

THE RADIOLOGICAL SIGNIFICANCE OF FARMED FISH

by Bryan Smith. FSA Project Officer: Nick Wood

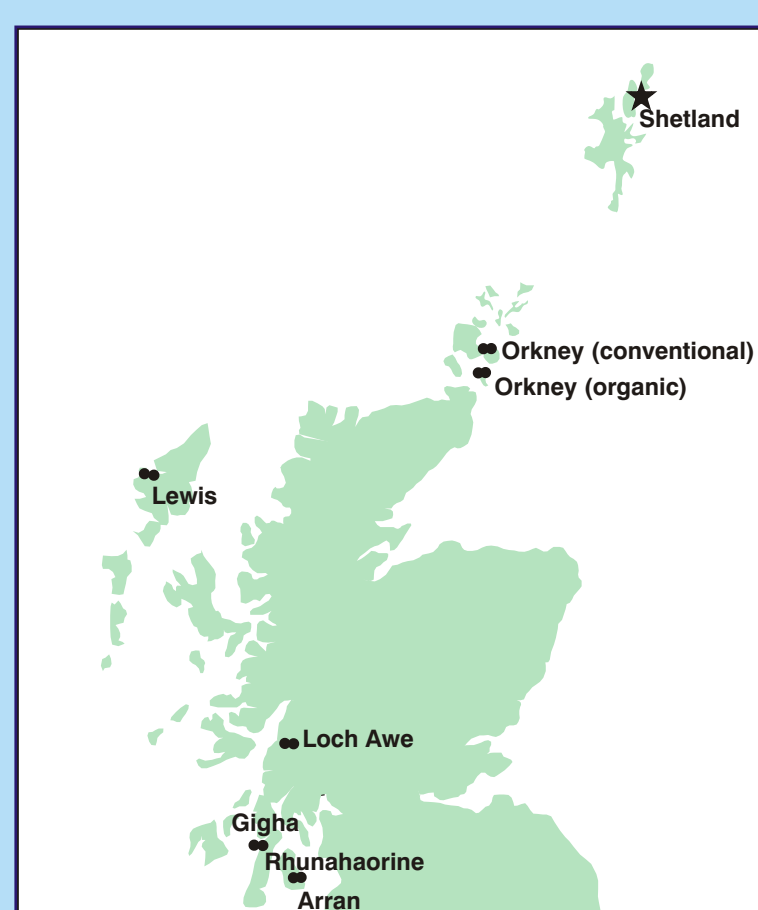
Objectives

To evaluate doses to man from the consumption of farmed fish raised on fishmeal-based feeds; and

To derive radionuclide transfer factors for the fish food to fish pathway.

Background

A previous study by CEFAS assessed the transfer of radioactivity in fishmeal to man as a result of consuming animals raised on fishmeal-based feeds (Smith and Jeffs, 1999). Fishmeal features in the diets of a wide range of animals, but predominantly poultry, farmed fish, pigs and dairy cattle. The study showed that, radiologically, farmed fish was the most significant of these pathways, although a number of assumptions about radioactivity transfer were made in the calculations. To meet the objectives of the study, farmed fish and the feeds they were reared on were monitored for radioactivity. Previously, such monitoring has been very limited (e.g. FSA and SEPA, 2001). The results were used to calculate doses and transfer factors.



Sampling locations

Sampling

Annual production of farmed fish in the UK amounts to some 200,000 tons North Atlantic salmon (predominantly in Scotland) and 14,000 tons rainbow trout (predominantly in England and Wales). Based on these production figures, samples of North Atlantic salmon, rainbow trout and the feeds they were raised on were collected from a cross-section of farms around the UK.



Atlantic salmon



Fish farm

Analyses

Samples were analysed for gamma-emitting radionuclides, ^{14}C , ^{210}Pb and ^{210}Po since the earlier report had indicated that these might be radiologically significant for consumers of farmed fish.

Radionuclide	Farmed fish, Bq kg ⁻¹ (wet)	Fish food, Bq kg ⁻¹ (dry)
^{14}C	10 - 50	30 - 130
$^{137}\text{Cs}^*$	0.2 - 0.5	<0.3 - 0.9
^{210}Pb	0.03 - 0.3	0.8 - 4.5
^{210}Po	0.03 - 0.4	2.9 - 24

* all other gamma-emitting radionuclides were below analytical limits of detection.

Table: Ranges of measured radionuclide concentrations

Acknowledgement

This work was funded by the Food Standards Agency under project R02015.

References

1. FOOD STANDARDS AGENCY AND SCOTTISH ENVIRONMENT PROTECTION AGENCY, 2001. Radioactivity in Food and the Environment, 2000. RIFE-6. FSA and SEPA, London. Ministry of Agriculture, Fisheries and Food and Scottish Environment Protection Agency, 1997. Radioactivity in Food and the Environment, 1996. RIFE-2. MAFF and SEPA, London.
2. SMITH, B.D. AND JEFFS, T.M., 1999. Transfer of radioactivity from fishmeal in animal feeding stuffs to man. RL 8/99. Centre for Environment, Fisheries and Aquaculture Science, Lowestoft.

Dose assessments

For an adult consuming salmon and trout at high rates (ie. an assumed 23 kg y⁻¹), doses due to ^{137}Cs , ^{14}C , ^{210}Pb and ^{210}Po at the maximum concentrations observed were assessed to be 0.2, 0.7, 6 and 18 $\mu\text{Sv y}^{-1}$ respectively. The report also includes doses to other age groups and to average rate consumers.

Transfer factors

The transfer factor is the ratio of the concentration of radioactivity in farmed fish to the daily intake of radioactivity.

Radionuclide	Transfer factor (d kg ⁻¹)
^{14}C	3 - 230
$^{137}\text{Cs}^*$	10 - 370
^{210}Pb	0.2 - 50
^{210}Po	0.1 - 15

Table: Ranges of calculated transfer factors.