



Association pour le Contrôle de la Radioactivité dans l'Ouest  
**Independent laboratory of radioactivity analysis**

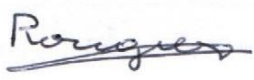

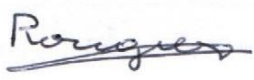

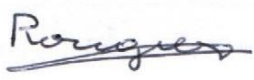

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# Analysis Report

RAP110805-GPJ-01

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<b>DEMAND</b>	
	<b>GREENPEACE INTERNATIONAL</b>
CONTACT	MR. JAN VANDE PUTTE
OBJECT	<b>EVALUATION ON THE ENVIRONMENTAL CONSEQUENCES IN JAPAN OF THE FUKUSHIMA NUCLEAR POWER PLANT ACCIDENT</b> <u>ANALYSIS OF MATRICES OF THE MARINE ENVIRONMENT (FISH)</u>
<b>REPORT ID</b>	
IDENTIFICATION	<b>RAP110805-GPJ-01</b>
DATE	5th of August, 2011
PAGE NB	5 (including appendices)
<b>SAMPLES</b>	
	10 FISH SAMPLES
<b>ANALYSES REALISEES</b>	
TYPE	MEASUREMENT OF GAMMA EMMITERS RADIONUCLIDES BY GAMMA SPECTROMETRY SEARCH FOR ARTIFICIAL NUCLIDES

<b>VISA</b>									
	<table border="1"><tr><td><b>EDITOR</b></td><td><b>APPROVAL</b></td></tr><tr><td></td><td></td></tr><tr><td><b>NAME</b></td><td><b>NAME</b></td></tr><tr><td>Guillaume ROUGIER</td><td>Mylène JOSSET, Analysis Supervisor</td></tr></table>	<b>EDITOR</b>	<b>APPROVAL</b>			<b>NAME</b>	<b>NAME</b>	Guillaume ROUGIER	Mylène JOSSET, Analysis Supervisor
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<b>NAME</b>	<b>NAME</b>								
Guillaume ROUGIER	Mylène JOSSET, Analysis Supervisor								

## 1. Samples identification

The samples were collected from Onahama Port on July 23<sup>rd</sup> and 24<sup>th</sup> 2011 and stored frozen. They were sent by Greenpeace to ACRO laboratory by express mail in a cool box.

Reception date: July 28th, 2011

The samples characteristics are given in the table below.

N°	Greenpeace references	Sample type	Species	Collection Date (local)	Location	GPS	References
1	F17-20110723	Flesh of fish	Hexagrammos otakii(Junior green ling)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.472 E140 54.048	110728-GPJ-01
2	F18-20110723	Flesh of fish	Oncorhynchus masou (Cherry Salmon)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.335 E140 54.682	110728-GPJ-02
3	F19-20110723	Flesh of fish	Sebastes ventricosus(rock fish)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.335 E140 54.683	110728-GPJ-03
4	F20-20110723	Flesh of fish	Hexagrammos otakii(Adult green ling)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.505 E140 54.705	110728-GPJ-04
5	F23-20110724	Flesh of fish	Sebastes ventricosus (rock fish / merabu)	July 24, 2011	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	110728-GPJ-05
6	G17-20110723	Guts of fish	Hexagrammos otakii(Junior green ling)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.472 E140 54.048	110728-GPJ-06
7	G18-20110723	Guts of fish	Oncorhynchus masou (Cherry Salmon)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.335 E140 54.682	110728-GPJ-07
8	G19- 20110723	Guts of fish	Sebastes ventricosus(rock fish)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.335 E140 54.683	110728-GPJ-08
9	G20-20110723	Guts of fish	Hexagrammos otakii(Adult green ling)	July 23, 2011	Onahama Port - hobby fishermen	N36 56.505 E140 54.705	110728-GPJ-09
10	G23-20110724	Guts of fish	Sebastes ventricosus (rock fish / merabu)	July 24, 2011	Onahama Port - hobby fishermen	N36 56.709 E140 54.456	110728-GPJ-10

## 2. Analysis method

### Bodies of fish:

The whole flesh from the fish bodies is taken and homogenized, to be conditioned in a geometry adapted to the gamma measurement.

### Guts:

The guts are homogenized and the whole part is taken to be conditioned in a geometry adapted to the gamma measurement.

The analyses are performed by gamma spectrometry (High purity Germanium detector) on fresh material (see appendix 1). The results are displayed in the two following tables.

### 3. RESULTS: Mass activity of fish samples (in Bq/kg fresh weight)

#### 3.1 Mass activity of fish flesh

Sample identification						
ACRO Sample number registration	110728-GPJ-01	110728-GPJ-02	110728-GPJ-03	110728-GPJ-04	110728-GPJ-05	
Type	<b>Flesh of fish</b>	<b>Flesh of fish</b>	<b>Flesh of fish</b>	<b>Flesh of fish</b>	<b>Flesh of fish</b>	
Species	Hexagrammos otakii(Junior green ling)	Oncorhynchus masou (Cherry Salmon)	Sebastes ventricosus(rock fish)	Hexagrammos otakii(Adult green ling)	Sebastes ventricosus (rock fish / merabu)	
Greenpeace sample number registration	F17-20110723	F18-20110723	F19-20110723	F20-20110723	F23-20110724	
Sampling						
date	July 23, 2011	July 23, 2011	July 23, 2011	July 23, 2011	July 24, 2011	
place	Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby	
Counting						
Geometry (ml)	61	500	61	300	61	
Sample mass analysed (g)	66	500.0	65.3	286.8	64.3	
analysed state	fresh	fresh	fresh	fresh	fresh	
age of the sample (days)	8.5	11	6	10	8	
Results						
Reference date	July 23, 2011	July 23, 2011	July 23, 2011	July 23, 2011	July 24, 2011	
Unit	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	
ARTIFICIALS RADIONUCLIDES						
<b>Ag-110m</b>	250 days	< 2.1	< 1.0	< 3.1	< 1.5	< 2.4
<b>Te-129m</b>	33,6 days	< 44	< 30	< 62	< 44	< 63
<b>I-131</b>	8 days	< 3.2	< 3.1	< 6.2	< 4.9	< 3.8
<b>Cs-134</b>	2.1 years	<b>141 ± 17</b>	<b>80 ± 9</b>	<b>497 ± 59</b>	<b>361 ± 42</b>	<b>131 ± 17</b>
<b>Cs-137</b>	30 years	<b>156 ± 19</b>	<b>92 ± 10</b>	<b>556 ± 66</b>	<b>388 ± 46</b>	<b>143 ± 17</b>

### 3.2 Mass activity of fish guts

Sample identification						
ACRO Sample number registration		110728-GPJ-06	110728-GPJ-07	110728-GPJ-08	110728-GPJ-09	110728-GPJ-10
Type		<b>Guts of fish</b>	<b>Guts of fish</b>	<b>Guts of fish</b>	<b>Guts of fish</b>	<b>Guts of fish</b>
Species		Hexagrammos otakii(Junior green ling)	Oncorhynchus masou (Cherry Salmon)	Sebastes ventricosus(rock fish)	Hexagrammos otakii(Adult green ling)	Sebastes ventricosus (rock fish / merabu)
Greenpeace sample number registration		G17-20110723	G18-20110723	G19-20110723	G20-20110723	G23-20110724
Sampling						
date		July 23, 2011	July 23, 2011	July 23, 2011	July 23, 2011	July 24, 2011
place		Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby	Onahama Port Hobby
Counting						
Geometry (ml)		50	61	20	50	20
Sample mass analysed (g)		46.5	63.2	20.3	46.3	24.4
analysed state		fresh	fresh	fresh	fresh	fresh
age of the sample (days)		9.5	6.5	5	10.5	6.5
Results						
Reference date		July 23, 2011	July 23, 2011	July 23, 2011	July 23, 2011	July 24, 2011
Unit		Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight
ARTIFICIALS RADIONUCLIDES						
<b>Ag-110m</b>	250 days	< 3.6	<b>13.0 ± 2.1</b>	< 6.5	<b>4.0 ± 1.7</b>	<b>7.5 ± 3.0</b>
<b>Te-129m</b>	33,6 days	<b>76 ± 46</b>	< 41	<b>175 ± 73</b>	< 80	< 107
<b>I-131</b>	8 days	< 5.2	< 1.8	< 4.8	< 6.1	< 5.0
<b>Cs-134</b>	2.1 years	<b>107 ± 13</b>	<b>47 ± 6</b>	<b>195 ± 26</b>	<b>169 ± 20</b>	<b>75 ± 10</b>
<b>Cs-137</b>	30 years	<b>115 ± 14</b>	<b>53 ± 7</b>	<b>221 ± 30</b>	<b>186 ± 22</b>	<b>83 ± 11</b>

## APPENDIX 1

ANALYSIS	
TITLE	<b>Measurement of gamma emitters nuclides by gamma spectrometry</b>
TREATMENT	The fresh sample is homogenized. A representative part is taken to be conditioned in a geometry adapted to the gamma measurement.
MATERIAL	High-Purity Germanium (HPGe), type N coaxial, 32% efficiency, mounted in a vertical cryostat. The samples are placed in a 10-cm thick lead shielding. Data are readout by a digital acquisition system (DSPEC-ORTEC). The energy range is taken as 27-2000 keV. The containers are normalized geometries with volumes of 300ml (round boxes), 50 ml (SG50), 61ml (Petri round boxes), and 20 ml (LSC vials) adapted to the available quantity.
UNITS	The measured quantity is the mass activity in Becquerel (Bq) per kilogram of fresh weight (kg fresh weight).

RESULTS	
IN GENERAL	<p>Measurements are performed with identical geometries as those of the standard (calibrated) sources. They concern gamma-emitters radionuclides displaying one or several emission peaks within the reference energy range. Among all the radionuclides detected in the samples, only the most abundant are displayed in the tables, without any specific demand from the client. In all cases, the tables display at least all detected artificial radionuclides.</p> <p>Only elements with activity larger than the decision threshold are given. On the contrary, for the specified radionuclides, the detection limit –LD- (detection limit) is indicated, with the inferior “&lt;” sign. When it is not possible to deduce a satisfying detection limit LD, the data are replaced by the sign “-”. When an element has been detected but cannot be quantified properly, the mention “Identified but Not Quantified” (INQ) is reported. The measured activity of each radioelement is given with its absolute uncertainty calculated within a 95% interval of confidence (2 times the standard deviation). Each expressed activity, including the detection limit, is calculated at the reference date indicated in the table (collection date and time).</p>

## APPENDIX 2

INFORMATION ABOUT THE LABORATORY ACRO	
Measurements capacities	The ACRO laboratory can measure radon concentration in the air, tritium (HTO) in liquids and gamma radionuclides in all kind of matrices. Other measurements are under development. The measurement protocols are in accordance to the actual French and International standards and quality procedures standards (ISO/CEI 17025).
QUALIFICATION	
The laboratory is qualified for radioactivity measurements in the environment by the French nuclear safety authority (ASN)	
<b>Agreements :</b>	
<b>DEP-DEU-0704-2009</b>	<ul style="list-style-type: none"> <li>- Measurement of gamma-emitters radionuclides in biological matrices</li> <li>- Tritium measurement in waters</li> </ul>
<b>CODEP-DEU-2010-031543</b>	<ul style="list-style-type: none"> <li>- Measurement of gamma-emitters radionuclides in waters</li> <li>- Uranium isotopes in soils</li> <li>- Thorium isotopes in soils</li> <li>- Radium-226/228 and decaying partners in soils.</li> </ul>
<b>CODEP-DEU-2011-031763</b>	<ul style="list-style-type: none"> <li>- Measurement of gamma-emitters radionuclides in soils</li> </ul>