Association pour le Contrôle de la Radioactivité dans l'Ouest
Independent laboratory of radioactivity analysis
Association loi 1901 SIRET : 950 369 868 00027 APE : 7120B
138 rue de l'Eglise – 14200 HEROUVILLE-SAINT-CLAIR - FRANCE
Tél. : (+33) 2.31.94.35.34 Fax : (+33) 2.31.94.85.31
Email : acro-laboratoire@wanadoo.fr
N°TVA: FR 62 950 369 868

Analysis Report

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, octopus & sea weeds)
REPORT ID	
IDENTIFICATION	**RAP111017-GPJ-01**
DATE	October 24, 2011
PAGE NB	6 (including appendices)
SAMPLES	
	10 SAMPLES
ANALYSES REALISEES	
TYPE	MEASUREMENT OF GAMMA EMMITERS RADIONUCLIDES BY GAMMA SPECTROMETRY SEARCH FOR ARTIFICIAL NUCLIDES

VISA

	EDITOR	**APPROVAL**
		
	NAME	**NAME**
	Aurélie MIGEON	Mylène JOSSET

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	20111012-ONH-1	Fish flesh	*Hirame* - Bastard halibut – (paralichthys olivaceus)	10/12/2011	Offshore Onahama port	111017-GPJ-01
2	20111012-ONH-2	Fish flesh	*Madai* - Red Seabream – (pagurus major)	10/12/2011	Offshore Onahama port	111017-GPJ-02
3	20111012-ONH-3	Fish flesh	*Mebaru* - Rockfish – (sebastes inermis)	10/12/2011	Offshore Onahama port	111017-GPJ-03
4	20111012-ONH-4	Octopus	*Madako* - Common octopus – *(octopus vulgaris)*	10/12/2011	Offshore Onahama port	111017-GPJ-04
5	20111012-ONH-5	Fish flesh	*Ainame* - Fat greeling – (hexagrammos otakii)	10/12/2011	Offshore Onahama port	111017-GPJ-05
6	20111012-TYM-1	Fish flesh	*Hirame* - Bastard halibut – (paralichthys olivaceus)	10/12/2011	Offshore Toyoma port	111017-GPJ-06
7	20111012-TYM-2	Fish flesh	*Warasa (Buri)* - Japanese amberjack – (seriola quinqueradiata)	10/12/2011	Offshore Toyoma port	111017-GPJ-07
8	20111013-HIS-1	Seaweed	*Nagaaosa* (ulva arasakii)	10/13/2011	Hisanohama port	111017-GPJ-08
9	20111013-HIS-2	Seaweed	*Makonbu* - Kelp – (Laminaria japonica)	10/13/2011	Hisanohama port	111017-GPJ-09
10	20111013-HBE-1	Seaweed	*Nagaaosa* (ulva arasakii)	10/13/2011	Beach at Hirono town	111017-GPJ-10

2. Analysis method

The flesh from fish bodies is taken and homogenized.
A representative part of fresh sample (fish flesh, octopus 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 IDENIFICATION				
ACRO Sample number registration	111017-GPJ-01	111017-GPJ-02	111017-GPJ-03	111017-GPJ-04
Type	fish flesh	fish flesh	fish flesh	octopus
Species	*Hirame* - Bastard halibut – (paralichthys olivaceus)	*Madai* - Red Seabream – (pagurus major)	*Mebaru* - Rockfish – (sebastes inermis)	*Madako* - Common octopus – *(octopus vulgaris)*
Greenpeace sample number registration	20111012-ONH-1	20111012-ONH-2	20111012-ONH-3	20111012-ONH-4
SAMPLING				
date	10/12/2011	10/12/2011	10/12/2011	10/12/2011
place	Offshore Onahama port	Offshore Onahama port	Offshore Onahama port	Offshore Onahama port
COUNTING				
Geometry (ml)	300	300	50	500
Sample mass analysed (g)	300.8	305.3	50.0	503.6
Analyse state	fresh	fresh	fresh	fresh
Counting date	10/19/2011	10/19/2011	10/21/11	10/20/11
RESULTS				
Reference date	10/12/2011	10/12/2011	10/12/2011	10/12/2011
Unit	**Bq/kg fresh weight**	**Bq/kg fresh weight**	**Bq/kg fresh weight**	**Bq/kg fresh weight**
ARTIFICIALS RADIONUCLIDES				
I-131 *8 days*	< 3	< 2	< 6	< 1
Cs-134 *2 years*	**58 ± 7**	**19.7 ± 2.8**	**110 ± 13**	**1.04 ± 0.30**
Cs-137 *30 years*	**71 ± 9**	**25.1 ± 3.4**	**141 ± 17**	**1.33 ± 0.32**

SAMPLE IDENIFICATION			
ACRO Sample number registration	111017-GPJ-05	111017-GPJ-06	111017-GPJ-07
Type	fish flesh	fish flesh	fish flesh
Species	Ainame - Fat greeling – (hexagrammos otakii)	Hirame - Bastard halibut – (paralichthys olivaceus)	Warasa (Buri) - Japanese amberjack – (seriola quinqueradiata)
Greenpeace sample number registration	20111012-ONH-5	20111012-TYM-1	20111012-TYM-2
SAMPLING			
date	10/12/2011	10/12/2011	10/12/2011
place	Offshore Onahama port	Offshore Toyoma port	Offshore Toyoma port
COUNTING			
Geometry (ml)	300	300	300
Sample mass analysed (g)	299.1	290.7	300.2
Analyse state	fresh	fresh	fresh
Counting date	10/20/2011	10/21/2011	10/21/2011
RESULTS			
Reference date	10/12/2011	10/12/2011	10/12/2011
Unit	**Bq/kg fresh weight**	**Bq/kg fresh weight**	**Bq/kg fresh weight**
ARTIFICIALS RADIONUCLIDES			
I-131 *8 days*	< 5	< 2	< 3
Cs-134 *2 years*	**116 ± 14**	**19.6 ± 2.6**	**21.9 ± 3.1**
Cs-137 *30 years*	**148 ± 18**	**25.8 ± 3.4**	**28.3 ± 3.9**

3.2 Mass activity of seaweeds

SAMPLE IDENIFICATION			
ACRO Sample number registration	111017-GPJ-08	111017-GPJ-09	111017-GPJ-10
Type	seaweed	seaweed	seaweed
Species	Nagaaosa (ulva arasakii)	Makonbu - Kelp – (Laminaria japonica)	Nagaaosa (ulva arasakii)
Greenpeace sample number registration	20111013-HIS-1	20111013-HIS-2	20111013-HBE-1
SAMPLING			
date	10/13/2011	10/13/2011	10/13/2011
place	Hisanohama port	Hisanohama port	Beach at Hirono town
COUNTING			
Geometry (ml)	500	500	500
Sample mass analysed (g)	416.2	425.6	416.8
Analyse state	fresh	fresh	fresh
Counting date	10/19/2011	10/19/2011	10/20/2011
RESULTS			
Reference date	10/13/2011	10/13/2011	10/13/2011
Unit	**Bq/kg fresh weight**	**Bq/kg fresh weight**	**Bq/kg fresh weight**
ARTIFICIALS RADIONUCLIDES			
I-131 *8 days*	< 3	< 3	< 3
Cs-134 *2 years*	**70 ± 9**	**37 ± 5**	**39.8 ± 4.5**
Cs-137 *30 years*	**87 ± 11**	**47 ± 6**	**51 ± 6**

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 cryostate. 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	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. 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).

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	- Measurement of gamma-emitters radionuclides in biological matrices - Tritium measurement in waters
CODEP-DEU-2010-031543	- 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	- Measurement of gamma-emitters radionuclides in soils