

Vancouver Symposium on Floating Articles and Debris Resulting from the Great East Japan Earthquake

October 1st, 2014

Theatre at Vancouver Aquarium



Co-hosted by
Vancouver Aquarium and JEAN



Supported by
Japan Love Project

Introduction to the Vancouver Symposium on Floating Articles and Debris Resulting from the Great East Japan Earthquake

Due to the tsunami caused by the Great East Japan Earthquake which occurred in March 11, 2011, houses and various materials from the coastal areas hit by the tsunami were washed into the North Pacific Ocean. At the end of 2011, some of the floating articles started to wash ashore on the west coast of the North American Continent, far away from Japan. This increased people's interest in the floating articles resulting from the 2011 Japan tsunami, in Japan as well as in the US and Canada. It is very difficult to collect and treat the floating articles which were washed ashore on the North Pacific coasts, particularly in the northern part of the west coast and on the remote islands, which are difficult to access.

Some of the articles washed ashore have been collected and they are currently being treated, thanks to the relentless efforts of residents, NGOs and the local governments on the west coast of the US and Canada. In light of this situation, from August 2012 to October 2013, the Japan Environmental Action Network (JEAN) and others conducted field surveys and discussions with relevant parties in the coastal areas in the US and Canada, using assistance from the Ministry of the Environment, Japan, the Environmental Restoration and Conservation Agency (ERCA), private foundations, etc. JEAN is a General Incorporated Association which has been conducting cleanup activities in cooperation with a US NGO since 1990.

JEAN, with support from Japan's Ministry of Environment, decided to organize a symposium in Vancouver, Canada, followed by another to be held in Japan. The purpose of these symposia is to share the latest information on the issue with people in both Japan and North America so that they will have a much better understanding of the issues involved.

A call for participation was sent out to communities, NGOs and government employees who have been involved in the beach cleanup activities along the coast of Vancouver Island. They include those who had been active even before the issue of the tsunami-caused debris arose and those who are taking up the issue because of the tsunami-derived litter on the beaches. NGOs in the coastal states of Alaska, Washington, Oregon and Hawaii were also invited to send representatives to speak on the current situations on their shores.

The participants from Japan will include community members of the disaster areas working on reconstruction, NGOs providing aid to the area and officials from the Ministry of Environment responsible for the cleanup. They will speak on the conditions and progress in the tsunami-affected areas. In addition, there will be a report from the group that conducted a beach cleanup on Vancouver Island in March 2014 involving 70 university students from Japan.

The symposium will hear first-hand reports from people on the frontline, illustrating the current situation and issues concerning the tsunami marine driftage reaching the coastline. The aim is to present the problem accurately and comprehensively, with the ultimate goal of building and deepening trust among NGOs and communities to strengthen their co-operation and coordinated efforts to solve the issue in the future.

Last but not least, we would like to thank the Vancouver Aquarium, Japan Love Project, and A&E Communications, Inc. for their support and co-operation.

October 1, 2014
Vancouver Aquarium
General Incorporated Society, JEAN

Vancouver Symposium on Floating Articles
and Debris Resulting from the Great East Japan Earthquake

5:30 PM	Doors Open
6:00 PM	Opening Remarks 6:00 PM Susan Debreceni/Vancouver Aquarium 6:05 PM Azusa Kojima/JEAN (Japan Environmental Action Network)
6:15 PM	Japan Updates 6:15 PM Initiatives by Government of Japan Jun Saegusa / Ministry of the Environment, Japan 6:25 PM Words of appreciation by Yuriage, Natori City, Miyagi Koichi Sakurai / Yuriage Port Morning Market Cooperative Association 6:40 PM Activities of Japanese NPO in disaster stricken area Akio Sakamoto / Sea Beautification Society 6:55 PM Activities of Japan Love Project Hanako Yokota/Japan Love Project
7:05 PM	Q&A
7:20 PM	Break
7:45 PM	Canada Updates 7:45 PM Communication with people in the disaster stricken area Peter Clarkson / Marine Driftage Artist 7:52 PM Tsunami Cleanup Kate Le Souef / Great Canadian Shoreline Cleanup 7:59 PM Actions on Vancouver Island including monitoring Karla Robison / District of Ucluelet 8:06 PM Impact & Action – Haida Gwaii Trent Moraes / Haida Gwaii Tsunami Debris Committee
8:15 PM	US Updates 8:15 PM State of Alaska Katie Gavenus / Centre for Alaska Coastal Studies 8:22 PM Christopher Pallister / Gulf of Alaska Keeper 8:29 PM State of Washington Jon Schmidt / Washington Coast Savers 8:36 PM State of Oregon Joy Irby / SOLVE 8:43 PM State of Hawaii Megan Lamson / Hawaii Wildlife Fund
8:50 PM	Q&A
9:00 PM	Summary Professor Shigeru Fujieda JEAN/Kagoshima University
9:10 PM	Closing Remarks Hiroshi Kaneko / JEAN Susan Debreceni / Vancouver Aquarium

Programs are subject to change without notice.

1. Japanese Contribution to PICES's New Research Project on the Effects of Marine Debris Generated by the Great Tsunami of 2011

1-1. Background

On 11 March 2011, the east coast of Japan was struck by a huge earthquake and tsunami, with a tremendous number of irreplaceable lives lost and unprecedented damage to our nation. The tsunami that followed the earthquake devastated the northeast region of Japan, severely damaging the infrastructure and buildings, and washing colossal amounts of garbage and debris into the ocean. Debris has been carried away by winds and ocean currents and scattered across the North Pacific Ocean, with some reaching the west coast of North America.

Many fear that this debris deposited on the shores of North America could have potentially devastating effects. Our major concern is that aquatic species native to Japan may have been swept along with the tsunami debris and will eventually reach the west coast, where they might exert an uncertain influence on the marine environment.

On the one hand, the people of the west coast of the USA and Canada have been so kind and incredibly considerate as to return recovered items to their owners in cases where names and addresses have been identifiable. Still now, all Japanese appreciate such dedicated engagement very much and are profoundly touched by such generosity of spirit.

On the other hand, we are anxious about the effect this tsunami-generated debris will have on the beautiful natural environment and the local communities of the west coast of North America. Our foremost concern is the potential future effects this will have on the west coast of North America.

1-2. PROJECT GOAL

The overall goal of the PICES project, funded by Ministry of the Environment of Japan (MoE), is to assess and forecast the effects of debris generated by the tsunami that followed the 2011 Great East Japan Earthquake, especially those related to non-indigenous (alien/invasive) species, on ecosystem structure and function, and on the coastlines and communities of the west coast of North America and Hawaii, and to suggest necessary measures. This project will be started in 2014 and will continue for three years.

1-3. Outline of the Project

The project will be directed by a Project Science Team (PST), co-chaired by three PICES members, one each from Canada, the USA and Japan. The activities of the project are outlined below.

A) Modelling of debris transport

In order to assess the risk posed to coastal ecosystems by species arriving from Japan on

tsunami debris, it is important to understand the trans-Pacific transport of different debris types generated by the earthquake and tsunami, and how near-shore oceanographic processes contribute to debris collection locations in North America and Hawaii. Thus, this project will employ both large-scale, trans-Pacific and small-scale, coastal dynamic models.

B) Surveillance and monitoring

Characterizing the potential ecological consequences of tsunami debris, including the impact of invasive species, requires understanding where debris is accumulating, the type of debris, the spatial and temporal patterns of debris accumulation, etc. Thus, this project will employ several surveillance/monitoring activities, as below:

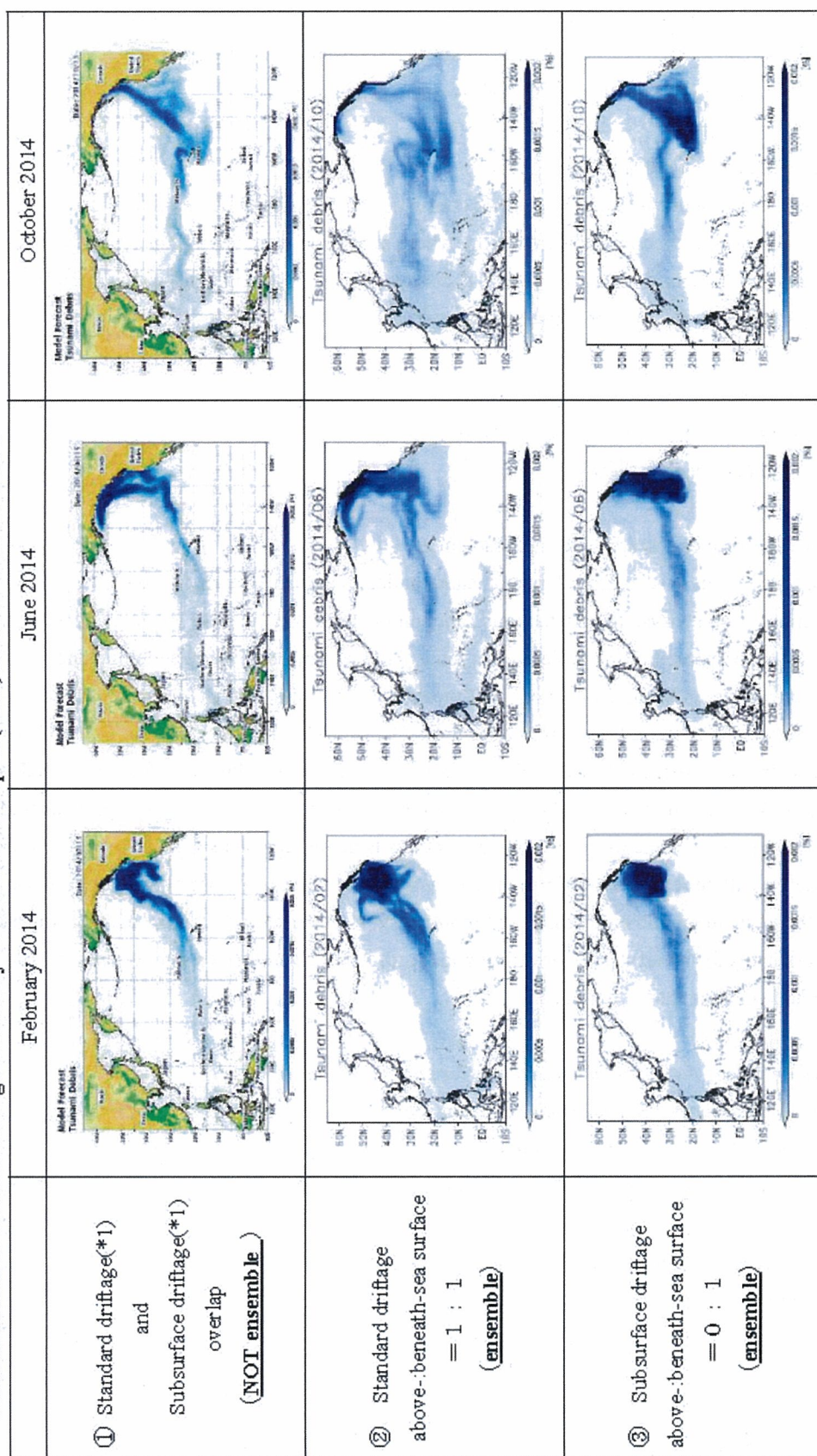
- a) *Analysis of existing monitoring data*
- b) *Webcam monitoring*
- c) *Rapid aerial assessments*

C) Invasive species research and risk assessment

The transport of species from Japan on tsunami debris arguably represents the greatest potential for impacts on ecosystem structure and function in North America and Hawaii, and as such is the focal component of the project. This focus will be informed by the modelling and surveillance/monitoring components outlined above. Risk assessments for invasive species can be used to characterize the uptake of species by tsunami debris, their potential for survival during transit across the North Pacific, their potential for establishment in foreign coastal waters (North America and Hawaii), their potential for spread, and ultimately their impacts should the invasion process come to fruition. Given that this tsunami represents a unique event, additional research will be required to inform the risk assessments. Thus, this project will employ various methods, including novel research and monitoring, to assemble data to inform and refine risk assessments for invasive species arriving in North America and Hawaii on tsunami debris. These methods include the following:

- a) *Identifying the potential invasive species pool*
- b) *Invasive species entrainment on tsunami debris*
- c) *Invasive species survival on tsunami debris*
- d) *Invasive species establishment potential*
- e) *Understanding impacts*
- f) *Risk assessments for invasive species*
- g) *Improved taxonomy*

Forecast results of tsunami driftage location by Government of Japan (MoE) released on March 2014.



① shows weight density distribution of total amount of about 1.53 million tons (Standard driftage: about 1.33 million tons, Subsurface driftage: about 0.20 million tons) ② and ③ show weight density distribution of each driftage.

(*1) Calculation scheme — standard driftage and subsurface driftage

A simulation was carried out for the two types of driftage (see below) influenced by both surface winds and surface ocean currents, in which we took into account the effect of windage based on experimental data provided by the Japan Coast Guard.

Subsurface driftage above-:beneath- sea surface = 0:1	Standard driftage above-:beneath- sea surface = 1:1
<ul style="list-style-type: none"> ● Mostly below the ocean's surface ● Lumber containing seawater, driftwood, etc. ● Rarely unaffected by Westerlies 	<ul style="list-style-type: none"> ● Nearly half is under water ● Lumbers derived from broken houses, flooded vessels, etc.
□□	

Accumulated amount of tsunami driftage estimated to reach within 100 km of the west coast of the North American continent in 2014.

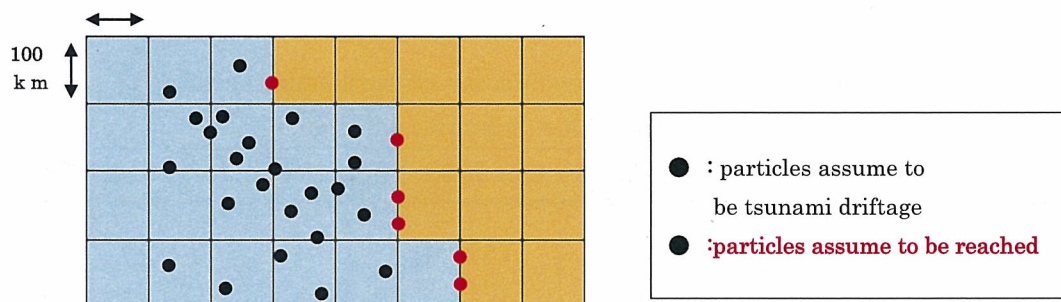


Figure 1:

Amount of tsunami driftage estimated to have reached within 100 km of the west coast of North America from February 2013 to October 2014 (MOE figures based on conditions below)

Conditions

- Estimated for standard and subsurface driftage
- Total amount of tsunami driftage is assumed to be about 1.53 million tons.
- Coverage area is the west coast of North America from 35 degrees north latitude to 55 degrees north latitude.
- The amount of the tsunami driftage was simulated on the basis of a model that assumed a specific number of particles had been released into the ocean. The estimate of the amount of tsunami driftage that will reach the west coast is obtained by calculating the ratio of “the number of particles washed ashore on the west coast” to “the total number of particles assumed to have been released” under the model, then multiplying this ratio by the assumed total amount of tsunami driftage.
- Figure 1 indicates the estimated amount of tsunami driftage expected to reach within 100 km

of the west coast of North America.

- ※ Not all of the tsunami driftage will actually reach shore, due to the effects of ocean currents, winds, transitory coastal conditions and other factors. Furthermore, simulations at this time might not accurately reflect the effect of localized meteorological and marine conditions in near-coastal areas. This is because the simulation was performed based on the assumption that meteorological and marine conditions are homogeneous within each 100 x 100 km unit of study.

Consequently, it must be noted that in Table 1 the estimated amount of tsunami driftage reaching the west coast is NOT equal to the estimated amount of tsunami driftage actually beached.

Additionally, the actual amount of tsunami driftage reaching the shore is expected to be smaller than the estimate because the simulation does not account for degradation, breakdown and sedimentation of driftage over time (diffusion and disappearance during drift).

Table 1. Accumulated amount to reach on forecasts of tsunami driftage in 2013
(black: total, green: Standard driftage, blue: Subsurface driftage)

	Feb 2013	Jun 2013	Oct 2013	Feb 2014	Jun 2014	Oct 2014
Amount of tsunami driftage reached (thousand tons)	68+0 (68)	69+0 (69)	71+0 (71)	76+1 (77)	170+50 (220)	343+59 (402)

- ※For reference accumulated amount to reach on forecasts of tsunami driftage in 2012
(Standard driftage Only)

	Feb 2013	Jun 2013	Oct 2013
Amount of tsunami driftage reached (thousand tons)	2	105	221

2. Shore arrivals along the west coast of North America

2-(1) Before and after the disaster (2011)

Table 1 compares marine debris before and after the disaster, based on information obtained from an NGO meeting between Japan and the USA in August 2012 and a research trip to the west coast of North America in September 2013 as well as from a questionnaire survey conducted in January 2014.

Table 1 Differences in types of driftage before and after the earthquake and tsunami

		Types of driftage		Changes in amount	Other driftage
		Before tsunami	After tsunami		
Canada	British Columbia	—	Polystyrene foams	Increase	—
United States	Alaska	—	Polystyrene and polyurethane foams	Significant increase	Some drum containers also arriving
			Construction materials, lumber, plastic bottles, kerosene cans, food and beverage containers	Increasing trend	
	Washington	Fishing floats, packaging materials, Styrofoam pieces, plastic bottles, shoes	Small fishing boats, floating pier	No change	—
	Oregon	—	Wood, foams, driftage with non-native species attached	Increasing trend	—
	California	Land-originated garbage	—	No change	As much as 80% is land-originated driftage
	Hawaii	Broken pieces of fishing gear, household plastic items	Oyster buoys, gas tanks, large containers, whole boats, large metal structure, wood building materials	Increasing trend	DNA testing on wood building materials to be performed to determine source

Extracted from Report on the Survey of Overseas Activities concerning Ocean Debris related to the Great East Japan Earthquake for FY2013, March 2014

2-(2) 2012 and 2013

Table 2 and Table 3 respectively show the responses to questionnaire surveys on marine debris conducted to the International Coastal Cleanup (ICC) in the USA and the Great Canadian Beach Cleanup in Canada in 2012 and 2013.

Table 2 Status of tsunami driftage washed ashore in each state in 2012

		Types of driftage	Changes in amount and type	Related information
Canada	British Columbia	Styrofoam	Significant increase in styrofoam	—
United States	Alaska	Styrofoam, polyurethane foam, aquaculture buoys, plastic bottles, lumber, kerosene tanks	Significant increase in styrofoam, polyurethane foam, and increase in plastic bottles, lumber, and kerosene tanks	—
	Washington	Large floating pier, kerosene tanks, Styrofoam, plastic bottles, soccer balls, plastic fragments	Significant increase in styrofoam	—
	Oregon	Styrofoam, heat insulation, construction lumber, aquaculture buoys, plastic bottles, small boats, sports balls	—	Most found on northern and central coasts
	California	N/A		
	Hawaii	Boats, floating pier, gas tanks, aquaculture buoys, refrigerator, fishing equipment, plastic fragments	—	Collect and report sightings

Table 3 Status of tsunami driftage washed ashore in each state in 2013

		Types of driftage	Changes in amount and type	Related information
Canada	British Columbia	Same as 2012	Construction lumber began to arrive after March	
United States	Alaska	Lumber, plastic bottles, food and beverage containers, large buoys	Slight decrease in large Styrofoam pieces	Breakup of foam
	Washington	Small boats, construction lumber	Increase in boats	—

	Oregon	Same as 2012		
	California	Fishing boats	—	Confirmed that a boat belonged to a high school in disaster stricken area and was returned to the school.
	Hawaii	Construction lumber	Increase in construction lumber and large pieces of wood	

Extracted from Report on the Survey of Overseas Activities concerning Ocean Debris related to the Great East Japan Earthquake for FY2013, March 2014

3. Concerns raised and responses

The concerns raised regarding the marine debris originating from the tsunami, as expressed by NGOs, researchers and administrators in the USA and Canada, fall into the following four areas. The actions taken so far in response to each are also described.

A) Collection and disposition

It is difficult to prepare a proper plan for collection and disposition in advance due to a lack of information about the objects and materials washed out to sea from the disaster areas.

Examples of desirable information include the types (sizes) and quantities of fishing buoys and hazardous materials such as red plastic kerosene tanks (commonly used as kerosene storage tanks in homes in Tohoku).

Action: The Japanese government occasionally provided information to NOAA, one example of which was an English translation of the “Hazardous Marine Driftage Handbook.” NOAA is advising the people involved in the West Coast to conduct monitoring based on the Field Guide for Marine Hazardous Driftage Surveys.

B) Radioactive contamination

There is a possibility that radioactive materials released in the Fukushima Daiichi nuclear disaster may have contaminated the debris.

Action: The Headquarters for Ocean Policy, a government agency, has posted an article on its website stating that there is an extremely low likelihood the tsunami debris contains radioactive contamination because the radioactive materials did not leak out until a few days after the marine driftage was generated by the earthquake.

C) Effect on ecosystem and invasive alien wildlife

The ecosystem of the affected beaches may be impacted by the invasion of life forms carried by

large pieces of driftage, such as a floating dock.

Action: The Ministry of the Environment commenced the Environment Impact Evaluation Project, a project spanning three years from 2014 till 2017. Under the leadership of the North Pacific Marine Science Organization (PICES), scientists from Canada, the USA and Japan will work together in a coordinated manner to study the impact of tsunami marine driftage on local marine environments, ecosystems and communities on the west coast of North America. The project deliverables will be shared among the participating countries to contribute to local measures and promote community understanding.

D) Returning objects to their original owners

Persons who find washed-up objects on the west coast of North America or on the shores of the Hawaiian Islands often wish to return those objects if their owner is identifiable from markings on the object. In order to do so, someone must be available on the Japanese side to act as an intermediary. Assistance is desired from the local Japanese community since many people in the U.S. and Canada can't distinguish Japanese writing from Korean writing.

Action: A broad range of ties and channels between Japan and Canada or Japan and the USA is utilized for returning objects to their owners. In Oregon, for example, a Japanese-American group is part of the state response team.

4. Future measures

Table 4 summarizes the information collected through interviews and the questionnaire survey conducted in January 2014, concerning future measures (plans) for tackling the problem of tsunami driftage washing ashore, as well as the challenges and problems in taking the measures and methods for facilitating cooperation between interested parties, etc.

Table 4. Future Measures, etc.: The Results of the Interviews and the Questionnaire Survey

Canada	
British Columbia (BC)	
Measures (plans)	<ul style="list-style-type: none"> - Take measures by following the guidelines and procedures provided by the Ministry of Environment, BC. - Conduct washed-up driftage collection activities, etc. under the control of the Tsunami Debris Coordinating Committee. - Carry out monitoring based on NOAA's Monitoring Field Guide.
Challenges and problems	<ul style="list-style-type: none"> - It costs money to conduct monitoring, collection activities, etc. because many beaches are difficult to access. - It is difficult to determine which pieces of debris are tsunami driftage.
Cooperation methods	<ul style="list-style-type: none"> - Share information between interested parties and disseminate information to the Japanese public. - Interaction with people in disaster-affected areas through the production of monuments, etc. using washed-up driftage - Washed-up driftage collection activities and exchange activities by Japanese university student volunteers - Cooperation through the participation in marine environment conservation activities using the ICC occasions
US	
Alaska	
Measures (plans)	<ul style="list-style-type: none"> - Washed-up driftage collection activities using the money given by the Japanese government
Challenges and problems	<ul style="list-style-type: none"> - It costs money to conduct collection activities, etc. because many beaches are located in remote areas and are difficult to access. - Collection activities can be conducted for only about two months a year, due to the climatic conditions. - Treatment methods for the collected driftage (securing disposal plants and funds for covering the costs) - It is difficult to determine which pieces of debris are tsunami driftage.

Cooperation methods	<ul style="list-style-type: none"> - Share information between interested parties and disseminate information to the Japanese public. - Cooperation through the participation in marine environment conservation activities using the ICC occasions
Washington	
Measures (plans)	<ul style="list-style-type: none"> - Take measures in accordance with NOAA's Marine Debris Program. - Carry out monitoring based on NOAA's Monitoring Field Guide.
Challenges and problems	<ul style="list-style-type: none"> - Measures to control invasive alien species - It is difficult to determine which pieces of debris are tsunami driftage.
Cooperation methods	<ul style="list-style-type: none"> - Share information between interested parties and disseminate information to the Japanese public. - Cooperation through the participation in marine environment conservation activities using the ICC occasions
Oregon	
Measures (plans)	<ul style="list-style-type: none"> - Take measures as part of the marine debris removal projects conducted by the state government and relevant organizations. - Monitoring activities by the Oregon Marine Debris Team - Install washed-up debris collection containers on 16 sites. - Establish a washed-up debris reporting system using the telephone number 211.
Challenges and problems	<ul style="list-style-type: none"> - It is difficult to determine which pieces of debris are tsunami driftage. - There is a high level of concern about radiation contamination problems.
Cooperation methods	<ul style="list-style-type: none"> - Cooperation of the Japan-America Society of Oregon (JASO) - Share information between interested parties and disseminate information to the Japanese public. - Cooperation through the participation in marine environment conservation activities using the ICC occasions
California	
Measures (plans)	<ul style="list-style-type: none"> - California Governor's Office of Emergency Services (OES) will take measures when driftage washes ashore.
Challenges and problems	<ul style="list-style-type: none"> - There is a high level of concern about radiation contamination problems and people are scared.
Cooperation methods	<ul style="list-style-type: none"> - Share information between interested parties and disseminate information to the Japanese public. - Cooperation through the participation in marine environment conservation activities using the ICC occasions
Hawaii	

Measures (plans)	<ul style="list-style-type: none"> - Carry out monitoring based on NOAA's Monitoring Field Guide. - A reporting system for washed-up debris via telephone - When driftage arrives, the Hawaii Department of Land and Natural Resources (DLNR) will collect it and store it.
Challenges and problems	<ul style="list-style-type: none"> - Cooperation between scientists, the state government and national government agencies - It costs money to conduct monitoring, collection activities, etc. because some beaches are difficult to access. - There is a shortage of funds including funds for research. - It is difficult to determine which pieces of debris are tsunami driftage.
Cooperation methods	<ul style="list-style-type: none"> - Share information between interested parties and disseminate information to the Japanese public. - Cooperation through the participation in marine environment conservation activities using the ICC occasions

Extracted from Report on the Survey of Overseas Activities concerning Ocean Debris related to the Great East Japan Earthquake for FY2013, March 2014

Reference Websites

Japan

NGOs

- JEAN : <http://www.jean.jp>
- Marine Litter Issue Platform • JAPAN: <http://www.malipjapan.jp>

Government agencies

- Ministry of the Environment: <http://www.env.go.jp/en>
(Tsunami driftage) <http://www.env.go.jp/en/headline/headline.php?serial=2071>
- Headquarters for Ocean Policy, Cabinet Secretariat
(Action by Japan relating to the driftage washed out to sea resulting from the March 11 Earthquake)
http://www.kantei.go.jp/jp/singi/kaiyou/hyouryuu_eng.html

Canada

NGOs

- Vancouver Aquarium: <http://www.vanaqua.org>
- Great Canadian Shoreline Cleanup: <http://shorelinecleanup.ca>

Government agencies

- Ministry of Environment: (Tsunami Debris Coordinating Committee)
<http://www.env.gov.bc.ca/epd/tsunami-debris/index.htm>

USA

NGOs

- Alaska Coastal Studies: <http://www.akcoastalstudies.org>
- Gulf of Alaska Keeper: <http://www.goak.org>
- Washington Coast Savers: <http://www.coastsavers.org>
- SOLVE: <http://www.solveoregon.org>
- Hawaii Wildlife Fund: <http://www.wildhawaii.org>
- Ocean Conservancy: <http://www.oceanconservancy.org>
- IPRC: <http://iprc.soest.hawaii.edu>

Government agencies

- NOAA: <http://www.noaa.gov>