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A COMPARISON OF 1986 AND 1987 CAESIUM ACTIVITIES OF VEGETATION IN THE RESTRICTED AREA OF NORTH WALES

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C O N T E N T S

1 SUMMARY

Vegetation from sites within and around the restricted area of North Wales, visited initially in June 1986, has been resampled and analysed for ^{137}Cs activity. At most sites the ^{137}Cs activity has declined to less than 50% of the 1986 value. However, there are areas where the caesium activity remains high enough to warrant the continuation of restrictions on the movement and slaughter of sheep.

2 INTRODUCTION

A nationwide survey of the ^{137}Cs activity of vegetation resulting from deposition of fallout from the Chernobyl accident was conducted by the ITE in late May 1986. Particularly intensive sampling was conducted in North Wales and Cumbria due to initial indications that higher deposition had occurred in those regions. In West Cumbria, North Wales and areas of Scotland, the caesium activity of vegetation was sufficiently high to cause tissue levels in sheep grazing these areas to exceed the limit of 1000 Bq kg^{-1} wet weight, recommended by the Group of Experts established under article 31 of the Euratom Treaty meeting in Luxembourg. Consequently it was necessary to place restrictions on the slaughter and movement of sheep from these areas.

Although the caesium activity of vegetation declined rapidly in most areas, in large upland areas of West Cumbria and North Wales it remained comparatively high. It became evident that caesium uptake by vegetation was occurring and that the need for restrictions in 1987 would be dependent on the caesium activity in the grazed vegetation of the new growing season.

The ^{137}Cs activity of vegetation, collected in June 1987 from 26 sample sites, in and around the restricted area of North Wales, has been measured to provide a comparison with activities of vegetation taken from the same sites in June 1986. The results may help to determine the potential for changes in the size of the restricted area in 1987. A similar report (Beresford et al. 1987) compares the 1986 and 1987 ^{137}Cs activities of vegetation from the restricted region of West Cumbria.

3 MATERIALS AND METHODS

Twenty-six sites within and around the currently restricted area of North Wales, originally sampled in June 1986, were revisited in early June 1987. The location of sample sites is shown in Figure 1.

Vegetation was clipped from 1 m^2 quadrats to a height of 1 cm above ground level. Areas dominated by dead vegetation or species other than grasses were avoided. The samples were dried at 80° C, weighed, ground and counted in plastic containers (130 ml) on a NaI(Tl) detector to determine ^{137}Cs activity. The 8 most active samples were recounted on a high resolution germanium detector.

Soil samples (20 x 20 x 4 cm) were taken from all sites. Soils were allocated to a series of textural categories on the basis of the estimated content of clay, silt, sand and organic matter. Soils dominated by material from one category were simply given one category name (eg silt). Soils given 2 names (eg sand/silt) had significant quantities of material from 2 categories, the first category being present in greatest quantity (sand in this examples). "Loam" was used for soils with significant quantities of material from 3 or more categories (eg sand, clay and organic matter). The categories were:-

1. Clay: particles of less than 2 μm diameter;

2. Silt: particles of 2-40 μm diameter;

3. Sand: particles of 50 μm - 2 mm diameter;

4. Loam: mixed - see above;

5. Organic: - humified plant material.

Soil pH was determined using an antimony electrode pH meter.

4 RESULTS AND DISCUSSION

Table 1 compares the ^{137}Cs activity of vegetation collected in 1987 to that taken in 1986, and provides data on soil pH and texture. In 1986 23 of the 26 samples were greater than 2000 Bq kg^{-1} dry weight, the maximum being 6410. In the 1987 resampling only one sample was greater than 2000 Bq kg^{-1} dry weight and a further 6 above 1000 Bq kg^{-1}. One sample however, had a greater ^{137}Cs activity in 1987, than that of the sample taken from the same site in 1986. Fourteen samples collected in 1987 were below 300 Bq kg^{-1}, the detectors limit of detection. As in West Cumbria (Beresford et al. 1987) the majority of samples greater than 300 Bq kg^{-1} dry weight in 1987 were from low pH, organic soils.

The data from North Wales suggests a slower decline in activity than was found in West Cumbria. Most of the 1987 samples from West Cumbria which were above the limit of detection (ie $>$ 300 Bq kg^{-1} dry weight), had declined to less than 30% of their 1986 activity. In contrast, 6 of the 12 North Wales samples which were above the detection limit in 1987, had a ^{137}Cs activity greater than 30% of that of the sample taken from the same site in 1986. However, the original detailed sampling of West Cumbria was conducted 6 to 7 weeks before that in North Wales, consequently 1986 ^{137}Cs activities in Wales were generally lower than those in Cumbria.

The ^{134}Cs activity and ^{134}Cs:^{137}Cs ratio (approximately 1:2.72) of the 8 most active samples are shown in Table 2.

Assuming that the transfer coefficient (caesium activity of muscle Bq kg^{-1} fresh weight/daily intake of caesium) for both ^{134}Cs and ^{137}Cs to lamb muscle is 0.79 (Howard et al. 1987), restrictions will need to remain in force in those areas where the ^{137}Cs activity of vegetation exceeds 1500 Bq kg^{-1} dry weight. As only 3 of the samples presented in the report are greater than 1500 Bq kg^{-1} dry weight, the results suggest that the size of the restricted area could be decreased. However, since early July data from the live monitoring of sheep by the MAFF have resulted in the restricted area being increased. This apparent discrepancy may be due to the timing of the vegetation resurvey; it may have been conducted too early in the growing season to show the full extent of caesium uptake by plants this year.

It should be noted that the samples presented in this report were taken at previously sampled, specific locations one year after the original survey to enable a comparison of current levels in vegetation with those of vegetation shortly after the deposition. The results should not be used to predict seasonal variations of the ^{137}Cs activity of vegetation over the coming year.

5 ACKNOWLEDGEMENTS

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6 REFERENCES

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HOWARD, B.J., BERESFORD, N.A., BURROW, L., SHAW, P.V. & CURTIS, E.J.C. 1987. A comparison of caesium activity in sheep remaining on upland areas contaminated by Chernobyl fallout with those removed to less active lowland pasture. J. Soc. Radiol. Prot., 7.

Table 1

Sample	Grid Reference	^{137}Cs Activity of Vegetation 1986 Bq kg^{-1} dry wt	1987 Bq kg^{-1} dry wt	Decrease in ^{137}Cs Activity (1986-1987) Bq kg^{-1} dry wt	Soil Classification	Soil pH
1	282352	850	< 300	> 550	Clay	6.4
2	294347	2710	< 300	> 2410	Clay/Silt	6.1
3	284349	3170	< 300	> 2870	Clay/Silt	6.4
4	293348	2860	< 300	> 2560	Clay/Silt	5.6
5	312322	320	< 300	> 20	Clay/Silt	6.2
6	275368	3240	< 300	> 2940	Clay/Silt	5.8
7	275361	2620	1340	1280	Clay/Silt	4.3
8	297322	1150	1960	+ 810	Silt/Clay	4.5
9	285348	3390	< 300	> 3090	Silt/Clay	6.2
10	291347	2140	< 300	> 1840	Silt/Clay	6.6
11	293345	2330	< 300	> 2030	Silt/Clay	5.7
12	274369	2800	< 300	> 2500	Silt/Clay	4.7
13	276364	2680	< 300	> 2380	Silt/Clay	5.6
14	271351	5580	< 300	> 5280	Silt/Clay	5.6
15	276358	2020	< 300	> 1720	Silt/Clay	5.2
16	271374	2050	420	1630	Silt/Clay	4.3
17	275366	3600	460	3140	Silt	5.0
18	290345	2080	< 300	> 1780	Organic	4.3
19	276340	6410	640	5770	Organic	3.6
20	277344	2090	780	1310	Organic	3.6
21	272358	3270	1050	2220	Organic	4.2
22	266360	5210	1290	3920	Organic	4.0
23	271366	3010	1610	1400	Organic	3.6
24	269359	4170	960	3210	Organic	6.4
25	268360	4990	2250	2740	Organic	4.3
26	274367	4040	1010	3030	Organic	3.4

Table 2

Sample	Caesium Activity of Vegetation		
	^{134}Cs	^{137}Cs	$^{134}Cs:^{137}Cs$
7	540	1330	1:2.46
17	700	1890	1:2.61
21	410	1070	1:2.61
22	480	1360	1:2.83
23	530	1490	1:2.81
24	290	820	1:2.83
25	900	2460	1:2.73
26	360	1010	1:2.81

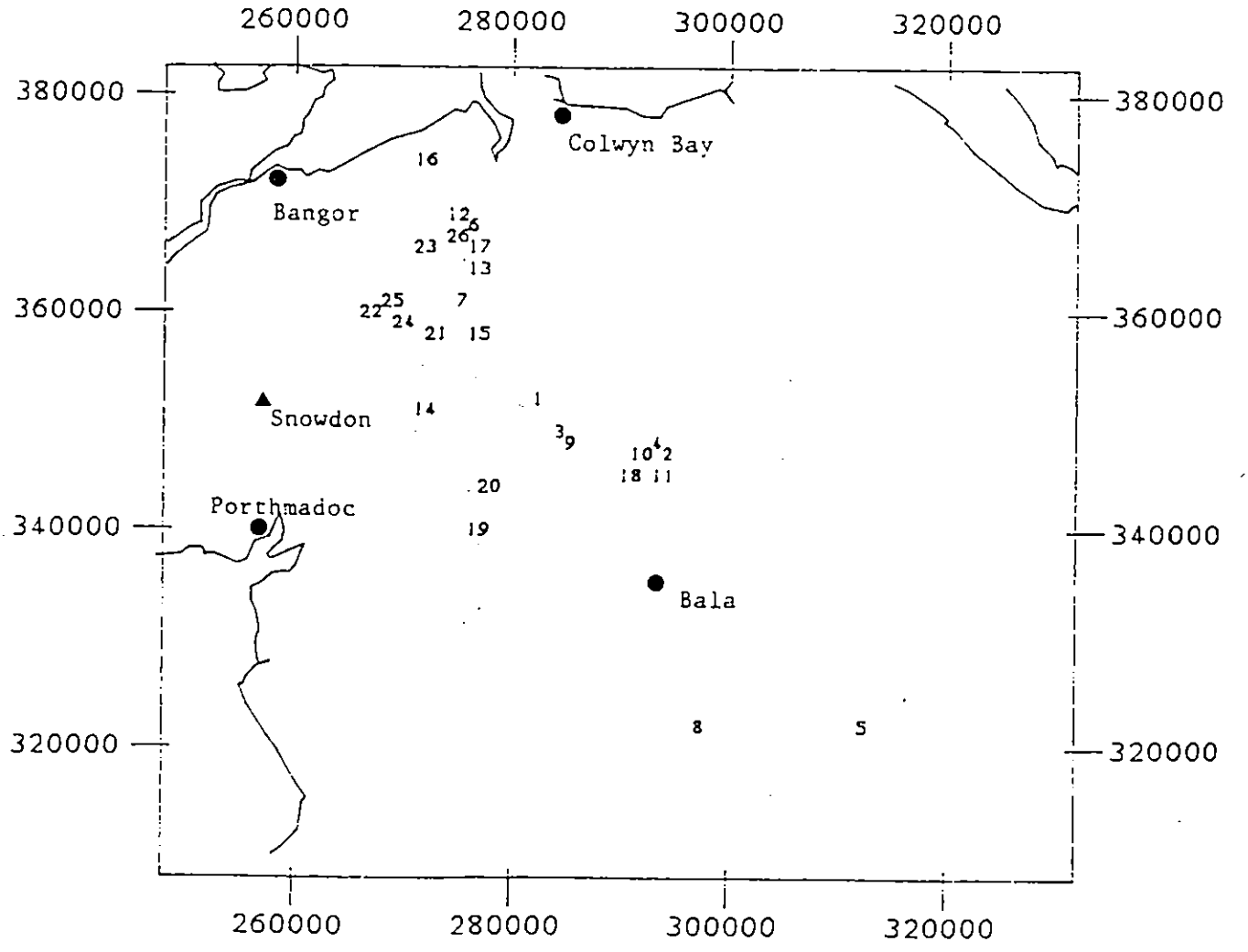

Figure 1. Location of sample sites