0.80	1.00	0.95	3.8
16	0.80	0.77	0.74	0.78	0.90	0.80	2.2
17	1.40	1.37	1.27	1.16	1.27	1.29	1.2
18	1.74	1.60	1.60	1.46	1.53	1.59	
19	1.70	1.54	1.46	1.40	1.40	1.50	
20	1.30	1.24	1.40	1.20	1.30	1.29	0.2
21	1.48	1.42	1.47	1.30	1.42	1.42	
22	1.68	1.56	1.66	1.58	1.64	1.62	
23	1.62	1.64	1.70	1.60	1.64	1.64	
24	1.60	1.64	1.46	1.40	1.34	1.49	0.2
25	1.20	1.26	1.20	1.10	1.26	1.20	
26	0.85	0.80	0.88	0.84	0.92	0.86	
27	0.64	0.62	0.60	0.62	0.66	0.63	
28	0.62	0.59	0.53	0.56	0.58	0.58	
29	0.95	0.93	0.94	0.85	0.93	0.92	
30	0.86	0.80	0.86	0.80	0.80	0.82	
Av. value	0.94	0.87	0.87	0.82	0.86	0.87	
Min. value	0.13	0.09	0.12	0.10	0.11	0.12	
Max. value	1.74	1.64	1.70	1.60	1.64	1.64	
Total precipit.							82.6

Table 7

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

JULY 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.36	0.30	0.30	0.26	0.32	0.31	17.0
2	0.42	0.37	0.39	0.40	0.39	0.39	0.4
3	0.49	0.55	0.47	0.46	0.46	0.49	1.4
4	0.35	0.32	0.36	0.38	0.38	0.36	3.4
5	1.10	1.02	0.98	0.90	0.88	0.98	0.2
6	0.91	0.90	0.88	0.76	0.78	0.85	
7	0.80	0.71	0.70	0.70	0.72	0.73	
8	0.32	0.34	0.32	0.29	0.33	0.32	3.4
9	0.52	0.50	0.46	0.44	0.52	0.49	
10	0.63	0.57	0.64	0.64	0.65	0.63	
11	0.57	0.53	0.53	0.51	0.54	0.54	
12	0.56	0.56	0.58	0.54	0.50	0.55	
13	0.62	0.62	0.64	0.60	0.66	0.63	0.2
14	0.64	0.60	0.60	0.60	0.67	0.62	
15	0.68	0.66	0.62	0.63	0.66	0.65	
16	0.39	0.38	0.42	0.40	0.40	0.40	0.2
17	0.26	0.27	0.26	0.24	0.24	0.25	0.2
18	0.36	0.34	0.34	0.30	0.31	0.33	
19	0.39	0.34	0.32	0.35	0.38	0.36	
20	0.24	0.24	0.26	0.26	0.22	0.24	48.8
21	0.27	0.25	0.23	0.21	0.22	0.24	1.0
22	0.15	0.14	0.14	0.14	0.15	0.14	23.6
23	0.09	0.07	0.08	0.06	0.08	0.08	
24	0.12	0.12	0.12	0.10	0.12	0.12	
25	0.12	0.10	0.10	0.12	0.11	0.11	26.8
26	0.40	0.42	0.42	0.34	0.38	0.39	
27	0.31	0.36	0.26	0.30	0.26	0.30	
28	0.32	0.30	0.30	0.27	0.32	0.30	
29	0.34	0.36	0.33	0.28	0.34	0.33	
30	0.34	0.36	0.34	-	0.31	0.34	
31	0.34	0.28	0.31	0.34	0.33	0.32	
Av. value	0.43	0.41	0.41	0.39	0.41	0.41	
Min. value	0.09	0.07	0.08	0.06	0.08	0.08	
Max. value	1.10	1.02	0.98	0.90	0.88	0.98	
Total precipit.							126.6

- = Measurement not performed.

Table 8

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

AUGUST 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.19	0.16	0.19	0.16	0.18	0.18	5.4
2	0.14	0.15	0.11	0.15	0.15	0.14	
3	0.17	0.15	0.15	0.15	0.14	0.15	
4	0.24	0.25	0.21	0.21	0.19	0.22	
5	0.24	0.23	0.21	0.12	0.22	0.20	0.2
6	0.23	0.21	0.24	0.21	0.25	0.23	0.2
7	0.26	0.27	0.23	0.21	0.25	0.24	
8	0.29	0.28	0.29	0.28	0.28	0.28	
9	0.32	0.31	0.31	0.28	0.29	0.30	0.4
10	0.22	0.21	0.21	0.21	0.25	0.22	
11	0.22	0.20	0.20	0.19	0.22	0.21	
12	0.24	0.21	0.20	0.23	0.22	0.22	
13	0.19	0.17	0.18	0.19	0.20	0.19	
14	0.17	0.16	0.17	0.15	0.13	0.16	15.8
15	0.14	0.16	0.16	0.16	0.12	0.15	0.2
16	0.16	0.18	0.19	0.15	0.16	0.17	8.0
17	0.14	0.14	0.13	0.15	0.14	0.14	3.2
18	0.10	0.14	0.13	0.14	0.14	0.13	10.0
19	0.18	0.17	0.16	0.15	0.14	0.16	
20	0.19	0.17	0.16	0.19	0.18	0.18	0.4
21	0.17	0.16	0.16	0.18	0.20	0.17	14.4
22	0.18	0.16	0.13	0.15	0.14	0.15	46.4
23	0.12	0.12	0.12	0.15	0.10	0.12	7.2
24	0.14	0.14	0.17	0.22	0.15	0.16	
25	0.19	0.19	0.16	0.15	0.18	0.17	
26	0.25	0.20	0.20	0.18	0.20	0.21	
27	0.18	0.17	0.18	0.14	0.13	0.16	0.2
28	0.16	0.17	0.16	0.14	0.16	0.16	0.2
29	0.16	0.16	0.16	0.14	0.16	0.16	
30	0.13	0.16	0.13	0.13	0.16	0.14	1.0
31	0.10	0.08	0.08	0.08	0.08	0.08	19.6
Av. value	0.19	0.18	0.18	0.17	0.18	0.18	
Min. value	0.10	0.08	0.08	0.08	0.08	0.08	
Max. value	0.32	0.31	0.31	0.28	0.29	0.30	
Total precipit.							132.8

Table 9

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

SEPTEMBER 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.04	0.07	0.04	0.04	0.04	0.05	25.0
2	0.10	0.06	0.06	0.07	-	0.07	47.8
3	0.04	0.04	0.03	0.05	0.04	0.04	1.0
4	0.06	0.05	0.05	0.05	0.08	0.06	
5	0.03	0.03	0.05	0.03	0.02	0.03	21.2
6	0.09	0.08	0.06	0.08	0.08	0.08	0.2
7	0.16	0.13	0.12	0.12	0.12	0.13	
8	0.12	0.11	0.14	0.10	0.10	0.11	0.2
9	0.10	0.10	0.10	0.09	0.09	0.10	47.6
10	0.05	0.07	0.08	0.04	0.06	0.06	4.6
11	0.05	0.05	0.06	0.07	0.06	0.06	0.2
12	0.04	0.04	0.04	0.04	0.04	0.04	21.0
13	0.06	0.06	0.05	0.06	0.07	0.06	0.2
14	0.07	0.08	0.10	0.08	0.08	0.08	
15	0.09	0.09	0.05	0.06	0.09	0.08	0.2
16	0.09	0.10	0.09	0.07	0.09	0.09	0.2
17	0.10	0.11	0.09	0.11	0.09	0.10	0.2
18	0.13	0.12	0.10	0.13	0.13	0.12	1.6
19	0.14	0.14	0.16	0.14	0.14	0.14	2.8
20	0.19	0.15	0.15	0.15	0.16	0.16	
21	0.23	0.23	0.20	0.20	0.18	0.21	0.2
22	0.20	0.19	0.20	0.19	0.17	0.19	0.2
23	0.20	0.19	0.19	0.14	0.20	0.18	
24	0.16	0.19	0.17	0.15	0.15	0.16	0.2
25	0.16	0.17	0.15	0.15	0.17	0.16	1.4
26	0.14	0.12	0.15	0.16	0.16	0.15	51.2
27	0.06	0.06	0.06	0.07	0.06	0.06	27.2
28	0.01	0.05	0.04	0.05	0.03	0.04	21.4
29	0.07	0.08	0.05	0.04	0.04	0.06	20.8
30	0.04	0.03	0.01	0.02	0.02	0.02	71.2
Av. value	0.10	0.10	0.09	0.09	0.10	0.10	
Min. value	0.01	0.03	0.01	0.02	0.02	0.02	
Max. value	0.23	0.23	0.20	0.20	0.20	0.21	
Total precipit.							367.8

- = Measurement not performed.

Table 10

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

OCTOBER 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.01	0.03	0.02	0.03	0.01	0.02	71.6
2	0.07	0.05	0.07	0.06	0.09	0.07	
3	0.15	0.13	0.14	0.12	0.17	0.14	
4	0.22	0.16	0.17	0.19	0.20	0.19	0.2
5	0.23	0.20	0.24	0.18	0.19	0.21	0.2
6	0.17	0.17	0.17	0.12	0.17	0.16	0.2
7	0.15	0.18	0.19	0.13	0.11	0.15	0.2
8	0.17	0.19	0.18	0.13	0.17	0.17	0.2
9	0.17	0.15	0.15	0.16	0.14	0.15	0.2
10	0.15	0.17	0.15	0.16	0.16	0.16	1.6
11	0.15	0.12	0.15	0.09	0.14	0.13	
12	0.17	0.14	0.14	0.12	0.11	0.14	
13	0.15	0.13	0.13	0.10	0.12	0.13	0.2
14	0.12	0.08	0.09	0.10	0.11	0.10	0.4
15	0.14	0.13	0.14	0.12	0.12	0.13	0.2
16	0.17	0.18	0.18	0.16	0.18	0.17	0.2
17	0.18	0.18	0.18	0.16	0.14	0.17	
18	0.12	0.14	0.10	0.12	0.12	0.12	
19	0.18	0.15	0.18	0.13	0.12	0.15	0.2
20	0.13	0.19	0.19	0.14	0.17	0.16	0.2
21	0.15	0.16	0.11	0.14	0.12	0.14	
22	0.08	0.07	0.09	0.08	0.10	0.08	
23	0.10	0.08	0.09	0.06	0.13	0.09	
24	0.16	0.17	0.15	0.15	0.16	0.16	0.4
25	0.16	0.18	0.18	0.20	0.20	0.18	
26	0.25	0.31	0.29	0.38	0.42	0.33	0.2
27	0.12	0.14	0.13	0.12	0.16	0.13	
28	0.14	0.14	0.16	0.11	0.14	0.14	0.2
29	0.11	0.15	0.14	0.13	0.14	0.13	
30	0.14	0.12	0.12	0.14	0.14	0.13	0.4
31	0.12	0.12	0.12	0.14	0.14	0.13	0.2
Av. value	0.14	0.15	0.15	0.13	0.15	0.14	
Min. value	0.01	0.03	0.02	0.03	0.01	0.02	
Max. value	0.25	0.31	0.29	0.38	0.42	0.33	
Total precipit.							77.2

Table 11

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

NOVEMBER 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.12	0.14	0.15	0.12	0.12	0.13	0.2
2	0.13	0.12	0.10	0.11	0.12	0.12	0.2
3	0.11	0.10	0.08	0.08	0.10	0.09	1.0
4	0.06	0.07	0.07	0.07	0.07	0.07	11.6
5	0.03	0.05	0.03	0.04	0.03	0.04	8.2
6	0.03	0.05	0.05	0.04	0.03	0.04	0.2
7	0.06	0.05	0.04	0.06	0.04	0.05	
8	0.08	0.08	0.07	0.08	0.08	0.08	
9	0.09	0.09	0.10	0.07	0.07	0.08	1.0
10	0.06	0.03	0.03	0.05	0.06	0.05	28.2
11	0.06	0.06	0.04	0.04	0.05	0.05	0.2
12	0.03	0.05	0.03	0.03	0.04	0.04	14.8
13	0.04	0.05	0.04	0.06	0.04	0.05	0.2
14	0.12	0.12	0.10	0.14	0.12	0.12	
15	0.10	0.11	0.11	0.12	0.11	0.11	
16	0.10	0.12	0.10	0.10	0.10	0.10	0.2
17	0.08	0.08	0.08	0.08	0.07	0.08	11.0
18	0.04	0.07	0.06	0.07	0.06	0.06	
19	0.07	0.04	0.06	0.04	0.04	0.05	5.0
20	0.06	0.06	0.04	0.06	0.06	0.06	10.2
21	0.04	0.04	0.03	0.04	0.03	0.04	11.6
22	0.04	0.06	0.06	0.05	0.03	0.05	
23	0.09	0.07	0.07	0.08	0.10	0.08	
24	0.12	0.08	0.06	0.06	0.06	0.08	
25	0.11	0.10	0.13	0.10	0.10	0.11	
26	0.11	0.14	0.10	0.14	0.12	0.12	
27	0.07	0.09	0.07	0.07	0.09	0.08	1.2
28	0.10	0.10	0.10	0.08	0.08	0.09	
29	0.06	0.05	0.07	0.06	0.05	0.06	4.2
30	0.08	0.08	0.08	0.07	0.10	0.08	
Av. value	0.08	0.08	0.07	0.07	0.07	0.08	
Min. value	0.03	0.03	0.03	0.03	0.03	0.04	
Max. value	0.13	0.14	0.15	0.14	0.12	0.13	
Total precipit.							109.2

Table 12

CONCENTRATIONS OF GROSS BETA RADIOACTIVITY

IN AIR AT ISPRA

DECEMBER 1965

Day	Station 1 pCi/m^3	Station 2 pCi/m^3	Station 3 pCi/m^3	Station 4 pCi/m^3	Station 5 pCi/m^3	Average value pCi/m^3	Precipitation mm
1	0.05	0.07	0.08	0.06	0.10	0.07	
2	0.08	0.12	0.12	0.11	0.12	0.11	
3	0.10	0.15	0.11	0.12	0.14	0.12	
4	0.09	0.12	0.11	0.11	0.10	0.11	
5	0.09	0.08	0.10	0.08	0.10	0.09	
6	0.09	0.08	0.10	0.10	0.12	0.10	
7	0.08	0.09	0.09	0.11	0.09	0.09	0.6
8	0.08	0.05	0.05	0.06	0.04	0.06	1.2
9	0.10	0.10	0.11	0.12	0.13	0.11	
10	0.13	0.14	0.13	0.12	0.10	0.12	0.2
11	0.06	0.06	0.05	0.06	0.06	0.06	
12	0.12	0.13	0.12	0.10	0.12	0.12	
13	0.14	0.12	0.11	0.08	0.08	0.11	
14	0.13	0.15	0.13	0.11	0.12	0.13	
15	0.17	0.17	0.16	0.16	0.18	0.17	
16	0.17	0.18	0.18	0.20	0.16	0.18	
17	0.17	0.22	0.19	0.23	0.16	0.19	
18	0.18	0.16	0.16	0.16	0.15	0.16	
19	0.16	0.15	0.17	0.18	0.18	0.17	
20	0.18	0.17	0.20	0.16	0.24	0.19	3.2
21	0.10	0.11	0.10	0.12	0.12	0.11	2.2
22	0.16	0.14	0.15	0.14	0.14	0.15	
23	0.12	0.19	0.16	0.16	0.18	0.16	0.2
24	0.16	0.14	0.14	0.14	0.16	0.15	0.6
25	0.12	0.07	0.08	0.10	0.11	0.10	0.4
26	0.08	0.10	0.08	0.09	0.08	0.09	
27	0.07	0.06	0.08	0.06	0.06	0.07	11.2
28	0.08	0.04	0.04	0.05	0.03	0.05	
29	0.05	0.04	0.08	0.04	0.06	0.05	
30	0.07	0.12	0.08	0.10	0.10	0.09	
31	0.14	0.12	0.12	0.25	0.22	0.17	
Av. value	0.11	0.12	0.12	0.12	0.12	0.12	
Min. value	0.05	0.04	0.04	0.04	0.03	0.05	
Max. value	0.18	0.22	0.20	0.23	0.24	0.19	
Total precipit.							19.8

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

1965

Month	Gross beta	Sr^{90}	Cs^{137}	Pu^{239}
January	0.26	0.009	0.014	2.1×10^{-4}
February	0.38	0.016	0.023	3.1×10^{-4}
March	0.29	0.012	0.020	2.6×10^{-4}
April	0.40	0.019	0.028	4.0×10^{-4}
May	0.43	0.018	0.029	5.5×10^{-4}
June	0.87	0.018	0.028	3.5×10^{-4}
July	0.41	0.017	0.024	2.8×10^{-4}
August	0.18	0.009	0.013	1.9×10^{-4}
September	0.10	0.005	0.008	0.93×10^{-4}
October	0.14	0.006	0.009	1.3×10^{-4}
November	0.08	0.003	0.004	0.55×10^{-4}
December	0.12	0.004	0.005	0.73×10^{-4}

Table 13

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

1965

Month	Gross beta K^{40} equivalent			Strontium-90		Cesium-137		Precipitation	Day with
	mCi/Km^2(*)	mCi/Km^2(**)	pCi/l(*)	mCi/Km^2	pCi/l	mCi/Km^2	pCi/l	mm	precipitation
January	7.3	7.1	99	0.59	8.0	0.89	12.1	73.8	10
February	1.5	1.4	940	0.09	56.3	0.15	93.8	1.6	3
March	10.5	9.8	72	0.78	5.4	1.3	8.9	145.4	9
April	5.3	5.2	210	0.43	17.2	0.70	28.0	25.0	7
May	29.0	24.0	220	1.4	10.7	2.0	15.3	130.4	15
June	16.0	14.0	190	0.85	10.3	1.2	14.5	82.6	13
July	9.2	8.6	73	0.90	7.1	1.3	10.3	126.6	11
August	5.9	5.6	44	0.69	5.2	1.1	8.3	132.8	12
September	9.1	8.9	25	1.1	3.0	1.7	4.6	367.8	16
October	2.4	2.3	31	0.21	2.7	0.35	4.5	77.2	3
November	1.9	1.8	17	0.17	1.6	0.25	2.3	109.2	14
December	0.79	0.78	40	0.08	4.0	0.13	6.6	19.8	9
Total				17.29		11.07		1292.2	

(*) = Values in this column are extrapolated to last day of collection month.

(**) = Values in this column are extrapolated to midpoint of next month.

Table 14

RADIONUCLIDES IN FALLOUT

(mCi/Km^2)*

1965

Month	Ru^{106}	Mn^{54}	Sb^{125}	Ce^{144}
January	0.94	0.27	0.40	3.6
February	0.23	0.04	0.05	0.68
March	1.3	0.32	0.40	4.1
April	0.88	0.20	0.29	2.5
May	2.4	0.56	0.87	7.0
June	1.8	0.31	0.54	3.7
July	1.2	0.31	0.64	4.2
August	1.1	0.18	0.38	2.2
September	1.7	0.29	0.78	2.8
October	0.29	0.06	0.15	0.80
November	0.20	0.05	0.12	0.47
December	0.10	0.02	0.05	0.27

* = Values are extrapolated to last day of collection month.

Table 15

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"

pCi/l

1965

Sampling point			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
P1	Center of the lake	(surface)	3.7	2.2	3.0	3.2	2.9	3.5	3.7	3.4	5.5	2.7	2.7	3.4	3.32
P1	Center of the lake	m 25	2.7	2.6	4.2	3.2	3.3	3.1	3.0	2.7	4.5	2.7	6.4	3.5	3.49
P1	Center of the lake	m 50	3.4	2.5	4.3	3.7	-(*)	3.2	3.0	1.7	3.6	1.7	3.0	3.3	3.03
P2	Zenna	(surface)	1.9	1.3	3.3	2.9	3.2	2.9	3.7	3.1	4.4	-(**)	4.3	3.0	3.09
P3	Sasso Galletto	"	3.2	2.3	2.2	2.4	2.8	3.4	4.2	3.1	3.9	4.0	4.0	3.1	3.21
P4	Laveno	"	3.5	2.1	2.2	2.7	3.2	3.4	3.6	3.5	20	4.5	3.9	2.2	4.56
P5	Porto Ispra	"	2.5	1.9	3.7	3.5	2.0	3.9	3.8	3.1	3.2	4.1	4.1	2.7	3.20
P6	Sesto Calende	"	3.9	2.6	4.6	3.7	4.1	3.9	3.3	3.8	6.4	5.3	5.1	3.5	4.18
P7	Acque Nere Mouth	"	3.0	3.0	3.5	3.7	33	4.1	4.1	4.8	7.1	4.3	3.6	2.6	6.40
P8	Ranco	(surface)	2.9	2.9	3.8	2.5	4.0	3.9	3.9	2.7	4.2	3.3	7.9	3.5	3.79
P8	Ranco	m 25	3.9	2.6	4.0	2.9	2.6	2.7	2.9	2.5	2.9	2.3	2.9	2.7	2.90
P8	Ranco	m 50	3.5	3.4	3.6	3.7	3.2	3.1	2.9	2.9	3.9	2.9	3.2	3.7	3.33
P9	Baveno	(surface)	3.4	2.4	3.9	3.4	3.5	4.3	3.6	4.5	5.1	3.7	1.9	4.1	3.65
	Average value		3.19	2.44	3.56	3.19	5.65	3.49	3.51	3.21	5.74	3.45	4.07	3.10	

(*) = Sample lost.

(**) = Sample not collected.

Table 17

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

NEAR TO THE ISPRA ESTABLISHMENT pCi/l

1965

	Sampling point	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly average
	Lakes													
P10	Monate	15	12	12	11	12	15	15	16	15	13	13	12	13.4
P11	Varese	10	9.1	9.2	11	10	12	7.4	9.5	13	9.2	9.2	7.8	9.78
P12	Comabbio	18	17	19	16	16	15	14	12	18	15	15	15	15.8
	Rivers													
P13	Acque Nere I	2.5	2.4	3.9	4.3	5.6	5.4	3.5	3.2	6.6	8.0	4.6	2.4	4.36
P14	Acque Nere II	3.5	3.1	4.2	5.1	3.7	5.7	3.7	3.7	7.6	4.5	6.0	5.0	4.65
P15	Tresa	4.1	3.7	4.6	4.4	3.7	4.8	4.9	3.2	4.5	4.3	5.1	4.2	4.29
P16	Boesio	< 0.5	< 0.5	0.9	1.4	< 0.5	0.6	1.5	1.1	3.2	4.3	3.9	1.8	1.68
P17	Toce	1.5	2.6	3.3	2.2	2.3	3.7	15	5.7	3.6	1.6	3.4	2.3	3.93
P18	Novellino	3.5	2.1	4.4	8.9	4.1	8.5	3.7	3.1	14	8.2	7.6	5.2	6.10
	Drinkable Waters													
P19	Farm Vicina	< 0.5	1.0	< 0.5	< 0.5	8.2	< 0.5	< 0.5	< 0.5	1.1	< 0.5	2.5	1.0	1.44
P20	Farm Casello	< 0.5	1.5	2.2	1.6	1.9	1.6	1.6	1.7	4.2	< 0.5	9.3	1.9	2.37
P21	Farm Gabriella	< 0.5	0.7	0.7	0.7	0.9	1.4	1.1	0.9	1.9	3.1	2.6	1.7	1.35
P22	Fontanone	< 0.5	< 0.5	1.4	1.3	1.5	1.2	1.4	1.4	3.4	1.8	6.0	3.9	2.02
P23	Roccolo	3.1	2.0	3.7	3.1	2.8	2.4	2.7	2.4	5.3	3.3	7.6	3.0	3.45

Table 18

STRONTIUM-90 AND CESIUM-137 IN LAKE WATERS

1965

Name of the lake	Sampling date	Sr^{90} pCi/l	Ca mg/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K mg/l	Cs^{137} pCi/g K
"Maggiore"	15- 3	0.65	20	33	0.52	1.8	290
"	9- 6	0.88	21	42	0.57	2.1	270
"	13- 9	1.1	21	52	0.46	1.7	270
"	8-12	0.81	19	43	0.30	1.8	170
"Monate"	10- 3	4.8	9.8	490	1.5	1.0	1 500
"	9- 6	4.6	10	460	1.5	1.1	1 400
"	12- 9	4.6	10	460	1.5	1.1	1 400
"	8-12	4.6	10	460	1.1	1.0	1 100
"Comabbio"	9- 3	8.0	28	290	1.2	1.8	670
"	9- 6	6.9	27	260	1.3	1.9	680
"	12- 9	7.2	28	260	1.3	1.8	720
"	8-12	6.7	27	250	1.0	2.0	500
"Varese"	11- 3	4.5	38	120	1.2	2.3	520
"	9- 6	3.5	24	150	1.1	2.6	420
"	13- 9	3.1	26	120	0.88	2.2	400
"	11-12	3.5	30	120	0.70	2.7	260

Table 19

CONCENTRATIONS OF RADIONUCLIDES IN LAKE WATERS

1965

pCi/l

Name of the lake	Sampling date	Ru^{106}	Sb^{125}	Mn^{54}
"Maggiore"	15- 3	0.66	0.29	u.
"	9- 6	1.00	0.33	u.
"	13- 9	0.74	0.37	u.
"	8-12	0.60	0.25	u.
"Monate"	10- 3	2.8	1.3	0.09
"	9- 6	3.2	1.4	0.14
"	12- 9	1.7	1.4	0.10
"	8-12	1.5	1.2	u.
"Comabbio"	9- 3	2.6	1.1	0.11
"	9- 6	3.0	0.72	0.70
"	12- 9	1.8	0.88	0.28
"	8-12	1.3	0.42	u.
"Varese"	11- 3	2.4	0.63	0.17
"	9- 6	3.3	0.83	0.27
"	13- 9	1.6	0.63	0.07
"	11-12	1.1	0.25	0.05

u. = Undetectable.

Table 20

STRONTIUM-90 AND CESIUM-137 IN SOILS

MARCH 1965

Sampling site	Strontium-90		Cesium-137	
	pCi/g (*)	mCi/Km^2	pCi/g (*)	mCi/Km^2
Angera	0.94	81	1.6	138
Barza	1.5	104	1.8	125
Brebbia	1.6	133	1.8	150
Diga Miorina	1.4	103	2.1	154
Ispra	1.3	96	2.1	154
Malgesso	1.1	56	1.9	96
Monvalle	0.90	61	1.3	89
Osmate	1.1	77	2.3	162
Pallanza	2.3	129	2.7	153
Parruzzaro	1.9	103	2.8	152
Solcio	1.3	106	1.9	156
Taino	1.3	83	1.9	121
Travedona	1.1	63	2.1	120
Varano Borghi	1.5	80	2.2	118

(*) = These data have been rounded off to two digits, whereas the mCi/Km^2 values are given as obtained by multiplication.

Table 21

NATURAL RADIOACTIVITY AND STABLE ELEMENTS IN SOILS

MARCH 1965

Sampling site	Th^{232} p.p.m.	Ra^{226} 10^{-12} g/g	K mg/g	Ca mg/g
Angera	8.3	0.53	16.0	5.3
Barza	9.4	0.56	14.7	4.3
Brebbia	8.6	0.75	14.3	4.9
Diga Miorina	13.2	0.83	19.1	5.8
Ispra	8.6	0.60	17.0	3.4
Malgesso	10.5	0.71	17.3	6.2
Monvalle	11.7	0.83	17.4	5.5
Osmate	12.3	0.75	18.0	6.3
Pallanza	10.0	0.72	14.4	7.3
Parruzzaro	13.0	0.78	23.8	4.3
Solcio	12.3	0.78	24.0	2.5
Taino	12.6	0.86	16.0	6.1
Travedona	10.7	0.67	16.1	6.1
Varano Borghi	10.1	0.67	15.1	4.4

Table 22

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

1965

Sampling site	Sampling date		R(**)	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
Barza	April	24	5.00	2.8	10.8	260	2.8	15.5	180
Brebbia	"	"	4.85	2.8	6.8	410	1.2	33.1	36
Ispra	"	"	4.88	2.5	9.2	270	2.0	12.4	160
Monvalle	"	"	5.97	2.0	10.8	190	0.90	22.0	41
Osmate	"	"	6.56	7.9	10.8	730	1.4	36.2	39
Taino	"	"	5.26	1.7	9.2	180	1.1	35.2	31
Barza	May	26	6.56	4.5	21.2	210	4.6	10.8	430
Brebbia	"	"	5.97	3.6	14.4	250	1.7	24.6	69
Ispra	"	"	5.42	4.3	8.4	510	2.0	19.2	100
Monvalle	"	"	9.09	1.5	14.8	100	1.0	39.5	25
Osmate	"	"	8.00	2.9	12.4	230	1.2	30.0	40
Taino	"	"	5.41	3.2	14.0	230	1.7	19.3	88

(*) = Values are given per weight unity of dry matter.

(**) = Weight ratio of the fresh matter at the collection to the dry matter.

Table 23

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

1965

Sampling site	Sampling date		R(**)	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
Barza	June	23	4.17	3.2	13.6	240	2.8	9.8	290
Brebbia	"	"	5.00	2.1	8.3	250	0.60	31.3	19
Ispra	"	"	5.88	2.1	10.0	210	1.1	21.4	51
Monvalle	"	"	5.52	3.5	17.6	200	1.1	14.7	75
Osmate	"	"	5.33	8.2	10.9	750	0.80	30.6	26
Taino	"	"	6.06	3.2	14.8	220	2.2	7.4	300
Barza	July	16	7.35	3.2	10.4	310	3.5	14.1	250
Brebbia	"	"	4.30	1.8	10.0	180	0.5	20.7	24
Ispra	"	"	5.60	2.6	12.0	180	1.2	20.4	59
Monvalle	"	"	5.15	1.1	12.4	89	0.6	20.0	30
Osmate	"	"	5.97	2.3	11.6	200	0.7	28.1	25
Taino	"	"	6.62	2.5	17.6	140	1.2	21.6	56

(*) = Values are given per weight unity of dry matter.

(**) = Weight ratio of the fresh matter at the collection to the dry matter.

Table 24

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

1965

Sampling site	Sampling date		R(**)	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
Barza	August	17	4.55	2.5	13.6	180	3.0	11.0	270
Brebbia	"	"	4.88	2.1	16.0	130	0.9	13.0	69
Ispra	"	"	8.00	2.9	13.6	210	1.7	32.3	53
Monvalle	"	"	8.00	1.7	13.6	130	1.0	31.9	31
Osmate	"	"	5.56	2.3	13.6	170	0.9	20.1	45
Taino	"	"	4.94	2.4	14.8	160	1.0	17.5	57
Barza	September	14	3.70	4.4	14.0	310	5.1	12.5	410
Brebbia	"	"	4.55	3.4	9.2	370	1.3	29.5	44
Ispra	"	"	4.38	3.1	10.4	300	2.1	12.0	170
Monvalle	"	"	5.97	2.0	10.0	200	1.1	25.8	43
Osmate	"	"	6.06	3.9	14.8	260	1.0	19.3	52
Taino	"	"	4.65	3.9	14.0	280	1.4	17.4	80
Barza	October	11	4.76	3.3	14.6	230	1.9	17.7	110
Brebbia	"	"	4.49	2.1	12.8	160	0.9	30.5	29
Ispra	"	"	6.06	1.4	8.5	170	1.0	42.0	24
Monvalle	"	"	6.06	1.9	17.6	110	1.2	25.7	47
Osmate	"	"	6.67	2.4	8.6	280	1.0	31.0	32
Taino	"	"	4.18	3.4	11.1	310	2.3	9.9	230

(*) = Values are given per weight unity of dry matter.

(**) = Weight ratio of the fresh matter at the collection to the dry matter.

Table 25

STRONTIUM-90 AND CESIUM-137 IN MILK

B A R Z A

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	98	1.07	92	220	1.85	120	0.77
February	95	1.20	79	270	1.80	150	0.53
March	83	1.08	77	270	1.74	160	0.48
April	91	1.01	90	200	1.78	110	0.82
May	69	1.10	63	130	1.82	71	0.89
June	54	1.13	48	110	1.84	60	0.80
July	45	1.17	38	85	1.71	50	0.74
August	51	1.15	44	91	1.72	53	0.83
September	61	1.20	51	69	1.73	40	1.3
October	61	1.15	53	110	1.65	69	0.77
November	53	1.22	43	100	1.75	57	0.75
December	49	1.12	44	150	1.65	91	0.48

Table 26

STRONTIUM-90 AND CESIUM-137 IN MILK

B R E B B I A

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	73	1.30	56	430	1.75	250	0.22
February	77	1.27	61	470	1.75	270	0.23
March	91	1.22	75	440	1.68	260	0.29
April	83	1.14	73	440	1.65	270	0.27
May	69	1.25	55	340	1.60	210	0.26
June	73	1.27	57	330	1.50	220	0.26
July	57	1.20	47	240	1.53	160	0.29
August	57	1.23	46	250	1.60	160	0.29
September	48	1.22	39	160	1.54	100	0.39
October	55	1.22	45	170	1.55	110	0.41
November	57	1.07	53	140	1.65	85	0.62
December	56	1.30	43	220	1.60	140	0.31

Table 27

STRONTIUM-90 AND CESIUM-137 IN MILK

ISPRA

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	65	1.13	58	440	1.65	270	0.22
February	66	1.23	54	430	1.73	250	0.22
March	62	1.25	50	430	1.63	260	0.19
April	64	1.08	59	400	1.66	240	0.25
May	54	1.20	45	290	1.68	170	0.26
June	45	1.04	43	260	1.67	160	0.27
July	39	1.17	33	190	1.55	120	0.28
August	37	1.12	33	200	1.61	120	0.28
September	40	1.17	34	170	1.54	110	0.31
October	40	1.15	35	170	1.50	110	0.32
November	36	1.13	32	150	1.50	100	0.32
December	40	1.17	34	170	1.50	110	0.31

Table 28

STRONTIUM-90 AND CESIUM-137 IN MILK

MILANO

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	26	1.23	21	110	1.69	65	0.32
February	23	1.17	20	110	1.68	66	0.30
March	23	1.23	19	110	1.67	66	0.29
April	18	1.22	15	67	1.65	41	0.37
May	18	1.29	14	60	1.65	36	0.39
June	20	1.20	17	70	1.60	44	0.39
July	17	1.13	15	69	1.70	41	0.37
August	13	1.08	12	55	1.62	34	0.35
September	16	1.17	14	45	1.63	28	0.50
October	15	1.20	13	45	1.55	29	0.45
November	16	1.20	13	39	1.65	24	0.54
December	13	1.12	12	41	1.60	25	0.48

Table 29

STRONTIUM-90 AND CESIUM-137 IN MILK

O S M A T E

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	62	1.12	55	270	1.72	160	0.34
February	56	1.23	46	290	1.69	170	0.27
March	71	1.15	62	280	1.65	170	0.37
April	76	1.13	67	350	1.64	210	0.32
May	52	1.30	40	200	1.68	120	0.33
June	62	1.09	57	230	1.57	150	0.38
July	52	1.17	44	190	1.54	120	0.37
August	52	1.27	41	170	1.49	110	0.37
September	44	1.20	37	140	1.45	97	0.38
October	55	1.18	47	190	1.50	130	0.36
November	54	1.15	47	160	1.60	100	0.47
December	48	1.25	38	170	1.58	110	0.35

Table 30

STRONTIUM-90 AND CESIUM-137 IN MILK

V A R E S E

1965

Month	Sr^{90} pCi/l	Ca g/l	Sr^{90} pCi/g Ca	Cs^{137} pCi/l	K g/l	Cs^{137} pCi/g K	$\frac{Sr^{90}\ pCi/g\ Ca}{Cs^{137}\ pCi/g\ K}$
January	53	1.20	44	300	1.73	170	0.26
February	59	1.25	47	310	1.65	190	0.25
March	51	1.25	41	300	1.52	200	0.21
April	48	1.29	37	280	1.63	170	0.22
May	44	1.05	42	170	1.52	110	0.38
June	48	1.25	38	170	1.61	110	0.35
July	35	1.15	30	120	1.51	79	0.38
August	32	1.19	27	110	1.55	71	0.38
September	37	1.22	30	100	1.56	64	0.47
October	39	1.25	31	120	1.59	76	0.41
November	42	1.03	41	120	1.59	75	0.55
December	34	1.32	26	120	1.51	80	0.33

Table 31

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "COMABBIO"

1965

Biological species	Sampling date	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
	March						
Perca fluviatilis	30	2.3	17.1	130	6.5	2.96	2 200
Scardinius erith.	30	1.3	15.8	82	1.3	2.82	460
Eupomotis gibbosus	30	1.6	16.5	97	1.2	3.00	400
	June						
Perca fluviatilis	16	1.2	10.5	110	3.0	3.00	1 000
Scardinius erith.	16	1.4	15.0	93	1.4	3.10	450
Eupomotis gibbosus	16	1.1	11.7	94	0.56	3.12	180
	September						
Perca fluviatilis	14	1.7	19.4	88	1.9	3.06	620
Scardinius erith.	14	1.7	17.3	98	0.82	2.71	300
Eupomotis gibbosus	14	1.0	13.7	73	0.76	3.10	250
	December						
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	6	2.0	16.6	120	0.79	2.86	280
Eupomotis gibbosus	16	1.6	11.8	140	0.48	2.39	200

- = Sample not available.

Table 32

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "MAGGIORE"

1965

Biological species	Sampling date	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
	March						
Perca fluviatilis	26	0.35	13.0	27	2.4	3.08	780
Scardinius erith.	26	0.45	16.3	28	0.95	3.04	310
Eupomotis gibbosus	-	-	-	-	-	-	-
	June						
Perca fluviatilis	9	0.34	13.9	24	1.7	3.49	490
Scardinius erith.	9	0.43	15.6	28	0.97	3.04	320
Eupomotis gibbosus	9	0.36	11.6	31	0.47	3.16	150
	September						
Perca fluviatilis	16	0.27	11.1	24	1.7	3.15	540
Scardinius erith.	16	0.51	12.6	40	0.80	2.84	280
Eupomotis gibbosus	16	0.29	13.5	22	0.42	2.95	140
	December						
Perca fluviatilis	6	0.17	15.2	11	4.4	2.95	1 500
Scardinius erith.	17	0.38	14.6	26	0.61	2.76	220
Eupomotis gibbosus	-	-	-	-	-	-	-

- = Sample not available.

Table 33

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "MONATE"

1965

Biological species	Sampling date	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
	March						
Perca fluviatilis	30	2.2	13.8	160	8.5	3.05	2 800
Scardinius erith.	30	3.8	16.7	230	4.1	3.17	1 300
Eupomotis gibbosus	30	3.2	19.1	170	7.6	3.08	2 500
	June						
Perca fluviatilis	16	1.3	17.0	76	6.5	3.47	1 900
Scardinius erith.	16	4.8	14.1	340	3.4	3.29	1 000
Eupomotis gibbosus	16	2.7	13.2	200	11.4	3.47	3 300
	September						
Perca fluviatilis	8	2.1	17.4	120	9.4	3.25	2 900
Scardinius erith.	8	3.1	14.9	210	1.7	2.56	660
Eupomotis gibbosus	8	2.6	15.3	170	12.5	3.38	3 700
	December						
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	17	3.5	14.8	240	0.98	2.66	370
Eupomotis gibbosus	-	-	-	-	-	-	-

- = Sample not available.

Table 34

STRONTIUM-90 AND CESIUM-137 IN LAKE FISHES

LAKE "VARESE"

1965

Biological species	Sampling date	Sr^{90} pCi/g	Ca mg/g	Sr^{90} pCi/g Ca	Cs^{137} pCi/g	K mg/g	Cs^{137} pCi/g K
	March						
Perca fluviatilis	-	-	-	-	-	-	-
Scardinius erith.	29	1.7	16.4	103	1.5	3.02	500
Eupomotis gibbosus	30	0.97	18.3	53	0.78	2.84	270
	June						
Perca fluviatilis	9	0.63	13.6	46	1.9	3.28	580
Scardinius erith.	9	1.1	15.4	71	1.5	3.18	470
Eupomotis gibbosus	9	0.57	11.8	48	0.48	2.90	170
	September						
Perca fluviatilis	7	0.71	16.0	44	0.85	3.18	270
Scardinius erith.	7	1.1	17.3	64	1.2	3.15	380
Eupomotis gibbosus	7	0.53	16.0	33	0.27	3.00	90
	December						
Perca fluviatilis	6	0.66	13.1	50	0.76	3.00	250
Scardinius erith.	6	1.2	16.9	71	1.0	3.02	330
Eupomotis gibbosus	6	0.61	14.3	43	0.25	2.80	90

- = Sample not available.

Table 35

DISTRIBUTION OF RADIOACTIVITY AND STABLE ELEMENTS WITHIN THE BODY OF THE FISH "PERCA FLUVIATILIS" *

LAKE MAGGIORE

DECEMBER 1965

Part	Skin	Head	Bones	Muscle	Intestine
% fresh weight	8.8	25.9	13.0	40.1	12.2
Sr^{90} pCi/g	0.57	0.21	0.23	0.006	0.013
Sr^{90} % of the total	36.2	39.5	21.5	1.7	1.1
Ca mg/g	63.0	19.5	22.0	0.40	1.53
Sr^{90} pCi/g Ca	9.0	11	10	14	8.5
Cs^{137} pCi/g	1.3	1.3	2.5	3.4	2.1
Cs^{137} % of the total	4.7	14.1	14.6	56.0	10.6
K mg/g	1.63	1.65	3.06	3.69	1.12
Cs^{137} pCi/g K	800	790	820	920	1 900

* = About 30 individuals, 2.620 Kg.

Table 36

DISTRIBUTION OF RADIOACTIVITY AND STABLE ELEMENTS WITHIN THE BODY OF THE FISH "PERCA FLUVIATILIS" *

LAKE VARESE

DECEMBER 1965

Part	Skin	Head	Bones	Muscle	Intestine
% fresh weight	8.7	23.1	10.3	46.7	11.2
Sr^{90} pCi/g	1.8	0.62	1.2	0.017	0.056
Sr^{90} % of the total	35.8	32.8	28.2	1.8	1.4
Ca mg/g	52.4	17.8	36.0	0.64	1.29
Sr^{90} pCi/g Ca	34	35	33	27	43
Cs^{137} pCi/g	0.30	0.30	0.90	0.96	0.97
Cs^{137} % of the total	3.5	9.3	12.5	60.0	14.7
K mg/g	1.64	1.79	3.60	3.57	2.67
Cs^{137} pCi/g K	180	170	250	270	360

* = About 30 individuals, 2.420 Kg.

Table 37

STRONTIUM-90 IN CALF BONES

1965

Sampling site	Sampling date	Sr^{90} pCi/g ash	Sr^{90} * pCi/g Ca
	January		
Angera	21	18	49
Brebbia	15	28	76
Cadrezzate	21	24	65
Osmate	21	18	49
Taino	21	17	46
	February		
Brebbia	16	10	27
Capronno	16	20	54
Ispra	16	22	59
Osmate	16	10	27
Taino	16	22	59
	March		
Angera	13	18	49
Barza	10	20	54
Brebbia	13	28	76
Cadrezzate	13	20	54
Osmate	13	22	59
	April		
Angera	20	19	51
Barza	20	24	65
Brebbia	20	11	30
Cadrezzate	20	38	103
Capronno	20	18	49
Capronno	20	38	103
Ispra	20	19	51
Osmate	20	22	59
	May		
Angera	14	23	62
Angera	14	30	81
Cadrezzate	14	23	62
Ispra	14	10	27
Malgesso	14	25	67
Monvalle	14	22	59
Taino	14	35	94
Travedona	14	32	86

* = Calcium concentration in bone ash has been assumed constant as 37.0%.

STRONTIUM-90 IN CALF BONES

1965

Sampling site	Sampling date	Sr^{90} pCi/g ash	Sr^{90} pCi/g Ca *
	June		
Angera	21	16	43
Cadrezzate	21	39	105
Osmate	21	38	103
Taino	21	24	65
Travedona	21	28	76
Travedona	21	29	78
	September		
Angera	8	21	57
Barzola	8	20	54
Cadrezzate	8	38	103
Capronno	8	24	65
Ispra	8	20	54
Osmate	8	19	51
Taino	8	19	51
	October		
Angera	12	40	108
Cadrezzate	12	23	62
Comabbio	12	35	94
Ispra	12	30	81
Osmate	12	26	70
Taino	12	23	62
	November		
Angera	18	17	46
Barza	18	25	67
Brebbia	18	18	49
Capronno	18	22	59
Comabbio	18	26	70
Ispra	18	25	67
Travedona	18	24	65

* = Calcium concentration in bone ash has been assumed constant as 37.0%.

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

1965

Species	Sr^{90} pCi/Kg	Ca g/Kg	Sr^{90} pCi/g Ca	Cs^{137} pCi/g Ca	K g/Kg	Cs^{137} pCi/g K
Spinach - "Spinacia Oleracea"	58	1.39	40	34	6.1	5.6
Tall Chard - "Beta Vulgaris"	53	0.87	48	29	3.5	8.3
Small Chard - "Beta Vulgaris"	73	1.02	59	38	3.4	11
Turnip Tops - "Brassica Oleracea Botrytis" D.C.	90	1.42	58	40	3.9	10
Chicory - "Cichorium Intybus"	31	0.33	57	16	2.7	5.9
Bitter Chicory - "Cichorium Intybus"	30	0.60	35	19	3.9	4.9
Lettuce - "Lactuca Scariola"	19	0.29	32	11	2.1	5.2
Lettuce - "Lactuca Sativa"	32	0.44	38	21	2.8	7.5

(*) = Concentration 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.

Table 40

Figure 1 Central ratemeters and recorders assembly of the telemetering network.

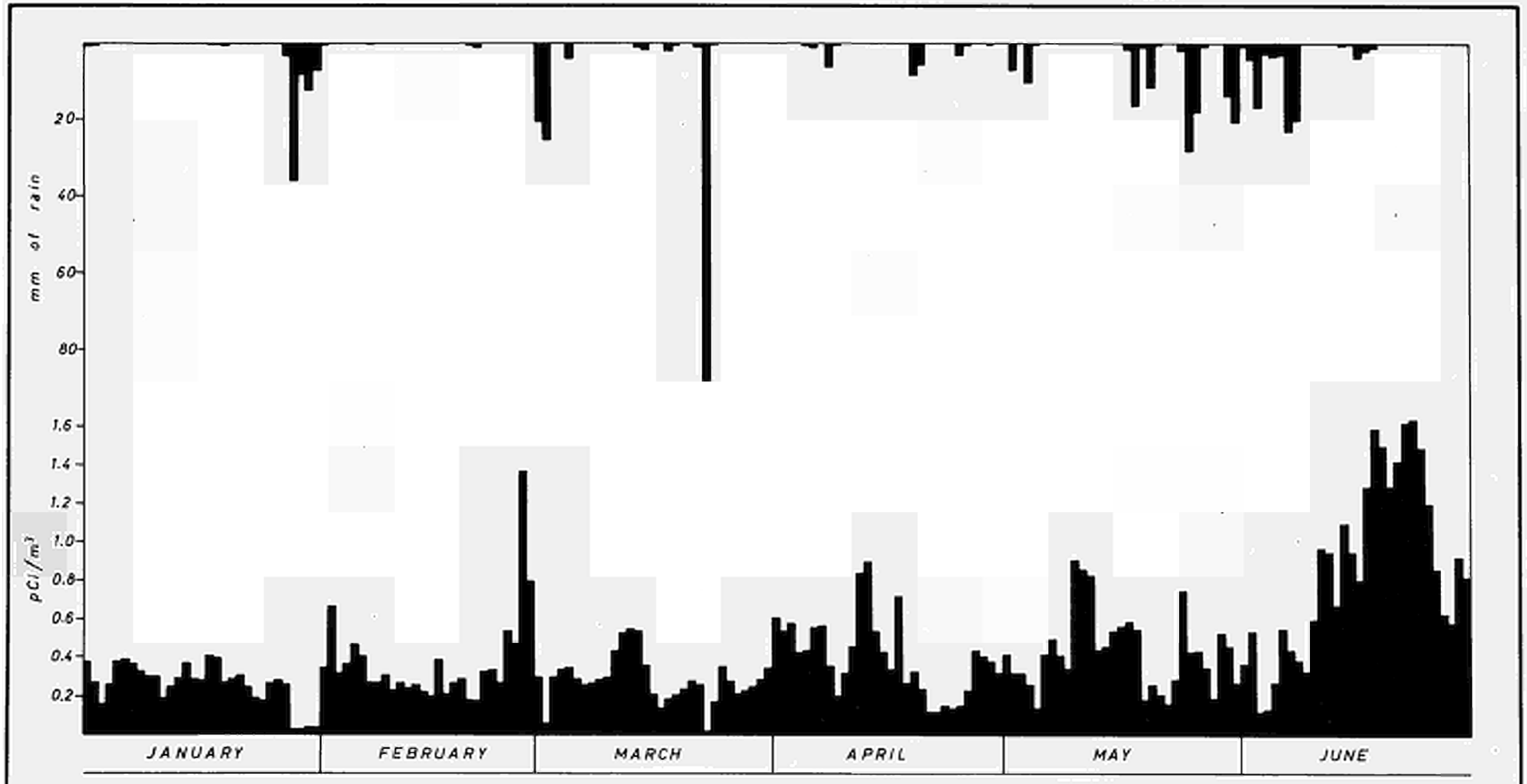

FIG. 2 - *Daily average concentration of gross beta radioactivity in air (January - June 1965)*

C.C.R.N. EURATOM ISPRA - SERV. PROTEZIONE
Sez. Sito e Meteorologia - d.ssa Gilbains 16.3.66

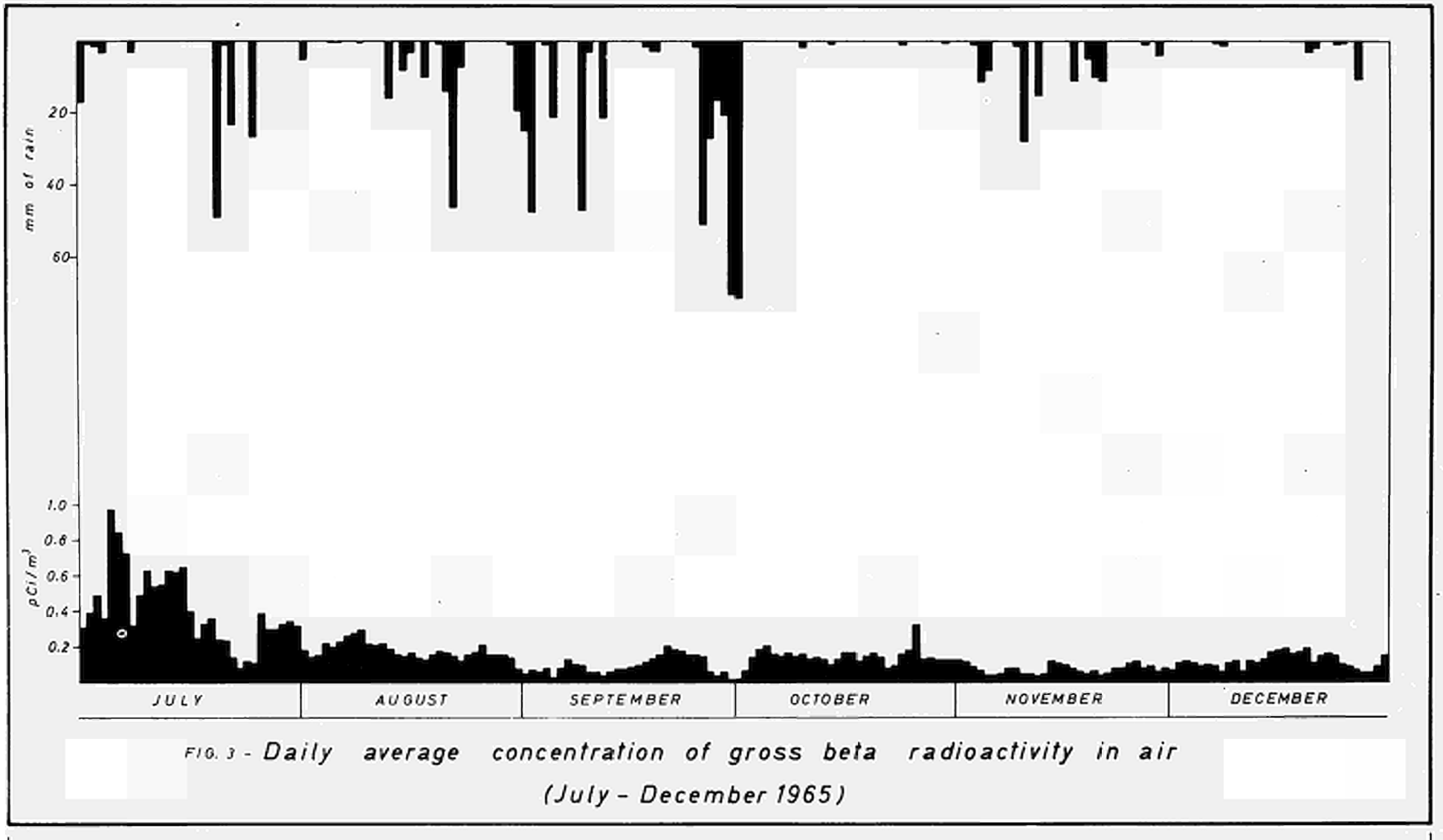

FIG. 3 - *Daily average concentration of gross beta radioactivity in air (July - December 1965)*

C.C.R.N. EURATOM ISPRA - SERV. PROTEZIONE
Sez. Sito e Meteorologia - dis. G.Bellini 18.2.66

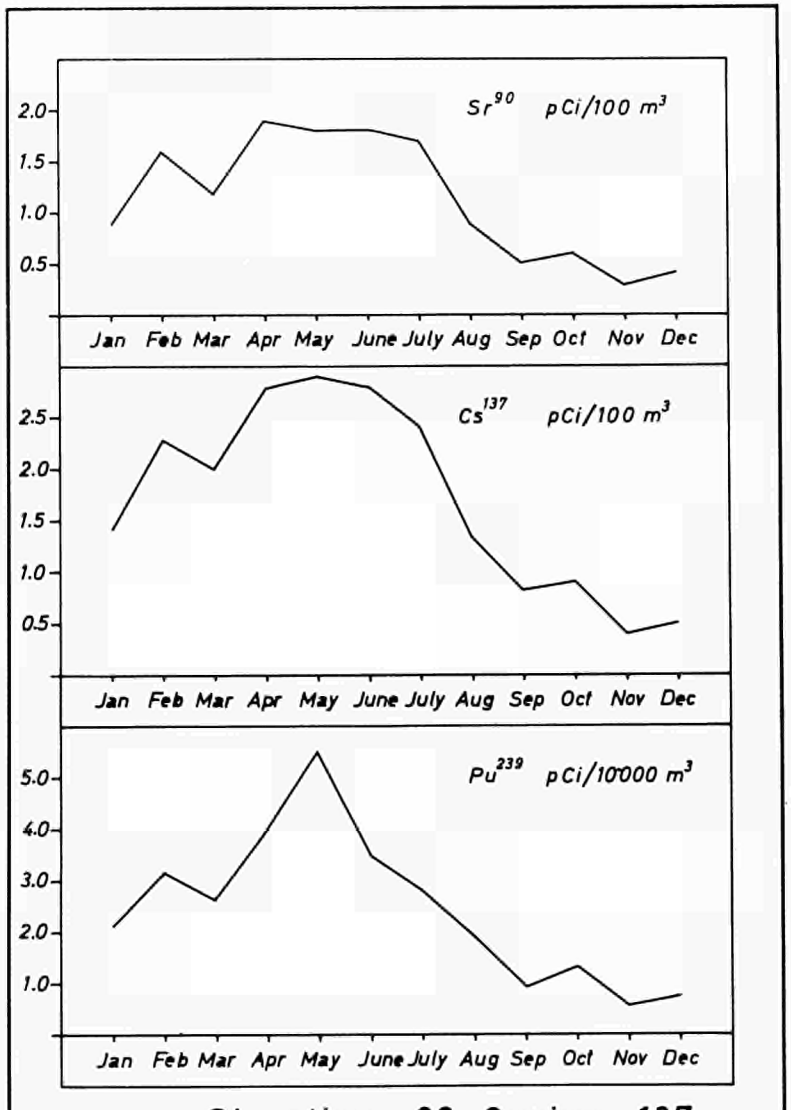

FIG. 4 - Strontium-90, Cesium-137 and Plutonium-239 in air (1965)

C.C.R.N. EURATOM ISPRA - SERV. PROTEZIONE
Sez. Sito e Meteorologia - dis. G.Bollini 9.3.66

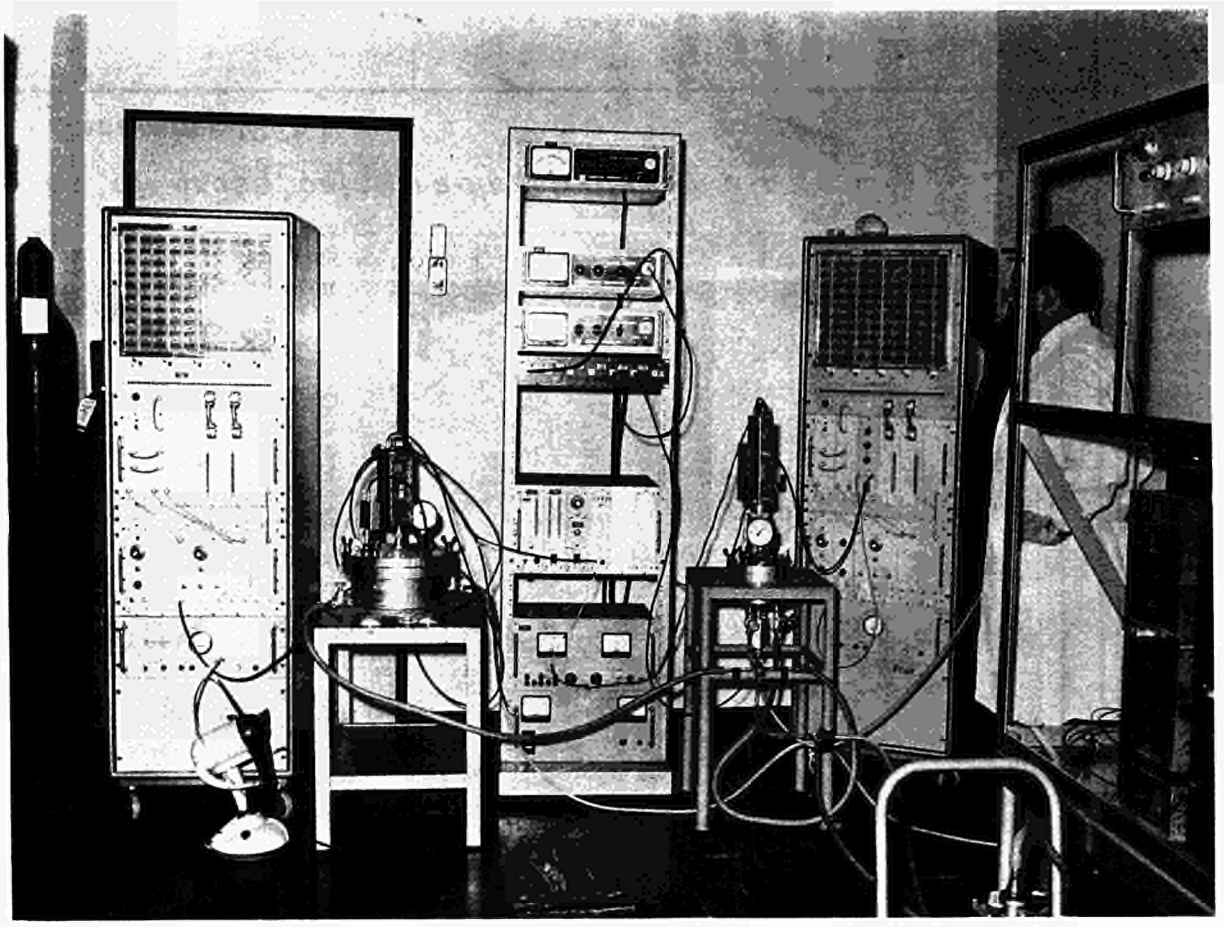

Figure 5

Ionisation chambers and multichannel analysers for alpha spectrometry.

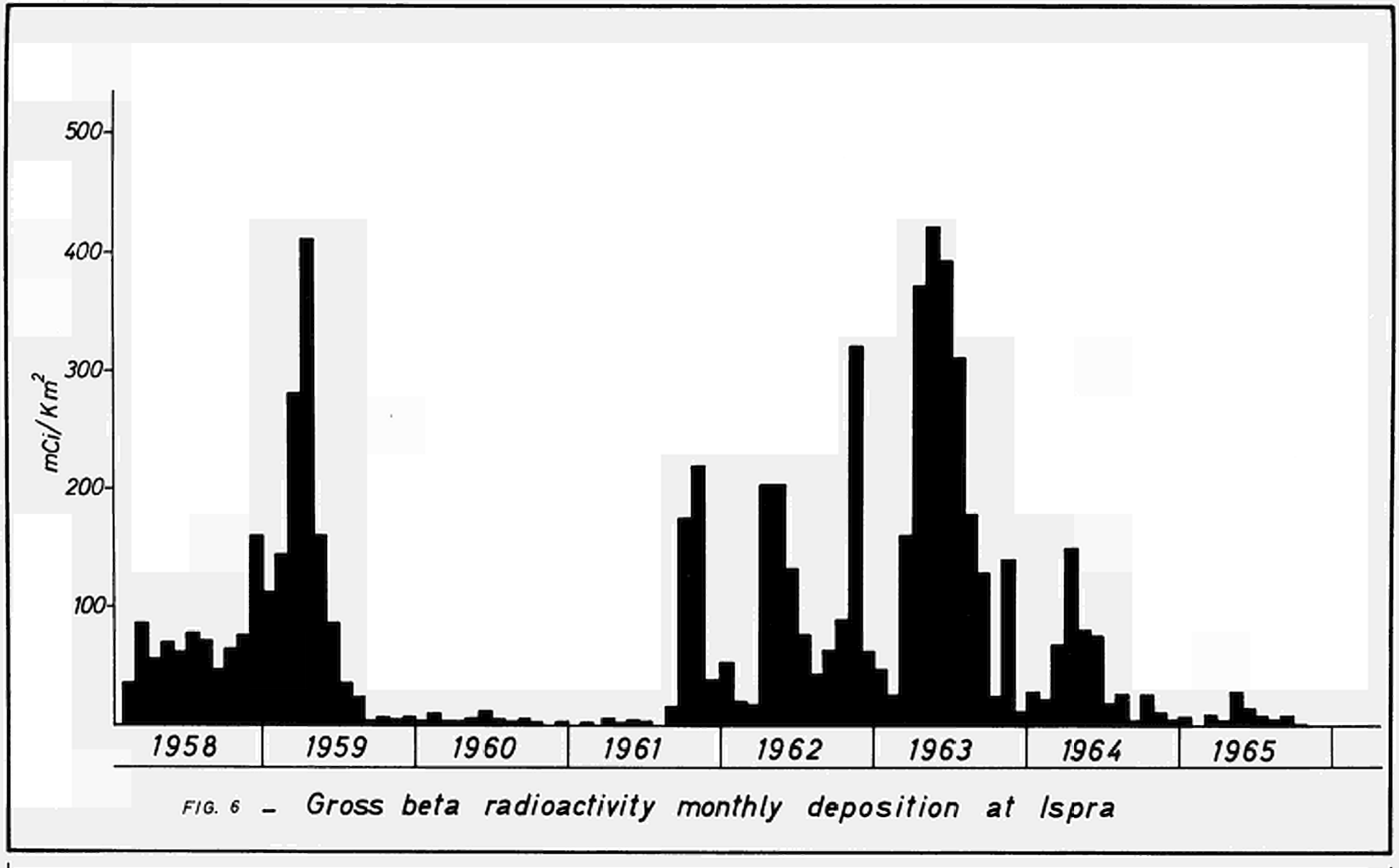

FIG. 6 – Gross beta radioactivity monthly deposition at Ispra

C.C.R.N. EURATOM ISPRA – SERV. PROTEZIONE
Sez. Sito e Meteorologia – diseg. G. Bottini 7.5.1965

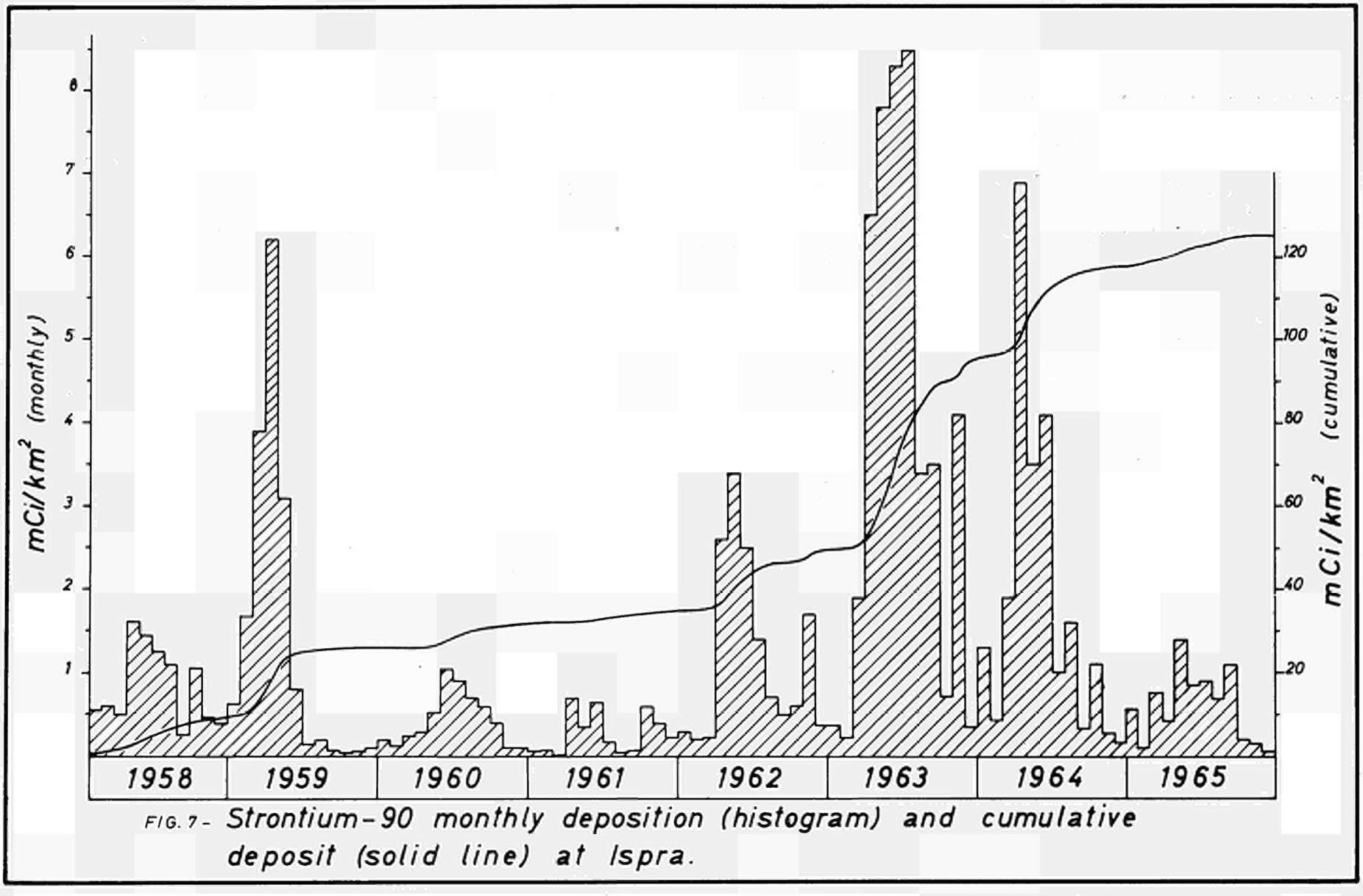

FIG. 7 - Strontium-90 monthly deposition (histogram) and cumulative deposit (solid line) at Ispra.

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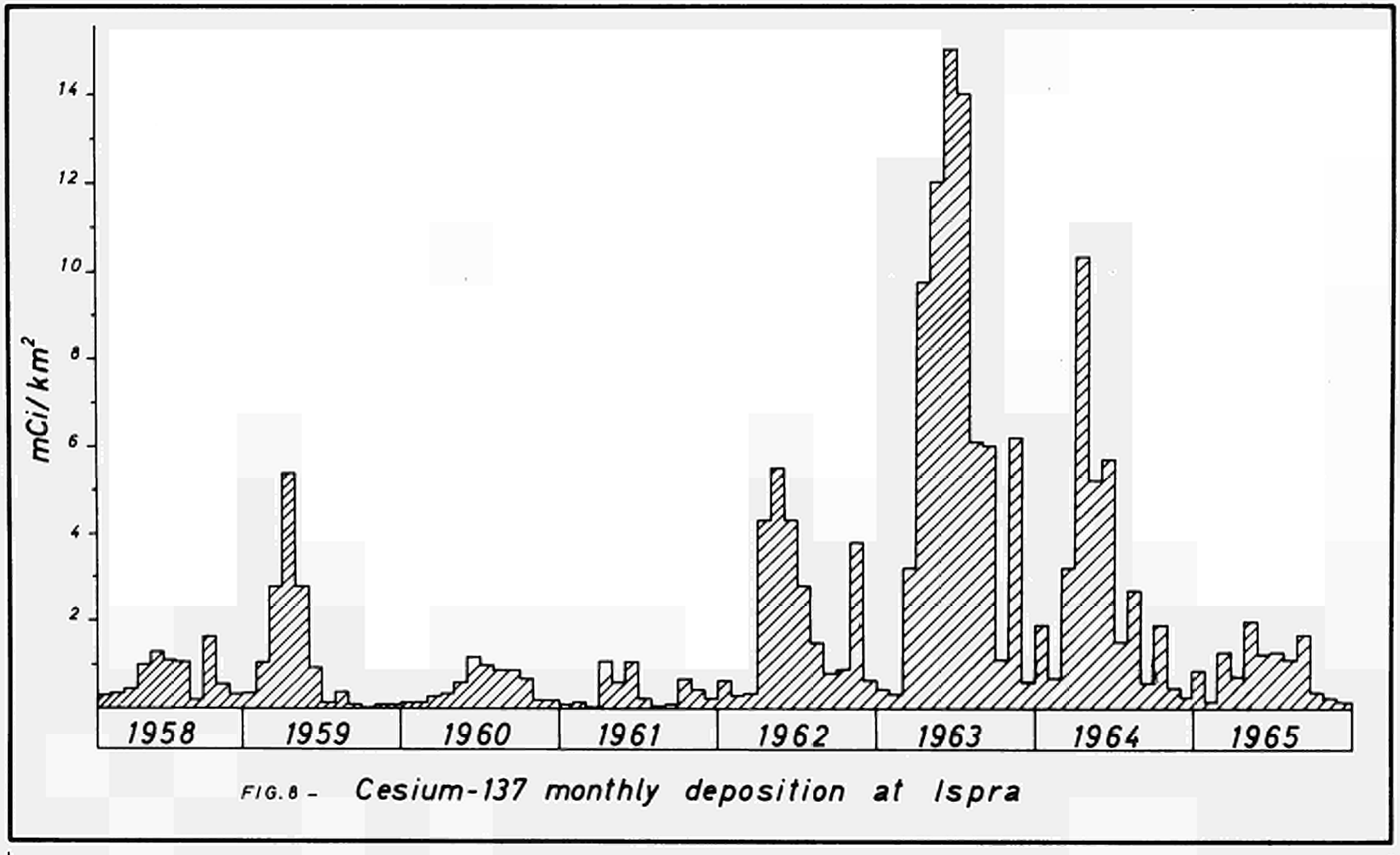

FIG. 8 - Cesium-137 monthly deposition at Ispra

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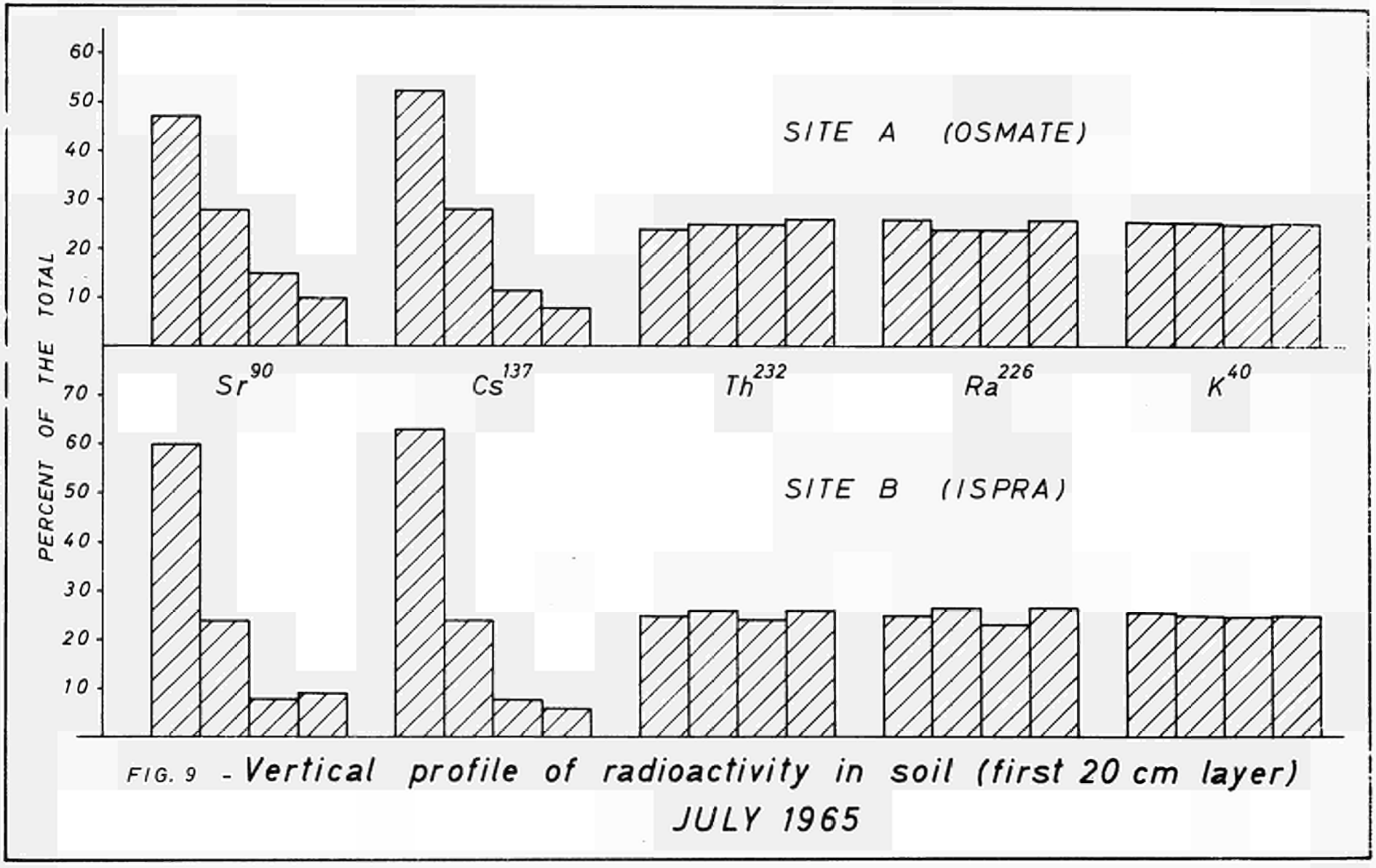

FIG. 9 - Vertical profile of radioactivity in soil (first 20 cm layer)
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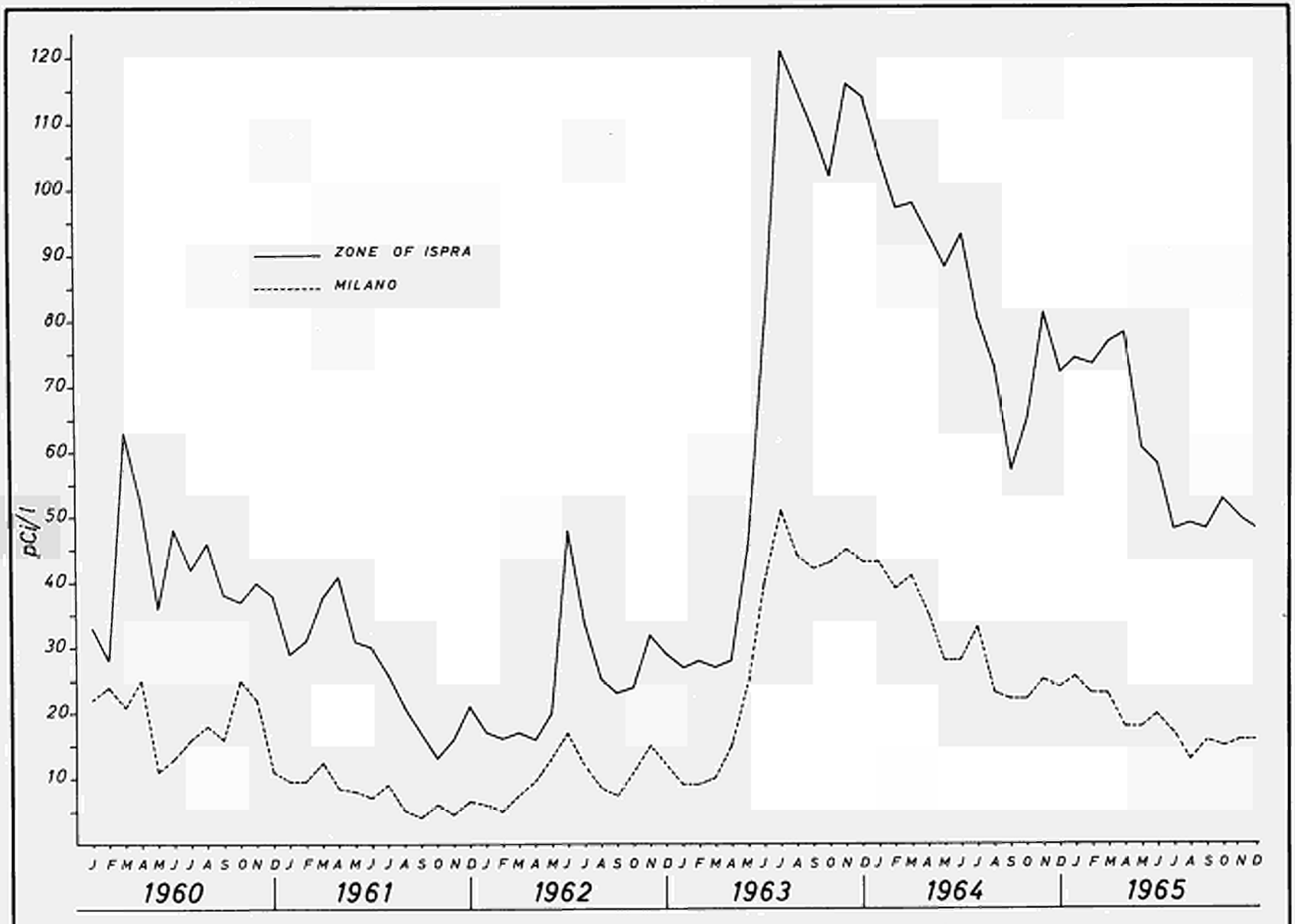

FIG. 10 - Monthly Strontium-90 in the milk of Ispra and Milano

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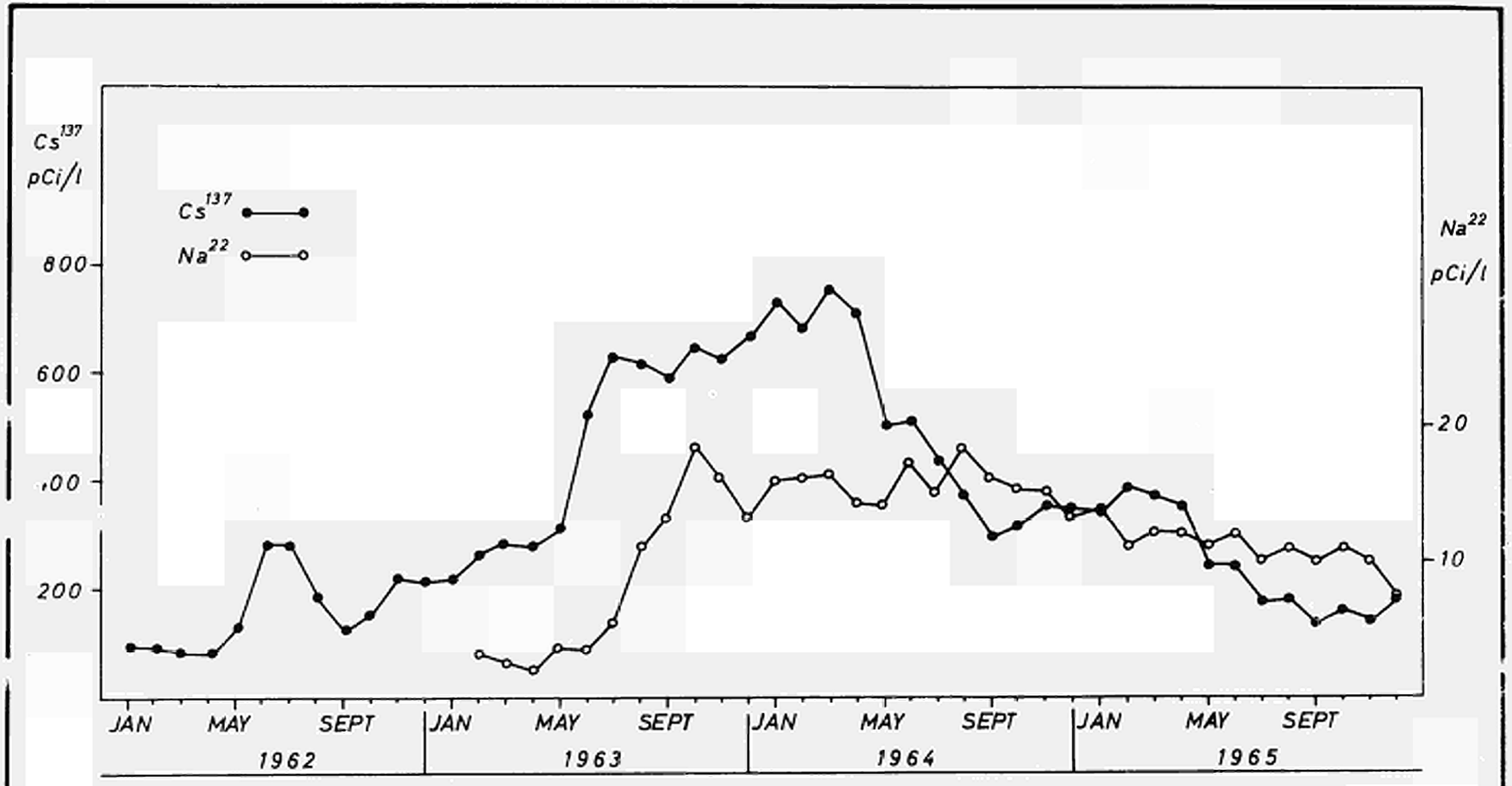

FIG. 11 - Sodium-22 and Cesium-137 average concentrations in the milk of the zone of Ispra.

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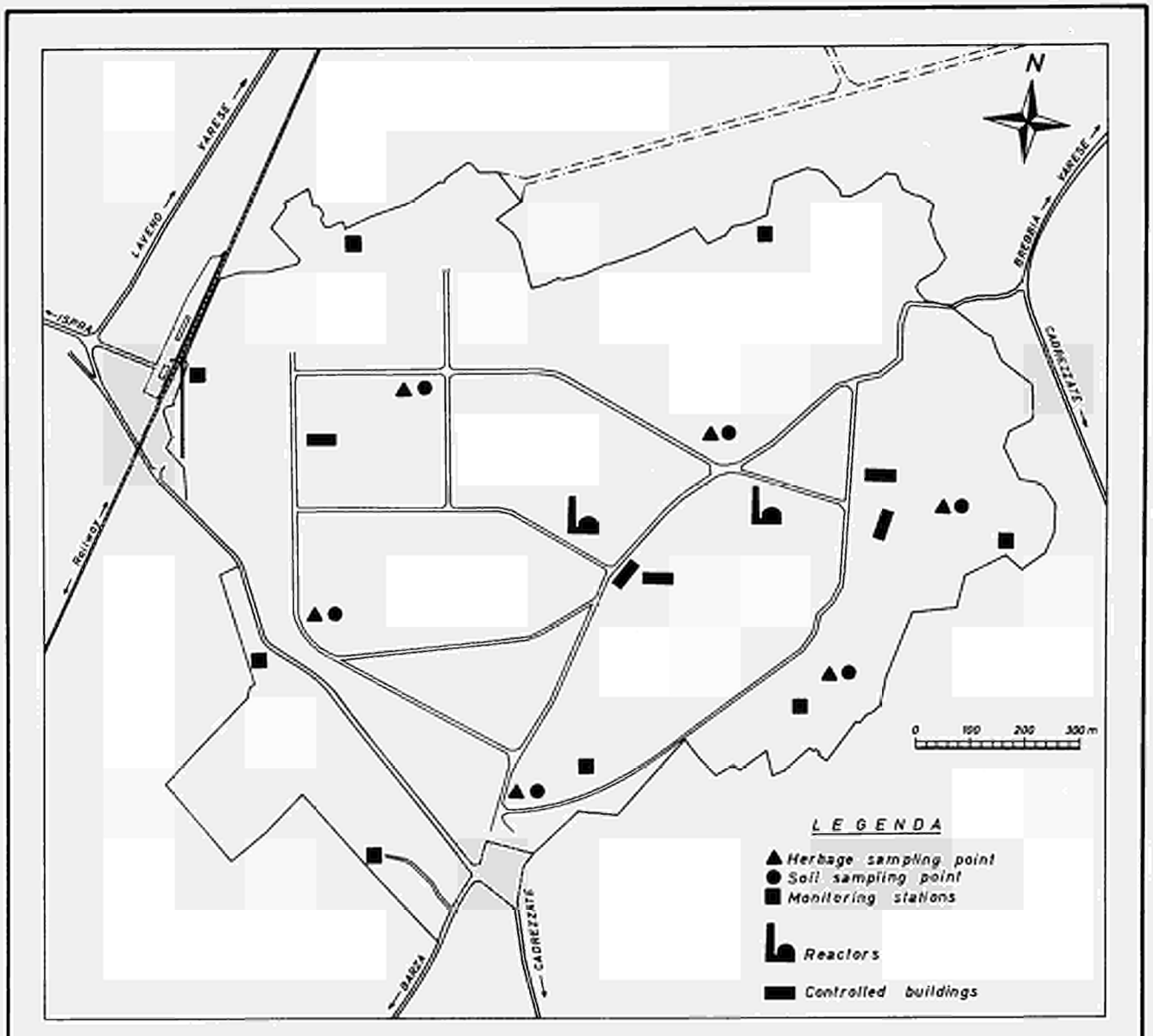

FIG. 12 - Map of the J.N.R.C.- Ispra Establishment.

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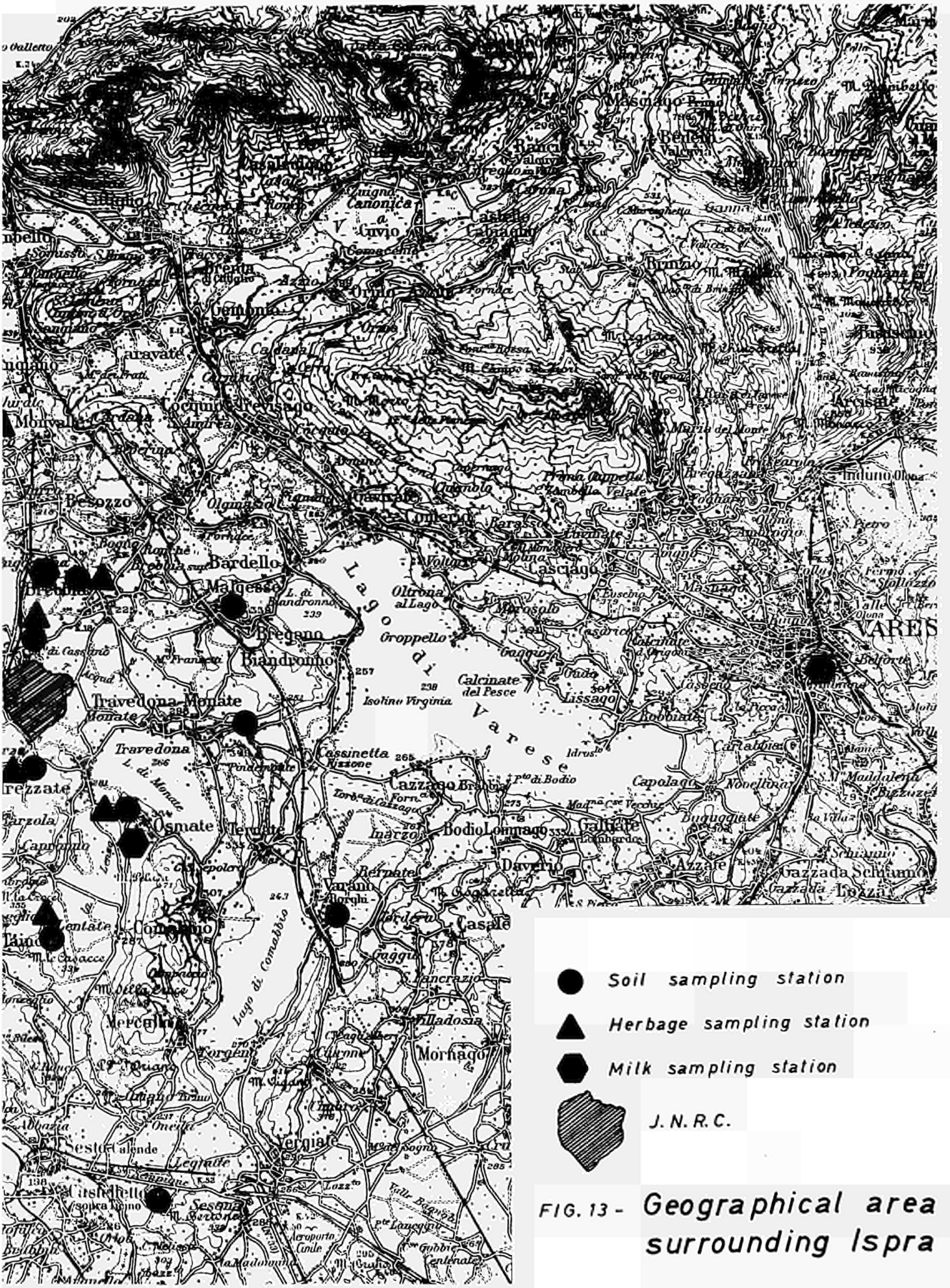

FIG. 13 - Geographical area surrounding Ispra

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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

ENVIRONMENTAL RADIOACTIVITY

ISPRA 1965

by

M. de Bortoli, P. Gaglione and A. Malvicini

E R R A T U M

Table 14

The value of total strontium-90 deposition is 7.29 mCi/Km^2 instead of 17.29 mCi/Km^2, as erroneously reported.

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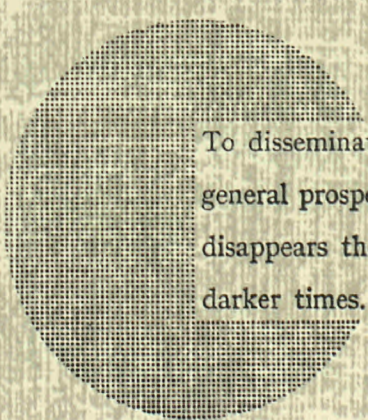

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Alfred Nobel

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