



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



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Analysis Report

RAP110928-GPJ-01

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DEMAND	
	GREENPEACE JAPAN
CONTACT	Wakao Hanaoka, Oceans Campaigner
OBJECT	EVALUATION ON THE ENVIRONMENTAL CONSEQUENCES IN JAPAN OF THE FUKUSHIMA NUCLEAR POWER PLANT ACCIDENT Analysis of matrices of marine environment (fish & sea weeds)
REPORT ID	
IDENTIFICATION	RAP110928-GPJ-01
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SAMPLES	
	10 SAMPLES
ANALYSES REALISEES	
TYPE	MEASUREMENT OF GAMMA EMMITERS RADIONUCLIDES BY GAMMA SPECTROMETRY SEARCH FOR ARTIFICIAL NUCLIDES

VISA		
	EDITOR	APPROVAL
		
	NAME	NAME
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1. Samples identification

The samples characteristics are given in the table below.
Samples were sent to ACRO laboratory by express mail in a cool box.

N°	Greenpeace references	Sample type	Species	Collection Date	Location	ACRO references
1	20110913-ONH-1	Fish flesh	Kampachi - Greater yellowtail - <i>Seriola dumerili</i>	9/13/2011	Onahama port	110920-GPJ-01
2	20110913-ONH-2	Fish flesh	Kitsunemebaru - Fox jacopever - <i>Sebastes vulpes</i>	9/13/2011	Onahama port	110920-GPJ-02
3	20110913-ONH-3	Fish flesh	Mebaru - Rockfish - <i>Sebastes inermis</i>	9/13/2011	Onahama port	110920-GPJ-03
4	20110913-ONH-4	Fish flesh	Mahirame - Bastard halibut - <i>Paralichthys olivaceus</i>	9/13/2011	Onahama port	110920-GPJ-04
5	20110913-ONH-5	Fish flesh	Ainame - Fat greeling - <i>Hexagrammos otakii</i>	9/13/2011	Onahama port	110920-GPJ-05
6	20110913-ONH-6	Fish flesh	Ainame - Fat greeling - <i>Hexagrammos otakii</i>	9/13/2011	Onahama port	110920-GPJ-06
7	20110914-HIS-1	Seaweed	Makonbu - Kelp - <i>Laminaria japonica</i>	9/14/2011	Hisanohama port	110920-GPJ-07
8	20110914-HIS-2	Seaweed	Wakame(Mekabu) - Wakame seaweed - <i>Undaria pinnatifida</i>	9/14/2011	Hisanohama port	110920-GPJ-08
9	20110914-HIR-1	Seaweed	Makonbu - Kelp - <i>Laminaria Japonica</i>	9/14/2011	Hirakata port	110920-GPJ-09
10	20110914-HIR-2	Seaweed	Nagaaso <i>Ulva arasakii</i>	9/14/2011	Hirakata port	110920-GPJ-10

2. Analysis method

The flesh from fish bodies is taken and homogenized.
A representative part of fresh sample (fish flesh and whole part of seaweeds) 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 2 following tables.

3. RESULTS

3.1 Mass activity of fish flesh

SAMPLE IDENTIFICATION						
ACRO Sample number registration	110920-GPJ-01	110920-GPJ-02	110920-GPJ-03	110920-GPJ-04	110920-GPJ-05	110920-GPJ-06
Type	Fish flesh	Fish flesh	Fish flesh	Fish flesh	Fish flesh	Fish flesh
Species	Kampachi	Kitsunemeburu	Mebaru	Mahirame	Ainame	Ainame
	- Greater yellowtail - <i>Seriola dumerili</i>	- Fox jacopever - <i>Sebastes vulpes</i>	- Rockfish - <i>Sebastes inermis</i>	- Bastard halibut - <i>Paralichthys olivaceus</i>	- Fat greeling - <i>Hexagrammos otakii</i>	- Fat greeling - <i>Hexagrammos otakii</i>
Greenpeace sample number registration	20110913-ONH-1	20110913-ONH-2	20110913-ONH-3	20110913-ONH-4	20110913-ONH-5	20110913-ONH-6
SAMPLING						
date	9/13/2011	9/13/2011	9/13/2011	9/13/2011	9/13/2011	9/13/2011
place	Onahama port	Onahama port	Onahama port	Onahama port	Onahama port	Onahama port
COUNTING						
Geometry (ml)	500	300	300	300	300	300
Sample mass analysed (g)	499.3	303.6	261.8	288.2	291.5	298.3
Analyse state	fresh	fresh	fresh	fresh	fresh	fresh
Counting date	9/20/2011	9/21/2011	9/22/2011	9/23/2011	9/23/2011	9/25/2011
RESULTS						
Reference date	9/13/2011	9/13/2011	9/13/2011	9/13/2011	9/13/2011	9/13/2011
Unit	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight
ARTIFICIALS RADIONUCLIDES						
I-131	8 days	< 1	< 3	< 3	< 6	< 4
Cs-134	2 years	22.7 ± 2.7	85 ± 10	114 ± 13	93 ± 11	106 ± 9
Cs-137	30 years	27.9 ± 3.3	102 ± 12	140 ± 17	114 ± 15	132 ± 12

3.2 Mass activity of seaweeds

SAMPLE IDENTIFICATION				
ACRO Sample number registration	110920-GPJ-07	110920-GPJ-08	110920-GPJ-09	110920-GPJ-10
Type	Seaweed	Seaweed	Seaweed	Seaweed
Species	Makonbu - Kelp - <i>Laminaria japonica</i>	Wakame(Mekabu) - Wakame seaweed - <i>Undaria pinnatifida</i>	Makonbu - Kelp - <i>Laminaria japonica</i>	Nagaaso <i>Ulva arasakii</i>
Greenpeace sample number registration	20110914-HIS-1	20110914-HIS-2	20110914-HIR-1	20110914-HIR-2
SAMPLING				
date	9/14/2011	9/14/2011	9/14/2011	9/14/2011
place	Hisanohama port	Hisanohama port	Hirakata port	Hirakata port
COUNTING				
Geometry (ml)	500	500	500	500
Sample mass analysed (g)	475.6	453,2	455.7	463.6
Analyse state	fresh	fresh	fresh	fresh
Counting date	9/21/2011	9/24/2011	9/23/2011	9/24/2011
RESULTS				
Reference date	9/14/2011	9/14/2011	9/14/2011	9/14/2011
Unit	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight	Bq/kg fresh weight
ARTIFICIALS RADIONUCLIDES				
I-131	8 days	< 2	< 2	< 4
Cs-134	2 years	58 ± 7	39 ± 5	8.8 ± 1.1
Cs-137	30 years	69 ± 8	46 ± 5	10.2 ± 1.3

APPENDIX 1

ANALYSIS	
TITLE	Measurement of gamma emitters nuclides by gamma spectrometry
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 500ml (SG500), 300ml (round boxes) and 50 ml (SG50), 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 “<” 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)	
Agreements :	
DEP-DEU-0704-2009	<ul style="list-style-type: none"> - Measurement of gamma-emitters radionuclides in biological matrices - Tritium measurement in waters
CODEP-DEU-2010-031543	<ul style="list-style-type: none"> - Measurement of gamma-emitters radionuclides in waters - Uranium isotopes in soils - Thorium isotopes in soils - Radium-226/228 and decaying partners in soils.
CODEP-DEU-2011-031763	<ul style="list-style-type: none"> - Measurement of gamma-emitters radionuclides in soils