



Marine Debris Research

Asian Marine Debris Research in Miyako Island, Japan
(Exit Survey) and in Ocean Shores, WA (Arrival Survey)

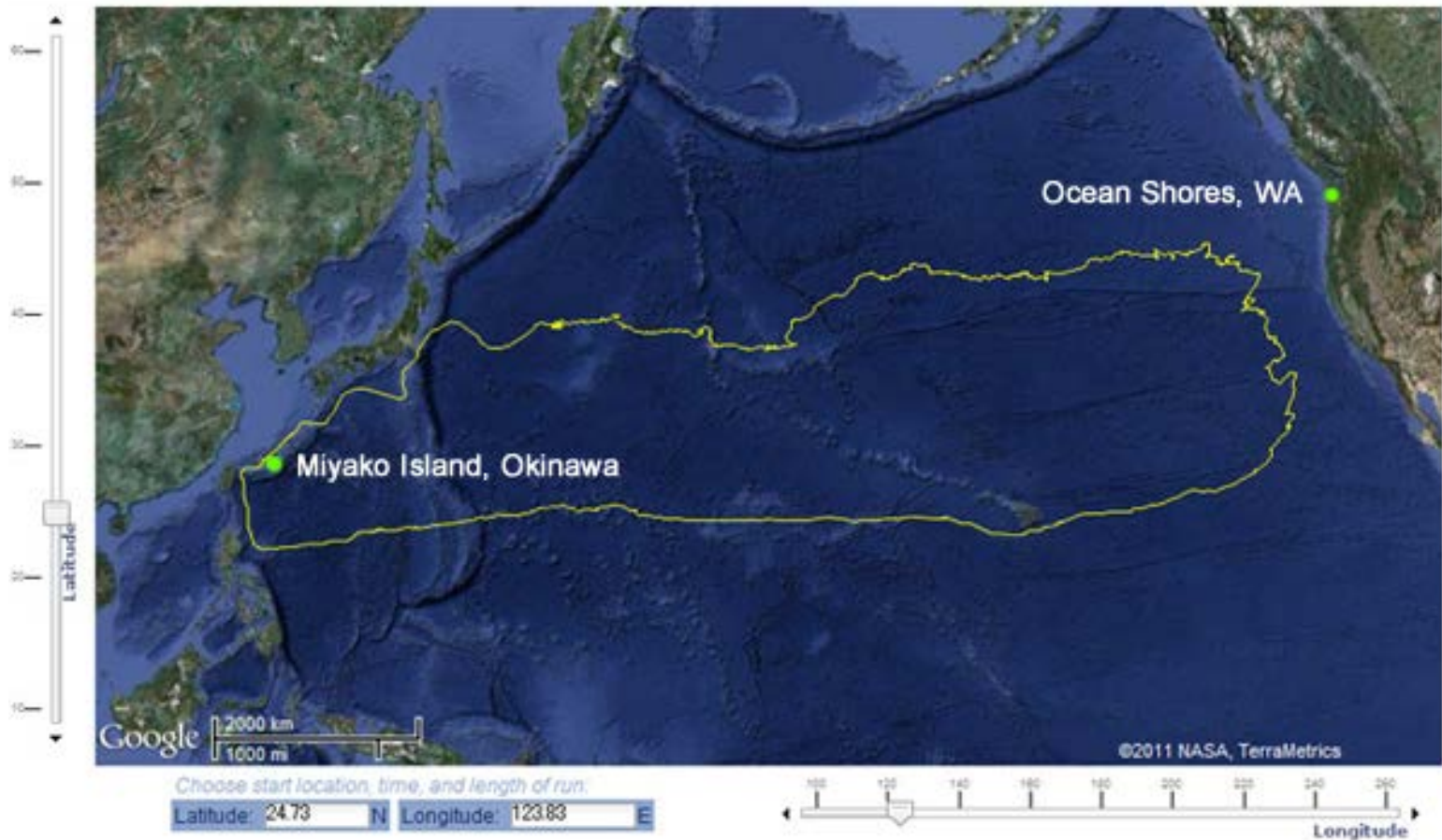
Marine Debris is Everyone's Problem

The latest article, “Plastic waste inputs from land into the ocean” on Science Magazine indicate that 275 million metric tons (MT) of plastic waste was generated in 192 coastal countries in 2010, with 4.8 to 12.7 million MT entering the ocean. Without improvements to waste management infrastructure, plastic waste entering the ocean from land is predicted to increase by an order of a magnitude by 2025. 12 out of 20 countries ranked by mass of mismanaged plastic waste are Asian countries. More Asian marine debris will flow into the Pacific Ocean and arrive to coastlines in the Pacific Northwest and Canada.

Our Mission

Our mission is to bring attention to the highly global aspect of marine debris issues and create a comprehensive visual display introducing current marine debris situations through our research and analysis platform. We hope to encourage youth to connect with marine debris issues so they can be motivated to take action of our degrading environment out of care and concern. To work towards solving issues of marine debris, we must nurture future generations of problem solvers and stewards.

How marine debris travels in the Pacific Ocean



Marine debris that leaves Southeast Asia takes about two years to reach the Pacific coast of the United States, and another two years to return to Asia. So, a roundtrip from Southeast Asian takes roughly four years.

Why do a marine debris survey at Miyako Island and the Pacific Northwest?

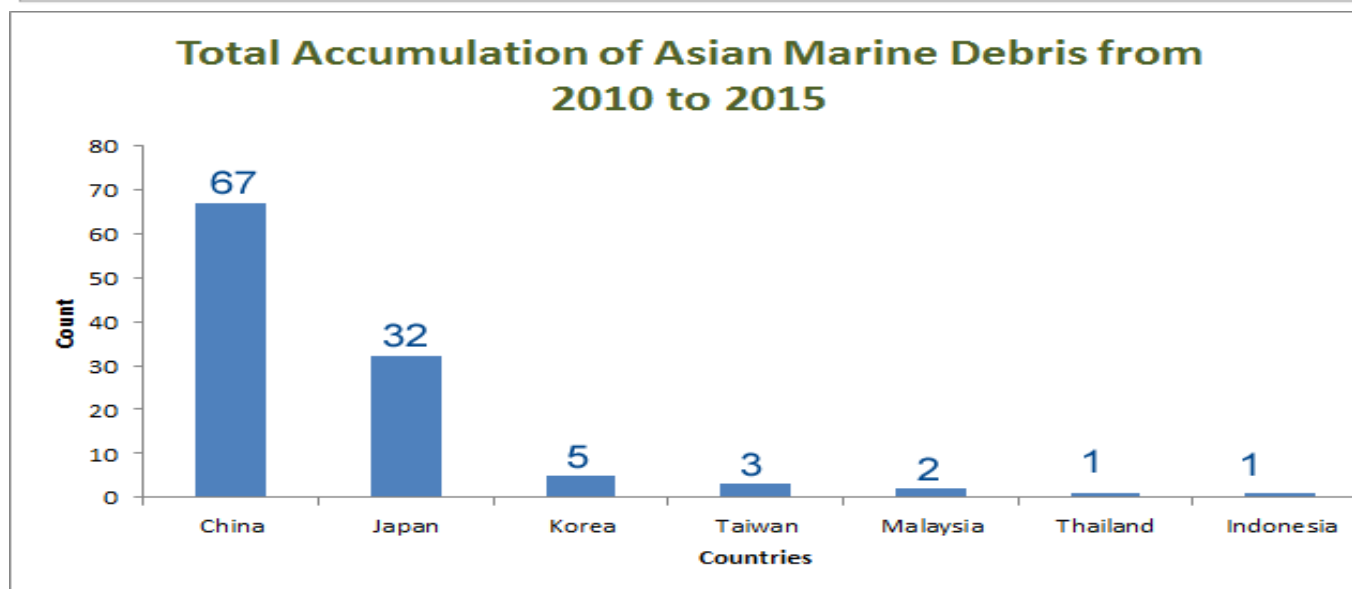
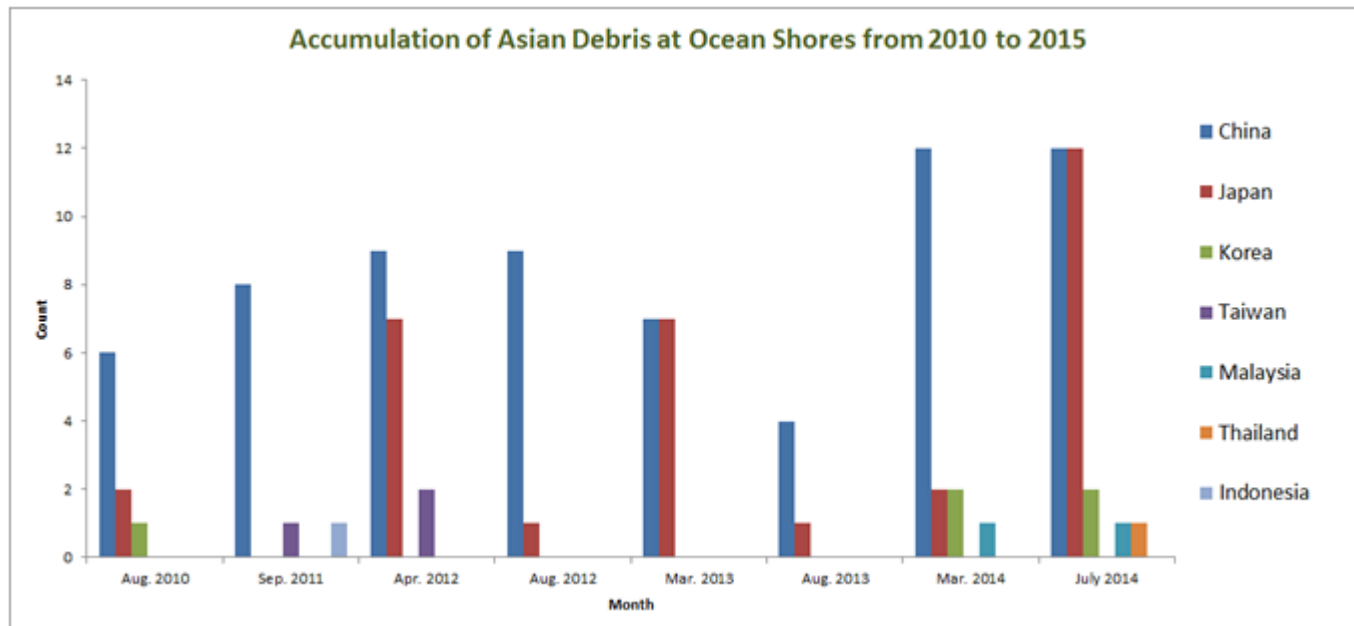
Miyako Island is at the starting point for many drifting trash. Debris from Asian nations pass by Miyako Island before their long trip across the Pacific Ocean.

The "Exit Survey of Asian Marine Debris" is done in Miyako Island to research the path taken by Asian debris. While some trash end up in the shores of Miyako Island, many get carried on the Kuroshio (Black Current) and travel across the Pacific Ocean to the west coast of the U.S. and Canada.

To see if Asian marine debris really travels that far, we have been doing "Survey of Arrival Situation" in Ocean Shores, WA. Through our arrival situation surveys, we have found Asian marine debris produced in China, Korea, Japan, Taiwan, Indonesia and Malaysia. This gives us reason to believe that they came directly through the Kuroshio. However, it is still not certain where the debris actually started its journey.



Arrival Survey



July 2014 Research Overview

Marine Debris Survey at the Pacific Northwest



Country of Origin	China	Japan	Korea	Malaysia	Thailand	Total
No.	12	12	2	1	1	28

*refers to debris believed to originate in Asia, but is unidentifiable to a specific country



On July 17, 2014, we went to Ocean Shores (0.5 mile south of the Elk Creek River) for another marine debris research.

The arrival situation gives us an overview of Asian originated marine debris traveling along the Kuroshio (Black Current), with some of them reaching the beaches of the Pacific Northwest. With a total of 28 Asian marine debris found, it was the most we have found so far. We also found the most debris originating from Japan than we have in the past. It seems that Japan tsumami related debris are arriving to this region after three years. Among those, was a propane tank. Due to its potential hazard on shore, we called the Washington State Department of Ecology to retrieve the tank.



Item No: 14717-1
Located at: 47.183579, -124.199026
Category: Plastic iced tea bottle
Country Originally Manufactured: Japan
Information: Coca-Cola Japan

Date Collected: 7-17-2014
Size & Weight: 22cm x 5.5cm



Item No: 14717-4 Date Collected: 7-17-2014
Located at: 47.182643, -124.199240
Category: Floating Dock
Country Originally: Japan
Size & Weight: 200cm x 102cm x 72cm
Manufactured:
Information: May have been used for oyster cultivation.



Item No: 14717-5 Date Collected: 7-17-2014
Located at: 47.181806, -124.198731
Category: Plastic pallet
Country Originally: Japan Size & Weight: 100cm x 100cm x 15cm
Manufactured:
Information: Marked on the side is company name, "Daigo"



Item No: 14717-23
Located at: 47.177654, -124.198853
Category: LP Gus, Propane tank
Country Originally: Japan
Manufactured: JIS
Information:

Date Collected: 7-17-2014
Size & Weight: 45cm x 30cm



Radiation Levels at the Beach

We also measure the intensity of radiation at Ocean Shores.

The detected values of background (atmospheric air) and seaweed levels were lower than the average amount of spontaneous emissions of radiation. The general conditions of the beach were not out of the ordinary level and we did not see any debris washed ashore with unusual amount of radiation level.



**Amount of Radiation Dose & Exposure
Background CPM (March 24, 2014):**

21 CPM (counts per minute)

Microsievert per hour: 0.17 μ Sv/hr

Millisievert per year: 1.5 mSv/yr

Milligray per year: 1.5 mGy/yr

Becquerel per cm²: 8.3 Bq/cm²

Picocurie per kg: 13,072 pCi/kg



**Amount of Radiation Dose & Exposure
Seaweeds CPM (March 24, 2014):**

19 CPM (counts per minute)

Microsievert per hour: 0.16 μ Sv/hr

Millisievert per year: 1.4 mSv/yr

Milligray per year: 1.4 mGy/yr

Becquerel per cm²: 7.5 Bq/cm²

Picocurie per kg: 11,827 pCi/kg

Exit Survey

Marine Debris Exit Survey at a Beach in Miyako Island, Okinawa Feb. 11, 2011

Date Monitored: February 11, 2011
 Survey Conducted by: Dr. Satoshi Oshiro & 11 members
 Beach Name: Takano in Miyako Island, Okinawa, Japan
 Beach ID (Lat./Long): [24.804699,125.331597](#) (Center of sample unit)

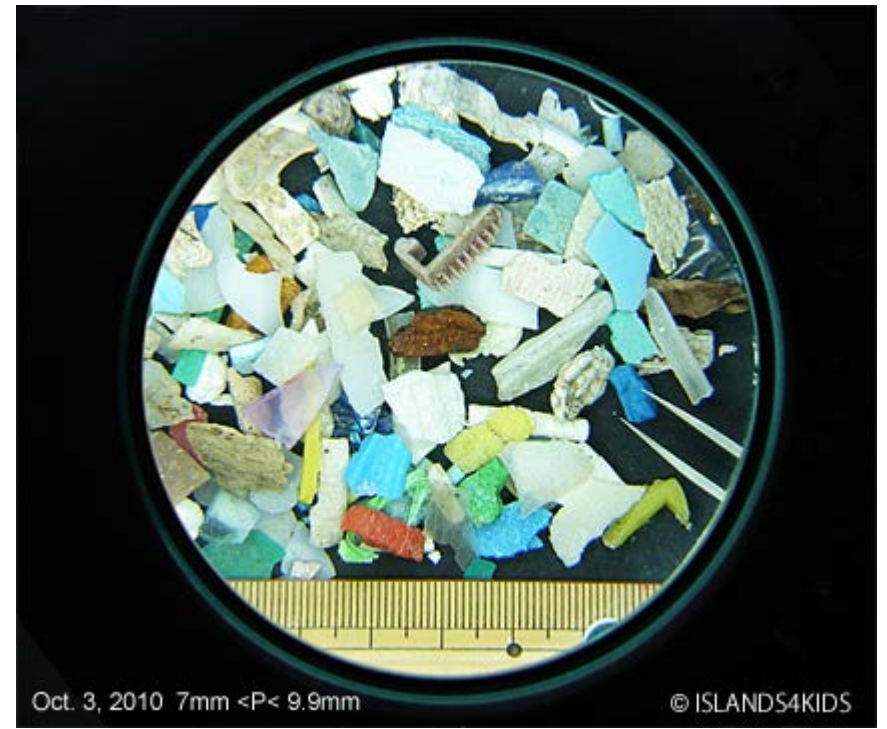
Beach Size: 100-105 meters x 10-12 meters
 Sampling Unit: 100 meters x 10 meters
 Beach Usage: Rural
 River/Creek input: No



Total Number and Weight of Debris Items Collected from Survey Site

(Sampling Units: 100m x 10 m. Start point: [24.840222,125.331908](#) End point: [24.80523,125.331302](#))

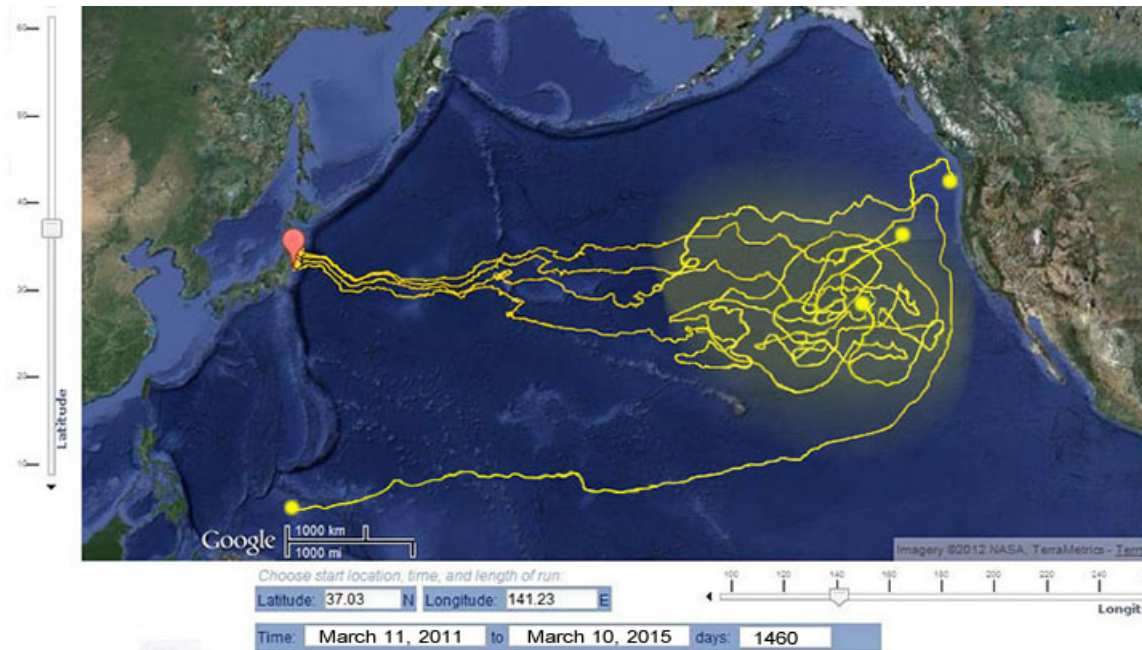
	Types of Debris	Quantity	%	Weight (kg)	%	Country-by-Country					
J=Japan, C=China, T=Taiwan, K=Korea, U=unknown											
Fishing Gears:											
1.	Fishing net	1	0%	3.50	0.7%	J	C	T	K	U	1
2.	Fishing lines					J	C	T	K	U	
3.	EPS Fishing floats and quills	493	8.3%	31.60	6.3%	J	C	T	K	U	493
4.	EVA or PVC float or buoy	258	4.4%	289.00	57.2%	J	C	T	K	U	258
5.	Ropes	1	0%	6.00	1.2%	J	C	T	K	U	1
6.	Foamed Polystyrene products	1,652	28%	42.60	8.4%	J	C	T	K	U	1,652



Samples of Visual aid on I4K website

- Japan Tsunami Debris Animation
- Great Pacific Garbage Patch
- Why can't we simply clean the ocean?
- Posters
- How does marine debris affect species?
- Types of Marine Debris
- Survey Tools
- Games

Japan Tsunami Debris Animation



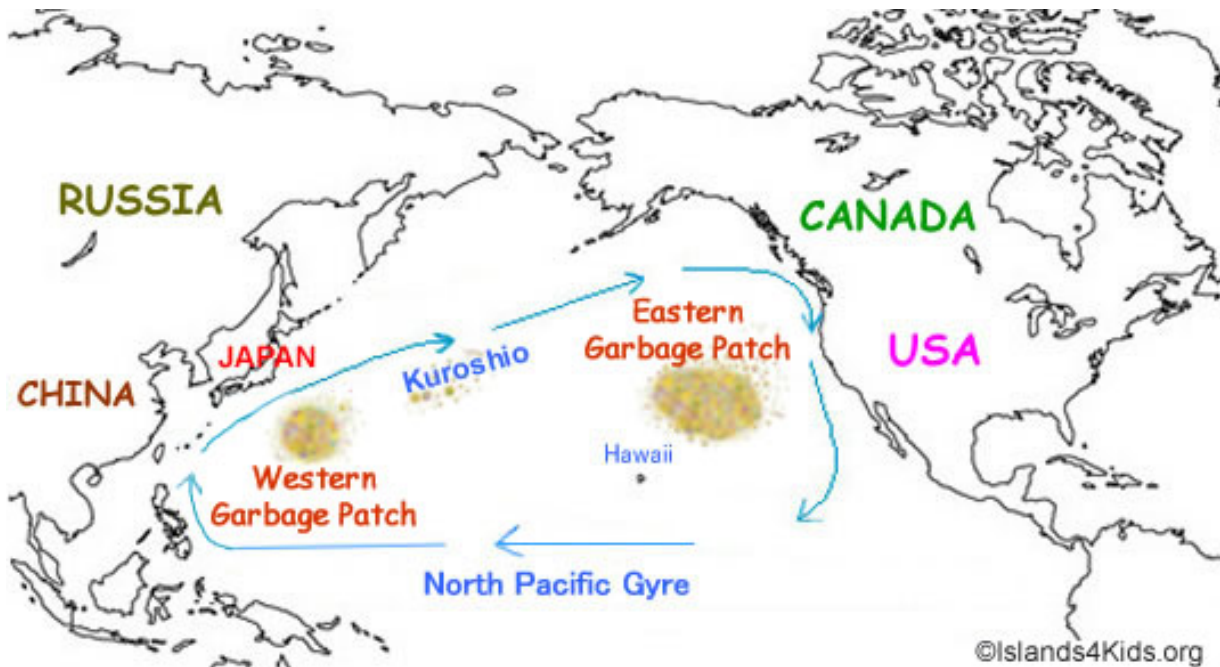
March 11, 2011: A magnitude 9.0 earthquake struck Japan, triggering a massive tsunami. The Government of Japan estimated in March 2012 that the tsunami swept about 5 million tons of debris into the ocean and that about 70% sank quickly.

The remaining debris was dispersed far across the North Pacific, an area of ocean roughly three times the size of the lower 48 states. Some debris have already reached US and Canadian shores, and is expected to continue over the next several years. At this time, there is no way to accurately estimate how much debris is still floating - some likely sank or deteriorated.

This animation was created by ISLANDS4KIDS to keep track of projected tsunami related debris drifting for past four years. There are four different courses. Three beginning at major prefectures (Iwate, Miyagi, Fukushima) and one from the Fukushima nuclear power plant hit by the tsunami.

The highlighted area shows the highest density of Japan tsunami debris as of March 10, 2015, 1460 days after the tsunami occurred.

What is the Great Pacific Garbage Patch?



When you think of a "Great Pacific Garbage Patch", you might think of enormous regions or patches of marine debris.

Might we be able to see long stretches of debris piling up like a landfill or even forming small islands of debris? Despite its name, a lot of the marine debris of the Great Pacific Garbage Patch are made of small fragments of plastics or styrofoam.

They are not just floating on the ocean surface either. Marine debris can be found at depths of close to 30 meters deep. For this reason, it is also possible to sail through the garbage patch.

It is difficult to obtain accurate information on the size of the garbage patch. The ocean is continuously moving, meaning the debris will also be moved and mixed constantly by forces of the wind and currents. While we might not know how vast the spread of the garbage patches may be, what we should realize is that marine debris is a serious issue.

Why can't we simply clean the ocean?

1. Since debris flows and moves around in the ocean, it will take lots of time to locate specific areas of debris. A lot of money will be needed for this!
2. Scooping up all the debris may sound simple, but it's not! Surprisingly, there are many sea creatures such as plankton, jellyfish, as well as fish and coral eggs that live among the floating debris. By scooping up the debris, that will mean that many sea creatures will be taken as well. This will harm the ecosystem.

During our July 2014 Marine Debris Arrival Survey, we found a 2 inch lightbulb that held some marine life. While much of the metallic components of the bulb has degraded, the filament remains. We might see this lightbulb as marine debris, but for these marine critters, it is already their home.




no
litter

no
marine
debris



no  harm



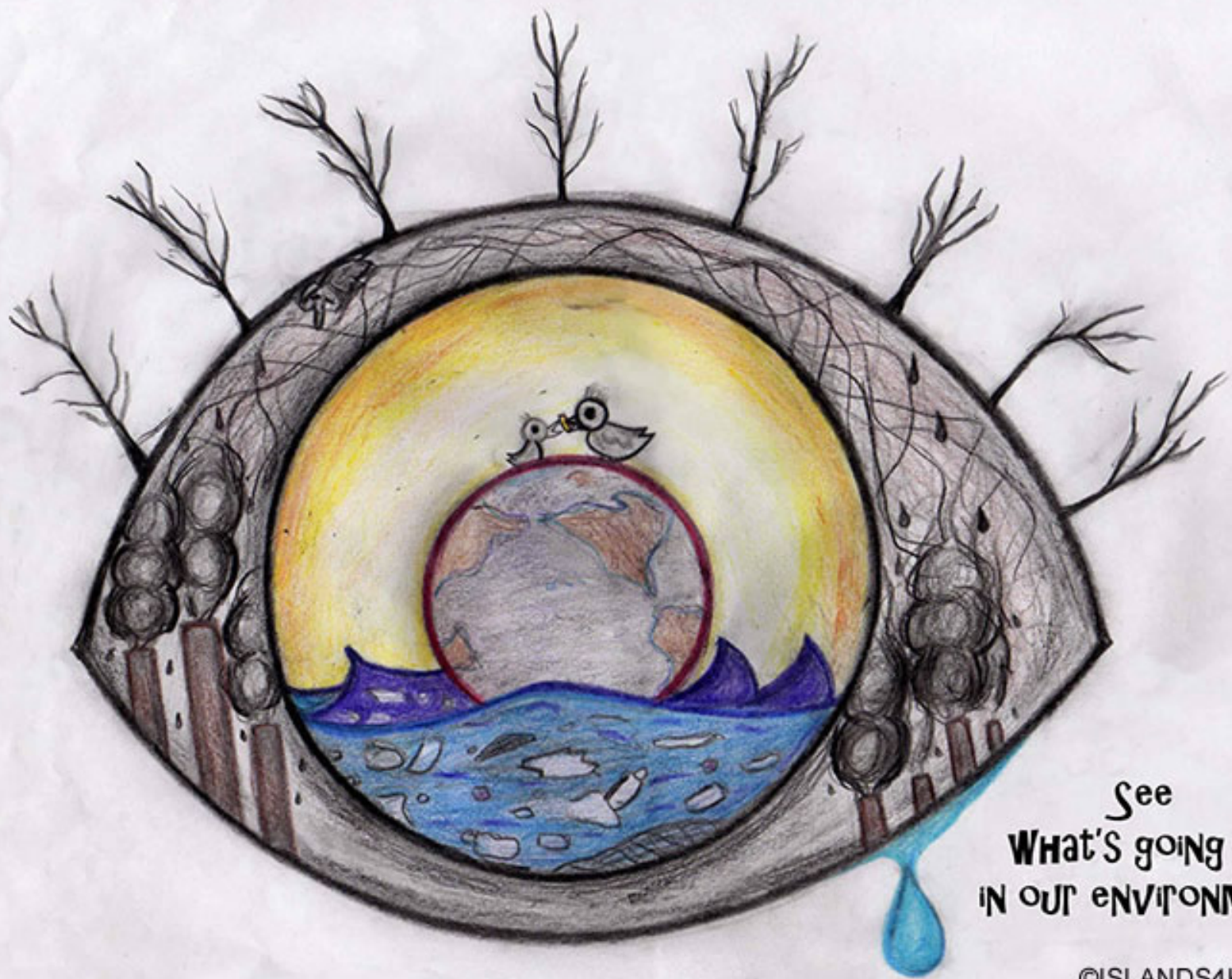


Trash rain
again. Lately,
it's like this
all the time.

Oh boy!
I can't
raise kids
like this.

-Trash Free Ocean-

©I4K



See
What's going on
in our environment

©ISLANDS4KIDS

Remember the 3 R's

①



Reduce

Don't buy unnecessary products or items using large amounts of packaging materials.

Reuse

Try to keep using things that can still be used or give them away to someone who can. Don't just throw them in the trash!

②



Recycle

Recycle things that can be turned into different products. Look for recycling bins!

③



How does marine debris affect species?

This dead turtle found on the beach of Miyako Island may have developed intestinal blockage from the plastics and Styrofoam found in the intestine.



Types of marine debris



plastic baskets & ropes



Drops & syringes



capsules



balloon

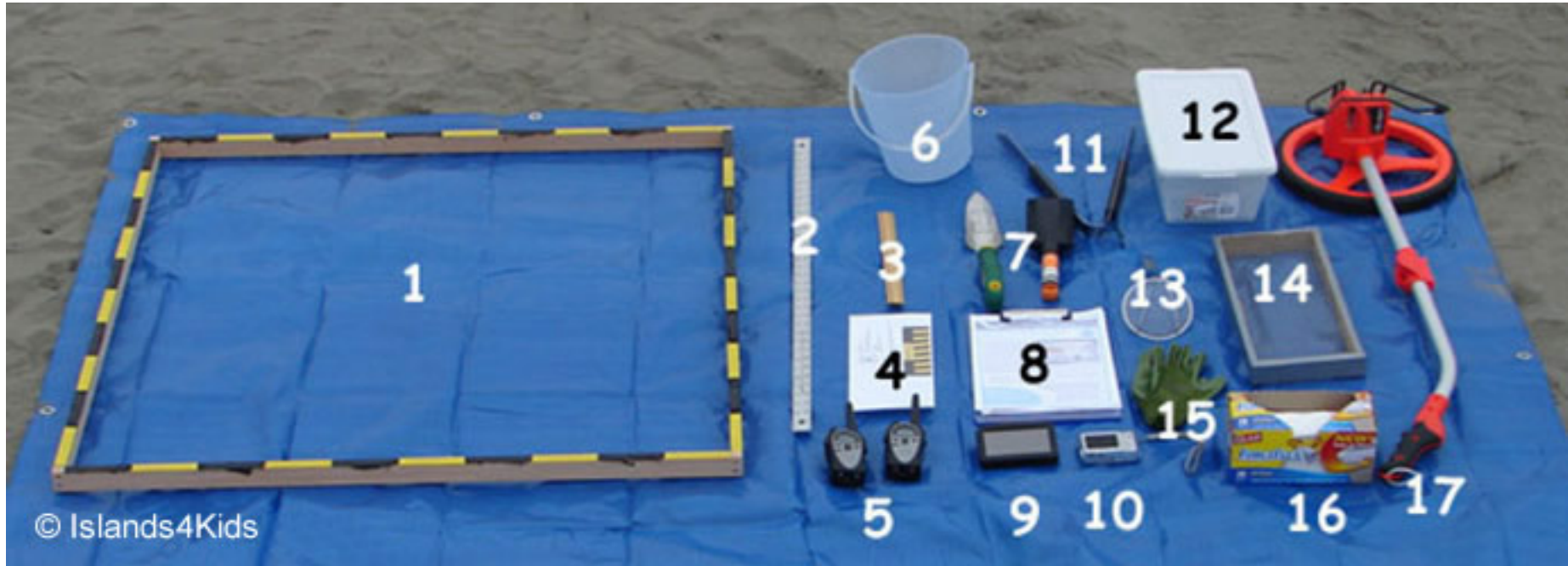


helmet



container

Survey Tools



1. Quadrat ($1 \text{ m}^2 = 100\text{cm} \times 100 \text{ cm}$ with 10cm makers)
2. 35 inches Ruler
3. 30 cm Ruler
4. 15 cm Photo Ruler
5. Walkie Talkies
6. Bucket to sort out plastic pellets and Nurdles
7. Garden Shovel
8. Data sheets and Clipboard

9. GPS (Global Positioning System)
10. Camera
11. Tongs to pick up syringes and unhygienic items
12. Container for syringes and clinical devices
13. 1 m/m mesh screen sifter for plastic pellets and Nurdles
14. 5 m/m mesh screen sifter
15. Rubber-coated gloves
16. Trash bags

Marine Debris Word Search - 1

Every year, it is estimated that over a billion pounds of debris are thrown into the ocean. Typical types of marine debris are plastics, glass, cloth, derelict fishing gear, metals, rubber, and vessels.

These greatly pollute the ocean and threaten the life of many marine communities. They also take away the beauty from beaches and damages habitat on land.

Find 20 different types of marine debris!

r	e	l	l	i	k	n	i	a	p	v	t	e
z	d	g	l	s	t	y	r	o	f	o	a	m
r	s	l	i	p	p	e	r	s	y	l	f	e
g	y	a	g	f	o	r	k	s	w	b	p	m
c	r	s	h	k	i	x	i	t	y	o	b	z
a	i	s	t	o	n	c	a	r	r	m	l	o
h	n	b	b	n	t	b	b	a	r	r	e	l
h	g	o	u	o	m	c	u	w	f	h	j	u
e	e	t	l	o	e	n	o	o	l	l	a	b
l	u	t	b	p	n	q	r	t	y	x	m	u
m	p	l	a	s	t	i	c	b	a	g	o	p
e	s	e	f	i	s	h	i	n	g	n	e	t
t	o	o	t	h	b	r	u	s	h	u	w	v
w	a	j	k	b	e	a	c	h	b	a	l	l



balloon	beach ball	fishing net	fork
helmet	ointment	rope	spoon
glass bottle	plastic bag	buoy	syringe
painkiller	straw	barrel	styrofoam
slippers	light bulb	toothbrush	toys