Independent radiological monitoring; results of a inter-comparison exercise

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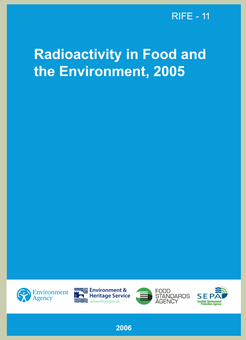
Introduction



The discharges of radioactive wastes, from nuclear sites in the United Kingdom, are controlled by the Environment Agency in England and Wales, under the Radioactive Substances Act, 1993. The Food Standards Agency and the Environment Agency operate independent radioactivity surveillance programmes throughout the UK to check the food safety implications and environmental impact of these discharges. This is to provide an independent check of the monitoring undertaken by nuclear operators around their sites.

The combined results from the surveillance programmes are reported in the annual Radioactivity in Food and the Environment (RIFE) series of reports that the Food Standards Agency jointly publishes with other UK authorities.

As part of an overall quality strategy the Environment Agency and Food Standards Agency devised a schedule of sample collections, and subsequent radioanalysis, to be undertaken by the contactors of their radiological surveillance programmes (Harwell Scientifics and Cefas, respectively).

Methodology

The inter-comparison programme commenced in 2005 and a number of sediment and seaweed samples were collected from selected sites (Sellafield and surrounding area, Trawsfynydd, Cardiff, Dungeness and Heysham), which are part of the scheduled radiological surveillance programmes. Both Cefas and Harwell Scientifics (HS) collected samples and provided aliquots for each to analyse, as well as collecting samples independently for analysis at the same location. Samples from each location were analysed by gamma spectrometry. In addition, samples collected at Heysham and Cardiff were analysed for ^{99}Tc and Total ^{3}H, respectively.

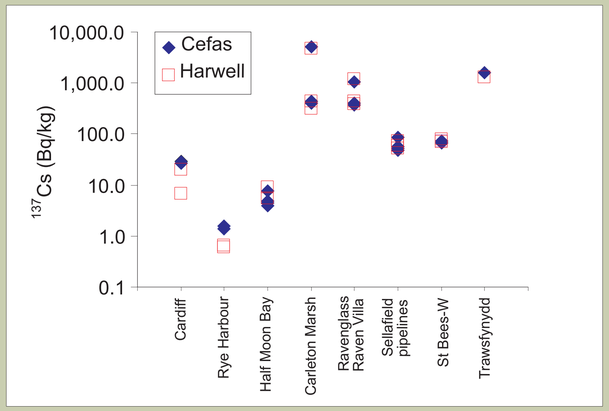
Sample details

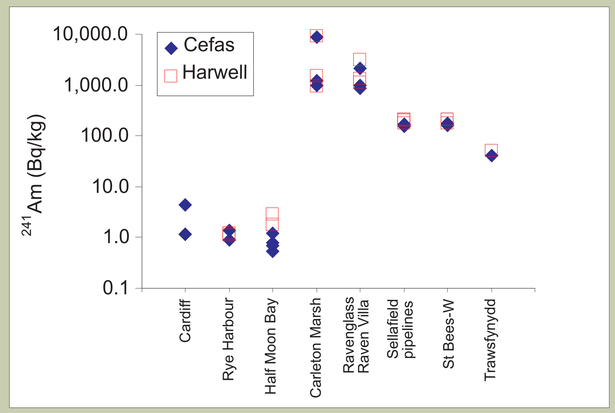
Sample Collector	Site/Location	Grid Reference	Sample Type	Sample Frequency
Cefas/HS[2]	Cardiff (Orchard Ledges East)	ST 213 747	Mud	Biannual
Cefas/HS[2]	Dungeness (Rye Harbour)	TR 943 190	Sandy mud	Biannual
Cefas/HS[2]	Heysham (Half Moon Bay)	SD 404 607	*Fucus V.*	Alternate quarters
HS[1]	Sellafield (Carleton Marsh)	SD 064 983	Sediment	Quarterly
HS[1]	Sellafield (Ravenglass Raven Villa)	SD 085 967	Sediment	Quarterly
Cefas[1]	Sellafield (Pipelines)	NY 018 033	Sand	Quarterly
HS[1]	Sellafield (St Bees West)	NX 959 116	Sediment	Quarterly
Cefas[1]	Trawsfynydd (East of pipe)	SH 696 383	Mud	Biannual

[1]Sampling by single contractor for both laboratories
[2]Independent sampling carried out by each laboratory

Results

1) Comparison of gamma emitting nuclides (^{137}Cs and ^{241}Am)





2) Comparison of Total ^{3}H data (Cardiff)

Collection date	Sample Identifier	Result (Bq/kg dry)[1]
24/01/05	EA3365*	50 ± 11
21/04/05	2005000295#	91 ± 14
16/08/05	EA4045*	120 ± 20
17/08/05	2005000847#	82 ± 12

[1]Actual uncertainties (±) quoted are 1.96 counting statistics only
*Denotes sample analysed by Harwell Scientifics
#Denotes sample analysed by Cefas

3) Comparison of ^{99}Tc data (Heysham)

Collection date	Sample Identifier	Result (Bq/kg wet)[1]
18/03/05	EA3573*	580 ± 40
13/04/05	2005000317#	1010 ± 79
11/07/05	2005000652#	1080 ± 85
22/07/05	EA3946*	550 ± 40

[1]Actual uncertainties (±) quoted are 1.96 counting statistics only
*Denotes sample analysed by Harwell Scientifics
#Denotes sample analysed by Cefas

Conclusions

- Results for gamma emitting nuclides, ^{137}Cs and ^{241}Am are reasonably consistent for samples collected by each of the laboratories and the independent sampling.
- Results for gamma emitting nuclides are also consistent over the range of concentrations observed.
- Both laboratories observed relatively enhanced levels of ^{137}Cs and ^{241}Am in samples from Ravenglass Raven Villa and Carlton Marsh – the enhanced levels may be due to the samples containing non-surface material, with contamination typical of greater historic discharges from Sellafield.
- Results for Total ^{3}H, using independent sample collection, are in reasonable agreement given the likely temporal and environmental variability.
- Some variation, but not excessive, is observed for ^{99}Tc results. Uptake in seaweed is known to be variable and dependant upon local conditions at the time of sampling.
- Overall, the results provide further confidence in the data produced by independent surveillance programmes.