Biological samples of Isotope concentrations of Cesium 134 and 137, Silver 110m, and Potassium 40 from cruise KOK1108 in June 2011 in the Western equatorial Pacific and Kurushio Extension (Fukushima Radionuclide Levels project)

Website: https://www.bco-dmo.org/dataset/3631
Data Type: Cruise Results
Version: 1
Version Date: 2012-03-23

Project
» Establishing Radionuclide Levels in the Atlantic and Pacific Oceans Originating from the Fukushima Daiichi Nuclear Power Facility (Fukushima Radionuclide Levels)

Contributors	Affiliation	Role
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Abstract
Isotope concentrations of Cesium 134 and 137, Silver 110m, and Potassium 40 in zooplankton and small fish from cruise R/V Ka`imikai-O-Kanaloa (KOK1108) in June 2011 in the Western equatorial Pacific and Kurushio Extension

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Coverage

Spatial Extent: **N**:38 **E**:147.12 **S**:34.48 **W**:141.39
Temporal Extent: 2011-06-07 - 2011-06-17

Dataset Description

Counts and concentrations of Cs134, Cs137, Ag110m, and K40 detected in zooplankton and small fish samples are reported. Samples were collected as part of a radioecological study of biota in order to assess the impact of radiation leaks from the Fukushima Daiichi nuclear power facility, damaged by a March 11, 2011 earthquake and tsunami. Radionuclide results were determined from high purity germanium detectors and calibrated against IAEA standards as described in Buesseler et al. (PNAS, 2012).

Methods & Sampling

Mixed zooplankton samples were sampled using Bongo nets (mesh size = 300 micromol and Methot net (mesh

size = 4mm) to collect gelatinous zooplankton, larger crustaceans and fish. Samples collected were pooled together from several casts to achieve biomass needed for radioanalysis. Samples were frozen prior to freeze-drying. Samples that were freeze-dried and ground were stored and analyzed in straight side Nalgene 4oz jar; powdered mass was compressed by a polyacrilamide ring placed on top to assure uniform distribution of the sample in the jar. Biological samples were analyzed using a planar low energy germanium detector - LEGe, Canberra, Model GLP 3830 with a 3800 mm2 active area; Genie 2000 software was used for spectrum analysis.

Data Processing Description

Total counting efficiencies that accounted for sample geometry and for energy emission were calculated based on standards composed of Se-75, Cs-137 and Eu-152 (265 keV, 662 keV and 1408 keV, respectively). We also accounted for the branching ratio and the concentrations were decay-corrected back to April 6th, 2011 The error reported reflects the % counting error. The lower end of the detection was decided based on the lowest among the samples radionuclide concentration minus one error. We did not correct for coincidence summing. An algorithm used for making these corrections - i.e. total % counting efficiency was: CEtot% = ((-6.24 * ln(sample volume) + 48.23) * (13.74 * energy * ^(-0.79)))/100;

nd = not determined
bd = below detection

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Data Files

File
biological_samples.csv (Comma Separated Values (.csv), 2.86 KB) MD5:044bf8ae218bdc7eedf88bf85b860dd3 Primary data file for dataset ID 3631

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Related Publications

Buesseler, K. O., Jayne, S. R., Fisher, N. S., Rypina, I. I., Baumann, H., Baumann, Z., … Yoshida, S. (2012). Fukushima-derived radionuclides in the ocean and biota off Japan. Proceedings of the National Academy of Sciences, 109(16), 5984–5988. doi:10.1073/pnas.1120794109
General

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Parameters

Parameter	Description	Units
sta	station ID	dimensionless
date	date of sample in yyyymmdd format	unitless
sampling_method	method used to collect sample	dimensionless
sample_type	type of biota in sample	dimensionless
dominant_species	most numerous species in sample	dimensionless
abundance_species	percent of total organisms represented by dominant species	dimensionless
mass_dry	mass of freeze-dried sample	grams
Ag110m_conc_dry	concentration of Ag110m	bequerels/kg
err_Ag110m_conc_dry	error in concentration of Ag110	percent
Cs134_conc_dry	concentration of Cs134	bequerels/kg
err_Cs134_conc_dry	error in Cs134_conc_dry	percent
Cs137_conc_dry	concentration of Cs137	bequerels/kg
err_Cs137_conc_dry	error in concentration of Cs137	percent
K40_conc_dry	concentraion of K40	bequerels/kg
err_K40_conc_dry	error in K40_conc_dry	bequerels/kg
event	event number	dimensionless
latitude	latitude, in decimal degrees, North is positive, negative denotes South	decimal degrees
longitude	longtude, in decimal degrees, East is positive, negative denotes West	decimal degrees

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Instruments

Dataset-specific Instrument Name	Bongo Net
Generic Instrument Name	Bongo Net
Dataset-specific Description	mesh size = 300 micrometer
Generic Instrument Description	A Bongo Net consists of paired plankton nets, typically with a 60 cm diameter mouth opening and varying mesh sizes, 10 to 1000 micron. The Bongo Frame was designed by the National Marine Fisheries Service for use in the MARMAP program. It consists of two cylindrical collars connected with a yoke so that replicate samples are collected at the same time. Variations in models are designed for either vertical hauls (OI-2500 = NMFS Pairovet-Style, MARMAP Bongo, CalVET) or both oblique and vertical hauls (Aquatic Research). The OI-1200 has an opening and closing mechanism that allows discrete "known-depth" sampling. This model is large enough to filter water at the rate of 47.5 m3/minute when towing at a speed of two knots. More information: Ocean Instruments, Aquatic Research, Sea-Gear

Dataset-specific Instrument Name	Methot Net
Generic Instrument Name	Methot Net
Dataset-specific Description	Methot Net mesh size = 4 millimeter
Generic Instrument Description	A Methot Net, a type of plankton net, is used to sample juvenile fish, shrimp, and 'larger' plankton, e.g. 4 millimeters and larger. Named after its designer, Richard D. Methot, of La Jolla, California, it is also called a Methot Trawl. It is a single net with a large square opening or mouth. The net is deployed from the stern and towed behind the vessel. The Methot uses fine mesh (e.g. 4 mm) but with openings slightly larger than other plankton net systems. The larger mesh size allows the net to be towed at higher speeds. A flowmeter suspended in the mouth of net measures the flow of water moving through the net and allows for the calculation of the volume of water sampled. With its larger mouth and faster speed through the water, the Methot is designed to catch the larger zooplankton that are often missed by other plankton net samplers.

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Deployments

KOK1108

Website	https://www.bco-dmo.org/deployment/58727
Platform	R/V Ka`imikai-O-Kanaloa
Report	http://bcodata.whoi.edu/Fukushima/Fukushima_KOK1108_dailyBlog.pdf
Start Date	2011-06-04
End Date	2011-06-19
Description	The purpose of the 16 day KOK1108 cruise aboard the University of Hawaii research vessel Ka'imikai-o-Kanaloa was to study the fate of radiation released into the ocean from the Fukushima Daiichi nuclear power plant that was badly damaged by a tsunami on March 11, 2011.

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Project Information

Establishing Radionuclide Levels in the Atlantic and Pacific Oceans Originating from the Fukushima Daiichi Nuclear Power Facility (Fukushima Radionuclide Levels)

Website: http://www.whoi.edu/page.do?pid=67796

Coverage: Northwest Pacific Ocean

The March 11, 2011 earthquake in Japan and the subsequent tsunami damaged and disrupted cooling systems at the Fukushima Daiichi nuclear power facility causing contamination of land and seas surrounding the site, as well as food supplies and drinking water. Small but measurable quantities of radioactivity have been detected in the atmosphere over the United States, including aerosol samples collected at the Woods Hole Oceanographic Institution, where I-131 was seen to increase to detectable levels as of March 21-22, 2011.

With major funding from the Moore Foundation, as well as a contribution from the National Science Foundation through a 2011 Grant for Rapid Response Research (RAPID) and support from the Woods Hole Oceanographic Institution, collaborating investigators from the United States, Japan, Spain, Monaco, and the United Kingdom were able to obtain samples off Japan for an early assessment of impacts.

From June 4 through June 19, 2011, a research cruise was carried out aboard the RV Kaimikai-O-Kanaloa, a research vessel operated by the University of Hawaii. During the cruise, hundreds of samples were collected in an area off the coast of Japan as close as 30 kilometers from the Fukushima Nuclear Power Plant and extending as far out as 600 kilometers off shore. The essential components of the program include: radionuclide measurements of water and particles; a radioecological study of biota, especially species at the base of the food chain and key fish species and a physical oceanographic study to characterize transport and water masses. A baseline radionuclide data set for the Atlantic and Pacific was obtained along an east to west network of sampling stations. Three hundred sampling events took place at thirty major stations for a total of more than 1500 samples. Along with 41 CTD stations, bottle samples of salinity, oxygen, radionuclides, and particulates were taken to depths of about 1000 meters. A list of the radionuclides sampled and a sampling summary map is available. One hundred net tows resulted in approximately fifty pounds of biological samples, including plankton and small fish. Daily samples of aerosol were also taken.

Early investigation following an accidental release of man-made radionuclides is key to understanding the magnitude of the release and the relationship to public health issues The research results also set the stage for the use of the longer lived radionuclides as tracers in subsequent studies by the community to understand ocean processes.

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Funding

Funding Source	Award
Gordon and Betty Moore Foundation (GBMF)	GBMF3007
NSF Division of Ocean Sciences (NSF OCE)	OCE-1136693

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