

CRIIRAD

Commission de Recherche
et d'Information Indépendantes
sur la Radioactivité

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Valence, August 8th 2011.

CRIIRAD Report No. 11-77 F / Preliminary results

Monitoring of artificial gamma emitting nuclides in fish samples collected in Japan

Study performed for GREENPEACE Japan

1 / Context

Greenpeace has sent to the CRIIRAD laboratory 3 samples of fish (flesh and guts in separate bags) collected in Japan between July 23th and 24th, with the help of fishermen.

Greenpeace asked for preliminary results (cesium 137, cesium 134, iodine 131) to be sent by August 5th.

This report is a preliminary version including only those 3 nuclides.

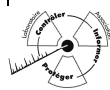
Description of the samples

CRIIRAD has not been associated to the sampling process.

The description of the samples (location, species) included in table T1 below is based on the information provided by Greenpeace (M Nikki Westwood).

Table T1: List of samples

Green peace code	Sampling time		Location	GPS coordinates	Sample type	Species	Material analysed
F21	24/7/11	17:45	Onahama Port - hobby fishermen	N36 56.716 E140 54.456	Adult Green Ling	Hexagrammos otakii	Flesh
G21	24/7/11	17:45	Onahama Port - hobby fishermen	N36 56.716 E140 54.456	Adult Green Ling	Hexagrammos otakii	Guts
F22	24/7/11	17:45	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	Adult Green Ling	Hexagrammos otakii	Flesh
G22	24/7/11	17:45	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	Adult Green Ling	Hexagrammos otakii	Guts
F24	24/7/11	06:00	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	Soi	Sebastes zonatusschlegeli	Flesh
G24	24/7/11	11:25	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	Soi	Sebastes zonatusschlegeli	Guts



2 / Analysis at the CRIIRAD laboratory

2.1 / Processing of the samples

The samples were delivered to CRIIRAD on July 28th 2011.

Samples (packed in plastic bags and plastic boxes) were clearly labelled, and in a good state of conservation (packing with dry ice).

Upon being received by the CRIIRAD laboratory, the samples underwent the following processing:

- Measurement of contact gamma radiation flux (SPP2 scintillometer) on each sample and logging of the samples. Only the flesh of fish samples (F21 and F22) showed a contact gamma radiation flux of 45-50 c/s, very slightly above the natural background level (40-45 c/s SPP2).
- Processing of the samples, homogenisation and packing in a calibrated counting geometry for gamma spectrometry analysis at the CRIIRAD laboratory (Hp Ge detector, N type) The counting geometry has been selected depending on the available quantity of material : from a small Petri dish (code PP in table T2) to a Marinelli dish (code MAR)

Details about processing and counting are summarised in Table T2 below.

Table T2 / Details about sample processing and counting at CRIIRAD laboratory

Green peace code	Sampling time		Location	Sample type	Species	Material analysed	Gamma radiation flux (c/s)	Mass analysed (g)	Counting geometry	Counting code	Counting day	Counting duration (s)
F21	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Hexagrammos otakii	Flesh	50	482	MAR	26267	1/8	13 210
G21	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Hexagrammos otakii	Guts	45	63	P	26269	1/8	17 464
F22	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Hexagrammos otakii	Flesh	50	469	MAR	26256	29/7	4 273
G22	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Hexagrammos otakii	Guts	40	54	P	26257	29/7	5 179
F24	24/7/11	06:00	Onahama Port - hobby fishermen	Soi	Sebastes zonatuschlegeli	Flesh	45	70	P	26258	29/7	4 940
G24	24/7/11	11:25	Onahama Port - hobby fishermen	Soi	Sebastes zonatuschlegeli	Guts	45	20	PP	26262	29/7	62 247

2.2 / Gamma spectrometry analysis

The CRIIRAD laboratory's agreements from France's Nuclear Safety Authority (Autorité de Sûreté Nucléaire) are listed in Appendix 1.

Counting was carried out between July 29th and August 2nd.

The spectra were then processed by M Stéphane Patrigeon, measurement technician at the CRIIRAD laboratory and checked by M Bruno Chareyron, engineer in nuclear physics and CRIIRAD laboratory manager.

The preliminary results (for Cs 137, Cs 134 and I131 only) are summarised in Table T3 below.

Uncertainties are given with a coverage factor k=2 which is associated with a level of confidence of about 95 %.

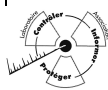


Table T3 / Fish (flesh and guts) / results expressed in Bq/kg (fresh weight) at sampling time

Green peace code	Sampling time		Location	Sample type	Material analysed	Cs 137	Cs 134	Cs 136	Total Cesium	I131
F21	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Flesh	368 ± 41	303 ± 34	< 0.4	671	< 1.0
G21	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Guts	165 ± 25	142 ± 20	< 1.4	307	< 2.1
F22	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Flesh	336 ± 41	289 ± 35	< 0.5	625	< 1.4
G22	24/7/11	17:45	Onahama Port - hobby fishermen	Adult Green Ling	Guts	172 ± 33	132 ± 25	< 2.6	304	< 3.6
F24	24/7/11	06:00	Onahama Port - hobby fishermen	Soi	Flesh	226 ± 38	182 ± 30	< 1.3	408	< 3.5
G24	24/7/11	11:25	Onahama Port - hobby fishermen	Soi	Guts	201 ± 27	165 ± 22	< 1.6	366	< 1.9

Comments

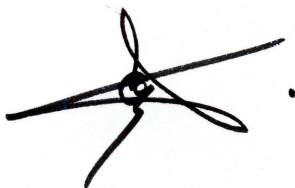
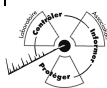
As can be seen in table T3 above, the total amount of radioactive **cesium** in the **flesh of fish** samples F21 and F22 (adult green ling) from Onahama port is **exceeding the Japanese limit for human consumption of 500 Bq/kg** (671 and 625 Bq/kg respectively). The contamination is about 400 Bq/kg in sample F24.

This is coherent with the fact that cesium accumulates particularly in muscles.

In all samples, it can be noted that the contamination of the flesh with radioactive cesium is higher than the contamination of the guts.

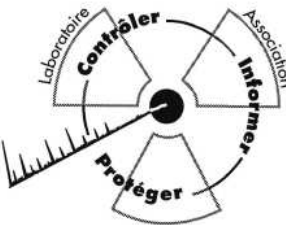
The activity of iodine 131 is below the detection limit in all samples.

Author : Bruno Chareyron, nuclear physics engineer in charge of the CRIIRAD laboratory.

ANNEX 1 / Agreements of the CRIIRAD laboratory

The document below gives a list of the agreements given to the CRIIRAD laboratory by the French Nuclear Safety Authority (ASN) for the monitoring of radiation in environmental samples.



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Valence, le 24 Juin 2011

Agréments du laboratoire de la CRIIRAD


Le laboratoire de la CRIIRAD est agréé par l'Autorité de Sûreté Nucléaire pour les mesures de radioactivité de l'environnement. La portée détaillée de l'agrément est disponible sur le site internet de l'Autorité de sûreté nucléaire.

Une liste actualisée¹ est présentée ci-dessous :

- 1 / Matrice **eaux** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2015) et tritium (agrément valable jusqu'au 30/06/2014).
- 2 / Matrice **sols** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2016), uranium et descendants, thorium et descendants, Ra 226 et descendants, Ra 228 et descendants (agrément valable jusqu'au 30/06/2015).
- 3 / Matrices **biologiques** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2014).
- 4 / Matrices **gaz** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV et gaz halogénés (agrément valable jusqu'au 01/02/2012).

En outre, le laboratoire de la CRIIRAD est agréé pour la mesure du radon dans les lieux ouverts au public (niveaux 1 A, 1 B et 2 ; validité jusqu'au 15 septembre 2011).

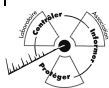
Le responsable du laboratoire
Bruno CHAREYRON
Ingénieur en physique nucléaire



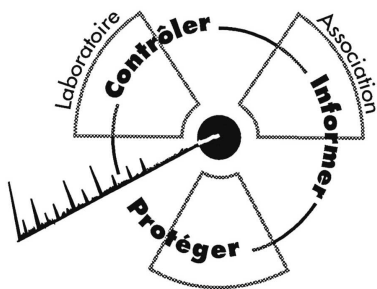
¹ La liste des laboratoires agréés pour les mesures de la radioactivité de l'environnement, mise à jour à la date du 1er janvier 2011, avec les dates de validité de leurs agréments est établie conformément aux décisions de l'ASN n°2007-DC-023 du 29 janvier 2007, n°2007-DC-0064 du 10 juillet 2007, DEP-0009-2008-PRESIDENT du 28 janvier 2008, DEP-DEU-0544-2008 du 09/07/08, n°2008-DC-0120 du 16 décembre 2008, DEP-DEU-0099-2009 du 06 février 2009, DEP-DEU-0373-2009 du président du 23 juin 2009, DEP-DEU-0704-2009 et DEP-DEU-0705-2009 du 8 décembre 2009, CODEP-DEU-2010-031543, CODEP-DEU-2010-031551 du 15 juin 2010, CODEP-DEU-2010-066536, CODEP-DEU-2010-066538 et CODEP-DEU-2010-066540 du 15 décembre 2010 (bulletin officiel de l'ASN). En ce qui concerne le renouvellement de l'agrément pour la matrice sol, voir la Décision n° CODEP-DEU-2011-031763 du 15 juin 2011 de l'Autorité de sûreté nucléaire.



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Valence, August 8th 2011.

CRIIRAD Report No. 11-77 S / Preliminary results

Monitoring of artificial gamma emitting nuclides in seaweed samples collected in Japan

Study performed for GREENPEACE Japan

1 / Context

Greenpeace has sent to the CRIIRAD laboratory 5 samples of seaweed collected in Japan between July 23th and 24th, with the help of fishermen.

Greenpeace asked for preliminary results (cesium 137, cesium 134, iodine 131) to be sent by August 5th.

This report is a preliminary version including only those 3 nuclides.

In this preliminary report, results for seaweed are given in Bq/kg wet (fresh). It should be noted that depending on the exact state of the samples when submitted to counting, the results expressed in Bq/kg wet are "relative".

Therefore, after counting, all seaweed samples have been dried in order to provide the dry-wet ratio (%) of the sample.

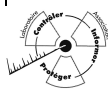
Description of the samples

CRIIRAD has not been associated to the sampling process.

The description of the samples (location, species) included in table T1 below is based on the information provided by Greenpeace (M Nikki Westwood).

Table T1: List of samples

Green peace code	Sampling time		Location	GPS coordinates	Sample type	Species	State
S3	22/7/2011	16:51	Tsurushihama Port	N 37 52.318 E14056.219	seaweed	Ulva arasaki	Fresh
S5	23/7/2011	09:59	Hisanohama Port	N37 08 .941 E 141 00.017	seaweed	Laminaria japonica	Fresh
S8	23/7/2011	10:47	Yotsukura Port	N37 06.475 E140 59.789	seaweed	Laminaria japonica	Fresh
S9	23/7/2011	10:48	Yotsukura Port	N37 06.475 E140 59.789	seaweed	Ulva arasaki	Fresh
S14	23/7/2011	15:45	Nakoso Port	N36 51.564 E140 47.405	seaweed	Laminaria japonica	Fresh



2 / Analysis at the CRIIRAD laboratory

2.1 / Processing of the samples

The samples were delivered to CRIIRAD on July 28th 2011.

Samples (packed in plastic bags and plastic boxes) were clearly labelled, and in a good state of conservation (packing with dry ice).

Upon being received by the CRIIRAD laboratory, the samples underwent the following processing:

- Measurement of contact gamma radiation flux (SPP2 scintillometer) on each sample and logging of the samples. No excess gamma radiation was detected compared to natural background level (40-45 c/s SPP2).
- Processing of the samples, homogenisation and packing in a calibrated counting geometry for gamma spectrometry analysis at the CRIIRAD laboratory (Hp Ge detector, N type) The counting geometry has been selected depending on the available quantity of material : from a 250 cm³ container (code B250 in table T2) to a Marinelli dish (code MAR)
- Note : the main species to be analysed have been separated manually from gravels and other species that were mixed inside the sample.
- Note : after counting of the “fresh” material, samples were dried in a drying oven at 45°C (until the dry weight remains constant), in order to provide the dry / wet ratio in %..This value can be used for comparison between different samples and different studies.

Details about processing and counting are summarised in Table T2 below.

Table T2 / Details about sample processing and counting at CRIIRAD laboratory

Green peace code	Sampling time		Location	Species	Material analysed	Gamma radiation flux (c/s)	Mass analysed (g)	Counting geometry	Counting code	Counting day	Counting duration (s)
S3	22/7/2011	16:51	Tsurushihama Port	Ulva arasaki	Fresh	45	108	B250	26266	31/7	46 823
S5	23/7/2011	09:59	Hisanohama Port	Laminaria japonica	Fresh	45	168	B250	26264	30/7	49 719
S8	23/7/2011	10:47	Yotsukura Port	Laminaria japonica	Fresh	45	199	B250	26265	31/7	36 527
S9	23/7/2011	10:48	Yotsukura Port	Ulva arasaki	Fresh	40	475	MAR	26263	30/7	35 329
S14	23/7/2011	15:45	Nakoso Port	Laminaria japonica	Fresh	45	120	B250	26268	1/8	33 819

2.2 / Gamma spectrometry analysis

The CRIIRAD laboratory's agreements from France's Nuclear Safety Authority (Autorité de Sûreté Nucléaire) are listed in Appendix 1.

Counting was carried out between July 29th and August 2nd.

The spectra were then processed by M Stéphane Patrigeon, measurement technician at the CRIIRAD laboratory and checked by M Bruno Chareyron, engineer in nuclear physics and CRIIRAD laboratory manager.

The preliminary results (for Cs 137, Cs 134 and I131 only) are summarised in Table T3 below and expressed in Bq/kg of fresh weight.

Uncertainties are given with a coverage factor k=2 which is associated with a level of confidence of about 95 %.

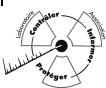


Table T3/ Seaweeds / results expressed in **Bq/kg (fresh weight)** at sampling time

Green peace code	Sampling time		Location	Species	Dry / wet (%)	Results in Bq/kg wet (fresh material)				
						Cs 137	Cs 134	Cs 136	Total Cesium	I131
S3	22/7/2011	16:51	Tsurushihama Port	Ulva arasaki	21.8	59 ± 9	50 ± 8	< 1.1	109	< 1,6
S5	23/7/2011	09:59	Hisanohama Port	Laminaria japonica	17.6	198 ± 24	168 ± 21	< 0.7	366	65 +/- 10
S8	23/7/2011	10:47	Yotsukura Port	Laminaria japonica	12.0	82 ± 11	69 ± 10	< 0.7	151	21 +/- 5
S9	23/7/2011	10:48	Yotsukura Port	Ulva arasaki	15.8	92 ± 11	78 ± 9	< 0.2	170	D < 2.0
S14	23/7/2011	15:45	Nakoso Port	Laminaria japonica	16.9	51 ± 8	45 ± 7	< 1.5	96	5.5 +/- 4.1

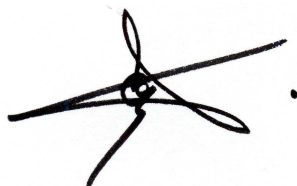
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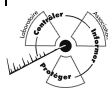
As can be seen in table T3 above, all samples of seaweed are contaminated with radioactive **cesium** (cesium 137 and cesium 134) : from 96 Bq/kg (fresh material) to 366 Bq/kg (fresh material).

Iodine 131 is detected in 4 out of 5 samples, particularly in the species Laminaria japonica. Generally speaking, Laminaria is well know¹ for its particular ability to concentrate iodine. The measured activities are between 5.5 to 65 Bq/kg (fresh material) in Laminaria japonica.

Author : Bruno Chareyron, nuclear physics engineer in charge of the CRIIRAD laboratory.

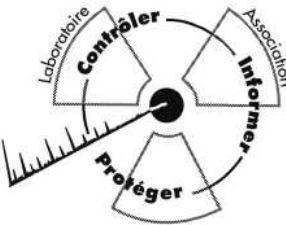


¹ CRIIRAD report N°970526 : Contrôles radiologiques sur des organismes marins à la Hague / B. Chareyron / Mai 1997 / Study performed for Greenpeace (in French).



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Valence, le 24 Juin 2011

Agréments du laboratoire de la CRIIRAD


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Une liste actualisée¹ est présentée ci-dessous :

- 1 / Matrice **eaux** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2015) et tritium (agrément valable jusqu'au 30/06/2014).
- 2 / Matrice **sols** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2016), uranium et descendants, thorium et descendants, Ra 226 et descendants, Ra 228 et descendants (agrément valable jusqu'au 30/06/2015).
- 3 / Matrices **biologiques** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV (agrément valable jusqu'au 30/06/2014).
- 4 / Matrices **gaz** : émetteurs gamma d'énergie inférieure à 100 keV et d'énergie supérieure à 100 keV et gaz halogénés (agrément valable jusqu'au 01/02/2012).

En outre, le laboratoire de la CRIIRAD est agréé pour la mesure du radon dans les lieux ouverts au public (niveaux 1 A, 1 B et 2 ; validité jusqu'au 15 septembre 2011).

Le responsable du laboratoire
Bruno CHAREYRON
Ingénieur en physique nucléaire



¹ La liste des laboratoires agréés pour les mesures de la radioactivité de l'environnement, mise à jour à la date du 1er janvier 2011, avec les dates de validité de leurs agréments est établie conformément aux décisions de l'ASN n°2007-DC-023 du 29 janvier 2007, n°2007-DC-0064 du 10 juillet 2007, DEP-0009-2008-PRESIDENT du 28 janvier 2008, DEP-DEU-0544-2008 du 09/07/08, n°2008-DC-0120 du 16 décembre 2008, DEP-DEU-0099-2009 du 06 février 2009, DEP-DEU-0373-2009 du président du 23 juin 2009, DEP-DEU-0704-2009 et DEP-DEU-0705-2009 du 8 décembre 2009, CODEP-DEU-2010-031543, CODEP-DEU-2010-031551 du 15 juin 2010, CODEP-DEU-2010-066536, CODEP-DEU-2010-066538 et CODEP-DEU-2010-066540 du 15 décembre 2010 (bulletin officiel de l'ASN). En ce qui concerne le renouvellement de l'agrément pour la matrice sol, voir la Décision n° CODEP-DEU-2011-031763 du 15 juin 2011 de l'Autorité de sûreté nucléaire.



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