Marine Debris Prevention Projects and Activities *in the* Republic of Korea and United States

A compilation of project summary reports

Carey Morishige (ed.)

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
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MARINE DEBRIS PREVENTION PROJECTS AND ACTIVITIES IN THE REPUBLIC OF KOREA AND UNITED STATES: A compilation of project summary reports

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Preface

This document is a compilation of summary reports highlighting nine successful marine debris prevention projects and activities in the Republic of Korea and United States. These summary reports were prepared and shared during the Marine Debris Abatement Workshop: Strategies and Activities for the Prevention of Nearshore Marine Debris held on August 12-13, 2009 in Honolulu, Hawai‘i.

The Marine Debris Abatement Workshop was the culmination of a 2009 joint marine debris partnership project between the Republic of Korea’s Ministry of Land, Transport, and Maritime Affairs and the National Oceanic and Atmospheric Administration’s Marine Debris Program in the U.S.

Nearshore Marine Debris Abatement Projects

REPUBLIC OF KOREA

Buyback Program for Fishing Gear and Marine Litter from Fishery Activities

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Abstract

South Korea's marine debris buyback program is an incentive program to encourage fishermen to bring to port entangled derelict fishing gear and other marine debris encountered while fishing. The program pays a small incentive fee for marine debris brought to port. Since its start in 2003 by the Ministry of Maritime Affairs and Fisheries (now the Ministry of Land, Transport and Maritime Affairs) this program has been implemented in 51 local areas of 38 cities/towns within South Korea as of 2009.

Introduction

The deposition of large amounts of marine litter in nearshore areas threatens the habitat of marine life and navigation safety, and may cause negative impacts to fisheries due to ghostfishing. In the past, fishermen have encountered derelict fishing gear during fishing activities and throw it back into the sea after disentangling it from their own fishing gear. As a result, a great deal of fishery-related marine litter has been deposited in coastal areas where it damages the spawning grounds and habitats of marine wildlife, threatens the safety of vessels, and impacts fishery operations and resources.

Derelict rope collected in a sack provided through the buyback program.

For this reason, the Korean central government's Ministry of Land, Transport and Maritime Affairs (MLTM) established the buyback program, under which the local government purchases the litter pulled up by fishing boats and disposes of it under proper procedures. The buyback program for marine litter requires fishermen to bring back to port the collected litter when they are fishing. Litter collected includes items such as worthless fishery-related marine litter (e.g., rope, net and vinyl). This program is not only an efficient and cost-effective way to collect marine litter, but it also increases the fishermen's awareness of the destructiveness of such litter to the marine environment. Another benefit of the program is the extra income fishermen receive. The main objectives of the buyback programs are to improve the marine environment and aid the recovery of fish populations.

Methodology

Several entities have helped to implement the buyback program, including MLTM, local municipalities, the fisheries cooperative union, Korea Marine Environment Management Corporation (KOEM), Korea Fisheries Infrastructure Promotion Association (KFPA), and the fishermen themselves.

Table 1 illustrates the role of each organization. MLTM accepts program applications from local municipalities, decides on program areas, allocates funds, and creates the project guide. Local municipalities also invest in the programs and help with supervision. The fisheries cooperative union plays a role in the direct buyback of marine litter from fishermen "on-the-spot." KOEM and KFPA play a role in waste disposal, providing collection sacks and national funds to the fisheries cooperative union.

Fishermen bring to port debris-filled sacks, which they pile up on their

The fisheries cooperative union distributes the sacks to fishermen as they leave port. Fishermen put the collected litter into sacks labeled with the vessel name, fishing type, fisherman's name, and phone number. When they return to port, they give the filled sacks to the fisheries cooperative union.

Table 1. The respective roles of organizations participating in the waste buyback program

Organization	Role
MLTM	• Develops and guides a master plan of buyback program • Supervises the project implementation and budget execution

Local government	• Metropolitan city & Province
	  - Makes a public awareness & education
	  - Manages program implementation of city & town & village
	  - Makes a project guide
	  - Manages budget execution
	  - Public awareness & education
	• City & Town & Village
	  - Decides buyback program area and
	  - Expands allocated budget and make a contract with relevant agencies
	  - Observes buyback program implementation
	• Public awareness & education

Fisheries Cooperative Union	• Purchases marine litter from fishermen • Operates caretaker who is in charge of bookkeeping and reporting • Distributes sacks to fishermen • Requests national funds • Makes and manages reception facilities • Public awareness

Sack used in the buyback program.

Sacks are provided in three sizes: 40 L, 100 L, and 200 L. When they are returned full, the government pays the fishermen 4,000 won ($4 USD), 10,000 won ($10 USD), 20,000 won($20 USD) respectively (Figure 1). In the case of the larger debris, which can't be packed into sacks, the fishermen attach a tag to the item, and the government pays them 250 won per kilogram ($0.25 USD/kg). The government also purchases shell, crab and eel trap for 150/250 won each ($0.15-$0.25 USD each). It should be noted that this program only accepts derelict rope, derelict net, plastic bags, and derelict traps recovered by (not produced by) fishermen.

Size	40 L	100 L	200 L	Tag	trap
Picture					(eel trap: 150 won) (shell and crab trap: 250 won)
Purchasing Price	4,000 won	10,000 won	20,000 won	250 won/kg	150/250 won per each

Figure 1. Sacks provided to fishermen, and an example of a tag.

Results

A great deal of marine litter was collected through the buyback program between 2004 and 2008. Table 2 shows the volume of litter collected by the program.

The buyback program collected a total of 29,472 tons for the period at a cost of $19,417 USD. In comparison, if this volume of litter were collected directly by the government, the cost would be much greater. Direct collection would require a fleet of vessels, a waste collecting boat, a towing boat, and a crane barge. Additionally there would be the added standard operating costs and fuel. Table 2 shows a comparison of the amounts of debris collected and cost of the buyback program compared to direct collection of deposited marine litter.

Table 2. Amount of litter collected through the buyback program

Year	Buyback program			Clean up deposited marine litter		
	Budget (MLTM + local budget, won)	Amount of litter (ton)	Cost per ton (won/ton)	Budget (private capital, won)	Amount of litter (ton)	Cost per ton (won/ton)
2004	2,518,491	2,819	893	7,062,988	3,618	1,952
2005	3,383,713	4,639	729	8,189,750	5,352	1,530
2006	5,043,546	7,458	676	8,310,492	5,368	1,548
2007	4,215,804	5,759	732	8,527,030	4,114	2,073
2008	4,255,679	8,797	484	8,860,376	3,419	2,952
Total	19,417,233	29,472	3,514	40,950,636	21,871	10,055

Average	3,883,446	5,894	659	8,190,127	4,374	1,872

Benefits
The buyback program is very cost-effective way to remove seabed litter, as well as it provides income to fishermen. Moreover, it helps improve fishermen recognition of marine debris impacts, consequently, it contribute preserving the marine environment.

Difficulties
Although the buyback program is cost-effective, the idea is counter to the polluter pays principle. Also, fishermen will include litter generated from their daily life along with their used fishing gear—two items not included in the buyback program. Some of fishermen are also passive or indifferent to participating in the buyback program because of the time-consuming need for debris separation.

Conclusions/Discussion

The buyback program is clearly a very cost-effective system with added benefits. It increases environmental awareness among the fishermen and provides them with an extra source of income. It also prevents damage to marine life, and uses existing resources (i.e., the fishing fleet). However, it does not follow polluter-pays principle, therefore it is recommended to transit the program into voluntary program such as floating receptacles for marine litter.

Appendix A: Buyback Program Process

Fishermen offload debris-filled sacks from their boat.

Sacks are stacked in reception area.

Sacks collected in port reception facility

Sacks loaded into a container for transport.

Sacks transported to waste management facility.

Sacks offloaded at waste management facility.

Sacks to be incinerated.

South Korea Coastal Cleanup Program for Marine Litter

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Abstract
The coastal cleanup program has been carried out as a government-led (or local government-led) project in Korea. From April-July 2009, the Korea Ocean Environment Management Corporation (KOEM) implemented this coastal cleanup program. The litter collected from the coastline was made up of: Styrofoam (32%), waste fishing net (16%), plastic (14%), and other (12%). Among the debris, some types, such as Styrofoam, plastic, and derelict fishing net, seem to originate from fishery-related activities. To address this, an action plan for education and public awareness of fishermen was suggested. Also, continuous implementation of a coastal cleanup program is very important. Administrative organizations should be established to manage the cleanup program as well as administrative measures.

Background/Introduction
Coastal marine litter can be defined as any manufactured solid material disposed of or abandoned in the marine and coastal environment. It is one of the major sources of pollution affecting oceans and coastlines. If coastal marine litter is not removed, it may cause serious problems such as economic impacts to the fishing industry and tourism, negative impacts on wildlife, and aesthetic degradation.

In 2009, South Korea's Ministry of Land, Transport, and Maritime Affairs (MLTM) launched a coastal cleanup program with a budget of approximately $9 million USD to clean the marine environment, improve public awareness, and create jobs in the public sector. Because of the current economic state, job creation helps low-income workers near the coastal areas. Originally, the coastal cleanup program was operated by local governments; however, in 2009 the program was coordinated by the central government.

This summary report focuses on the 2009 recovery program for marine litter at the coast coordinated by KOEM to improve the coastal environment in Korea and help the economy by providing a supplemental source for financial income to local residents.

Methodology
The marine litter cleanup program in Korea can be divided into five categories: 1) cleanup from port and harbors, 2) removal of seabed litter, 3) buyback program, 4) coastal cleanup after typhoon and flood, and 5) coastal cleanup program.

1) Cleanup from port and harbors
At present, floating litter is regularly collected by a cleaner-ship. In 2007 and 2008, the amount of marine litter collected by the cleaner-ship was 3,116 tons and 3,166 tons respectively.

2) Project of removal of seabed litter
This project was launched in 1999. In 2009, this project was carried out in 19 sea areas, such as Koeje and Gosung.

3) Buyback program
This project, begun in 2003, is an incentive program to purchase marine litter collected during fishing by fishermen. This project was implemented at major fishing farm locations through the fisheries cooperative union.

4) Coastal cleanup after typhoon and flood
After a typhoon or flood, a coastal cleanup is conducted to remove generated marine litter at the coast. For example, a total of 252,000 tons of marine litter was collected after typhoons (e.g., Loosa, Maemi, Maegi and Nabi) with a budget of approximately 30 million USD since 2002.

5) Coastal cleanup program
In 2007, the coastal cleanup program has removed a total of 27,401 tons of marine litter (4,547 tons by the Regional Maritime Affairs and Port Office and 22,854 tons by the local government). Coastal cleanup program is made up of two activities: A) coastal cleanup campaign and B) One Beach One Company Campaign.

> A) Coastal cleanup campaign -- A coastal cleanup campaign is held annually on May 31st in cooperation with local non-governmental organizations. Additionally, participation in the annual International Coastal Cleanup event is also held on the third Saturday of every September. These events help raise public awareness of the severity of marine debris through personal involvement in actions that help protect the environment. These efforts should be held continually throughout the year in order to have a significant beneficial effect on the coastal environment.
>
> B) One Beach, One Company campaign -- The One Beach, One Company campaign was developed by MLTM in order to raise public awareness of the marine environment. The campaign involves fishery-related corporations, local organizations, communities, and volunteer groups from more than 30 companies. The objective of the campaign is the removal of marine litter on Korea beaches by volunteers. Each cleanup area is assigned according to its proximity to the participating company and its likelihood for accumulating litter. These areas include, but are not limited to, beaches, harbors, and port.

Coastal marine litter cleanup program, April 15 - July 28, 2009
The coastline and nearshore area is 11,914 km and 3,220 km (3.2% of total territory of the Korea), respectively. The population near the coast is 13 million people (approximately 27% of the total population of Korea) and has 76 local administrative units.

KOEM launched the coastal litter cleanup program in 162 sites in 42 administrative units. This program is coordinated through 12 KOEM branches located along the coast in Korea. Cleanup sites were recommended by competent administrative units and local residents were hired as workers. Workers were mainly senior citizens (64+ years old). The program provides the underprivileged and senior citizen classes with job opportunities as well as improves the ocean environment. Additionally, most local governments may dispose of or incinerate the collected debris free of charge or through cost-sharing. KOEM has employed the manpower needed, thus saving local governments this cost.

Conveyance

Figure 1. Photos of program operation

Results

Results of the coastal cleanup program show that coastal marine litter consists of Styrofoam (32%), derelict fishing net (16%), plastic (14%) and others.

Table 1. Project summary (as of July 28, 2009)

Workers (# of people)	Debris collected (ton)	Budget
46,151	2,218 (estimated)	1.6 million USD

Table 2. Detailed breakdown, by cleanup location, of project operation by KOEM

Branches	Workers	Amounts(ton)
Busan		
Inchon	1,426	55
Yeosu	3,418	167
Ulsan	3,068	101
Daesan	1,806	241
Masan	4,741	416
Donghae	2,696	92
Gunsan	3,456	132
Pohang	1,817	120
Pyeongtack		130
Mokpo	2,795	298
Jeju	1,908	140
Senior Club		260
TOTAL	**46,151**	**2,218**

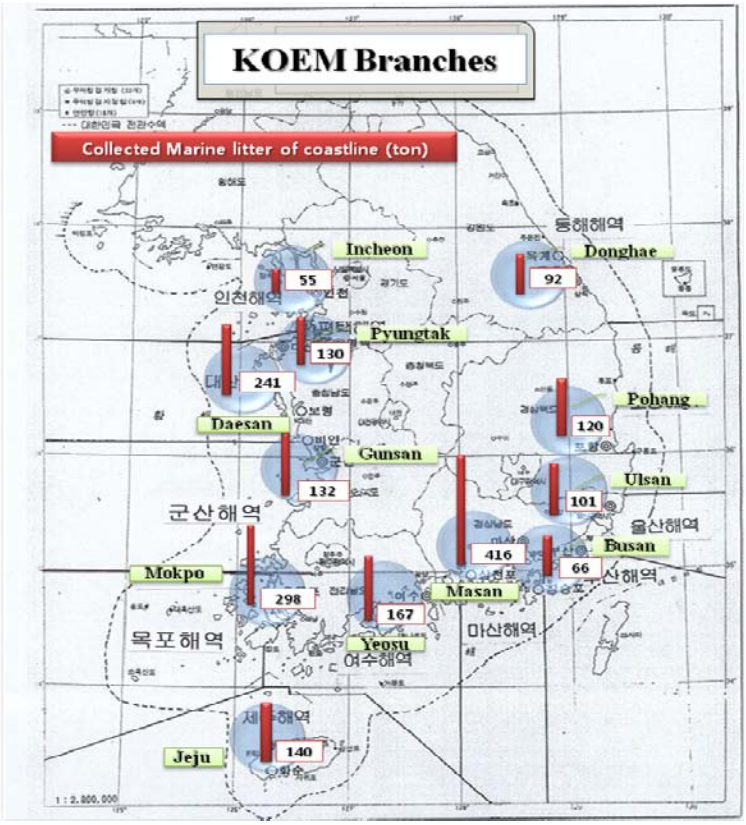

Table 3. Type and percentage of coastal marine litter from the project

Location	Styrofoam (%)	Rope / Net (%)	Plastic (%)	Wood (%)	Rubber (%)	Glass (%)	Metal (%)	Paper (%)	Foreign (%)	Fireworks (%)	Other (%)
Busan	30	30	25	10	5	-	-	-	-	-	-
Incheon	50	8	15	15	2	5	-	-	1	-	4
Yeosu	60	5	15	15	2	-	-	-	1	-	2
Ulsan	2	-	3	-	3	2	-	-	-	-	90
Daesan	30	40	10	10	3	1	1	1	1	-	3
Masan	40	9	20	15	5	5	4	1	-	1	-
Donghae	25	5	25	10	4	-	1	20	-	5	5
Gunsan	35	-	20	20	5	5	5	2	2	-	6
Pohang	50	-	20	10	10	-	10	-	-	-	-
Pyeongtak	30	30	10	15	3	2	-	-	-	-	10
Mokpo	25	45	5	10	10	-	-	-	5	-	-
Jeju	10	15	5	10	5	1	-	-	4	-	50
Average	**32%**	**16%**	**14%**	**12 %**	**5%**	**2%**	**2%**	**2%**	**1%**	**1%**	**14 %**

Conclusion

This program contributed to prevention of marine debris from entering the sea and is more cost-effective than recovering marine debris from ocean. The coastal cleanup program has been, in part, carried out by volunteers and has provided supplementary job opportunities for the elderly. It also enhances the aesthetic value of coastline and has educational effect through involvement of many individuals and companies.

Because of the absence of standard operational and cleanup guidelines, it was difficult to record reliable data on the types and amounts of collected marine litter. As a result, it was also difficult to set guidelines for the coastal cleanup program.

Also, most of the marine litter was generated from fishery-related activities. There is a strong need for the introduction of marine litter management policies and systems that deal with the proper disposal of litter via reception facilities in ports and harbors. The lack of adequate port reception facilities may have resulted in marine litter being disposed of at sea. Therefore, the central government (or local government) should provide adequate reception facilities with appropriate recycling and treatment measures. In addition, it is necessary to educate port reception facility users, related companies, and organizations in order to facilitate the use of these port reception facilities. Also, in order to reduce marine litter, it is highly recommended to collect reliable and standardized data from each site and to utilize the data for developing future strategies.

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A Responsible Management System to Address Land-based Litter from the Nakdong River basin

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Abstract

The majority of marine litter in South Korea comes from land-based sources through large rivers during the rainy season. Much of the damage from land-based litter is caused once the litter reaches the marine and coastal environments. Several municipals along the Nakdong River as well as ministries of the central government joined to solve this problem. They agreed to share the treatment cost of the debris at the mouth of the river. Studies were conducted on the input of debris by each municipal. Utilizing those results along with several other variables, the cost-sharing percentage was calculated for each municipal. By May 2009, this type of responsible management system was applied to the five main rivers in South Korea. The Polluter-Pays-Principle was successfully applied through this system. Additionally, this system resulted in the voluntary control of land-based litter in the inland municipals.

Introduction

Marine litter may obstruct safe sailing and navigation, destroy the habitat of marine organisms, and so on. In South Korea approximately 70% of marine litter originates on land. Because of this it is necessary to create a system of controlling the outflow of land-based litter into the sea. Large amounts of land-based litter flow into the sea with localized heavy rains, typhoons, and floods during the rainy season.

Problems such as the uncertainty of government agency operations and difficulties with quick collection and removal of debris sometimes result in litter flowing out to the sea. The majority of the land-based marine litter originates upriver. Though the inland municipals should share the marine litter treatment cost with other relevant regions according to the Polluter-Pays-Principle, typically most inland/upriver municipals are not concerned with collection and treatment of the litter. For this reason, it was necessary to guide upriver local governments in minimizing their waste outflow by applying Polluter-Pays-Principle.

Figure 1. Map of South Korea with Nakdong River basin circled.

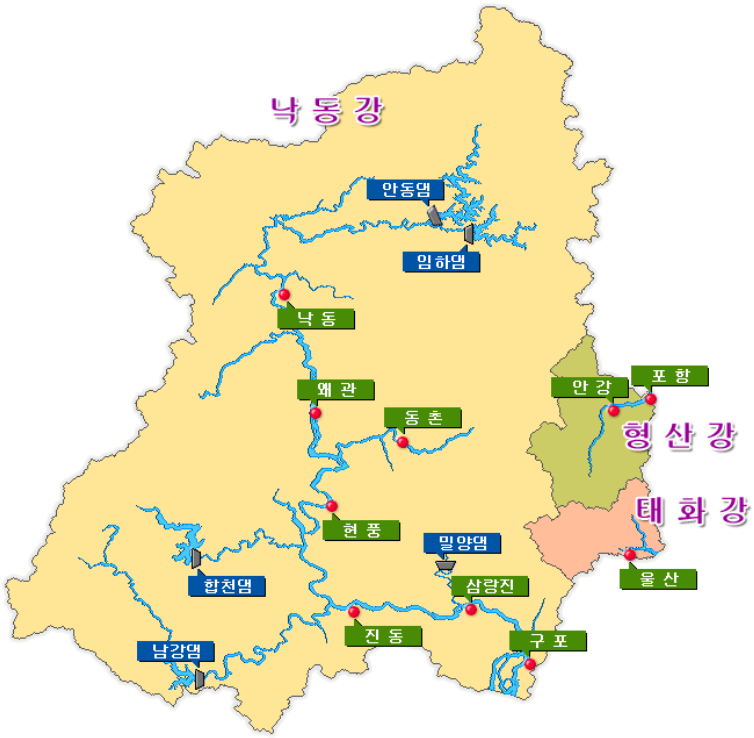

Figure 2. A detailed map of the Nakdong River basin.

Methodology

The central government (at the time the Ministry of Maritime Affairs and Fisheries (MOMAF), Ministry of Environment (MOE)) and the four local governments along the Nakdong River (Busan, Daegu, Gyeongsangbuk-do, and Gyeongsangnam-do) signed a Memorandum of Understanding (MOU) in September, 2007. The objective of the MOU was the efficient management of marine litter flowing into the sea from the mouth of the Nakdong River. The main goal was "organizing a council for the waste management of the Nakdong River basin" and "carrying out studies to prepare the responsible management plan in the basin of the Nakdong River".

Research on the actual level of litter outflow from the Nakdong River was conducted in preparation for the management plan. The Ministry of Land, Transport and Maritime Affairs (MLTM, formerly MOMAF) carried out these studies to prepare "Responsible Management Plan" according to the MOU. The Korea Ocean Research and Development Institute (KORDI) and other research institutes in each city and province joined the project to help track the results.

This project adopted a sharing rate for the treatment cost of marine litter at the mouth of Nakdong River. The cost is shared between the central and local governments, and takes into account the polluters, beneficiaries, and each location based on the area of the basin, population, and the estimated volume of the waste.

Procedure for estimating the cost-share rate

Step 1	Estimating sharing rate between central government payment and cooperative payment between relevant local governments

(Central government 50%: Local government cooperative payment 50%)

Step 2	Estimating sharing rate between beneficiaries and polluters (within cost-

(sharing rate of beneficiary 40.4% : polluter 59.6%)

Step 3	Estimating sharing rate between the polluters in part of the polluter payment

(Estimating after considering quantity of litter, population, area, financial independence, etc.)

Step 4	Estimating sharing rate with each parties

Table 1. Result of preliminary investigation and the final weighting factors

	Busan	Daegu	Gyeongnam	Geongbuk	Total	Weighting factor
estimated volume of outflow(ton)	342	152	387	206	1087	37.90%
	31.46%	13.98%	35.60%	18.95%	100.00%	
Population	799,469	2,504,253	1,582,238	1,821,360	6,707,320	21.70%
	11.92%	37.34%	23.59%	27.15%	100.00%	
Area(km2)	240.7	885.7	7,983.00	15,180.40	24,289.80	19.70%
	0.99%	3.65%	32.87%	62.50%	100.00%	
Financial Independence	71.8	74.5	45.5	42.7	234.5	20.70%
	30.62%	31.77%	19.40%	18.21%	100.00%	
Sharing rate of polluter	21.04%	20.70%	29.10%	29.16%	100%	100.00%

Formula to estimate the cost-sharing rate for each local government:

Local government(0.5) × Polluter(0.596) × Sharing rate between the polluters(A) × 100
+Local government(0.5) × Sharing of the beneficiary (0.404) × Benefit rate(B) × 100

Busan city and Gyeongsangnam-do province did not agree upon the cost-sharing rate between polluters (A) and benefit rate (B). To facilitate mediation between the two local authorities, three meetings and workshops were held. Participants of these meetings included MLTM and research institutes (KORDI, Korea Maritime Institute (KMI), and each local government's development research institutes). A final agreement was reached regarding the sharing rate for the treatment cost.

Table 2. Cost-sharing after considering benefit rate(suggested)

Benefit rate for Busan:Gyeong-Nam	Central government	Local government				Total
		Busan	Daegu	Gyeong-Nam	Gyeong-Buk	
95:05	50.00%	25.46%	6.17%	9.68%	8.69%	100.00%

Results

Executives with the central government as well as each local government signed the MOU for the responsible management of land-based litter in the Nakdong River basin (see Appendix A). The MOU was prepared utilizing research results and input from working level meetings.

Signing ceremony for the MOU, April 3, 2009.

By sharing the treatment cost of the land-based litter between the central and the local government, and upper and lower municipals of the Nakdong River, the Polluter-Pays-Principle was applied to help solve the marine litter problem. Furthermore, this cost-sharing management system is also expected to result in upriver local governments controlling their input of land-based litter voluntarily, thus promoting responsible control and management of domestic waste.

Conclusion

Beginning with the Han River in 2001, a cost-sharing agreement for land-based litter management was completed in all five major river basins that flow through more than two cities or provinces (Han River (2001), Geum River (March 2009), Nakdong River(April 2009), Youngsan River/Seomjin River(May 2009)). Additional investigation is underway to determine whether the same type of MOU is needed for other rivers that flow through many of the smaller cities and country towns within larger provinces.

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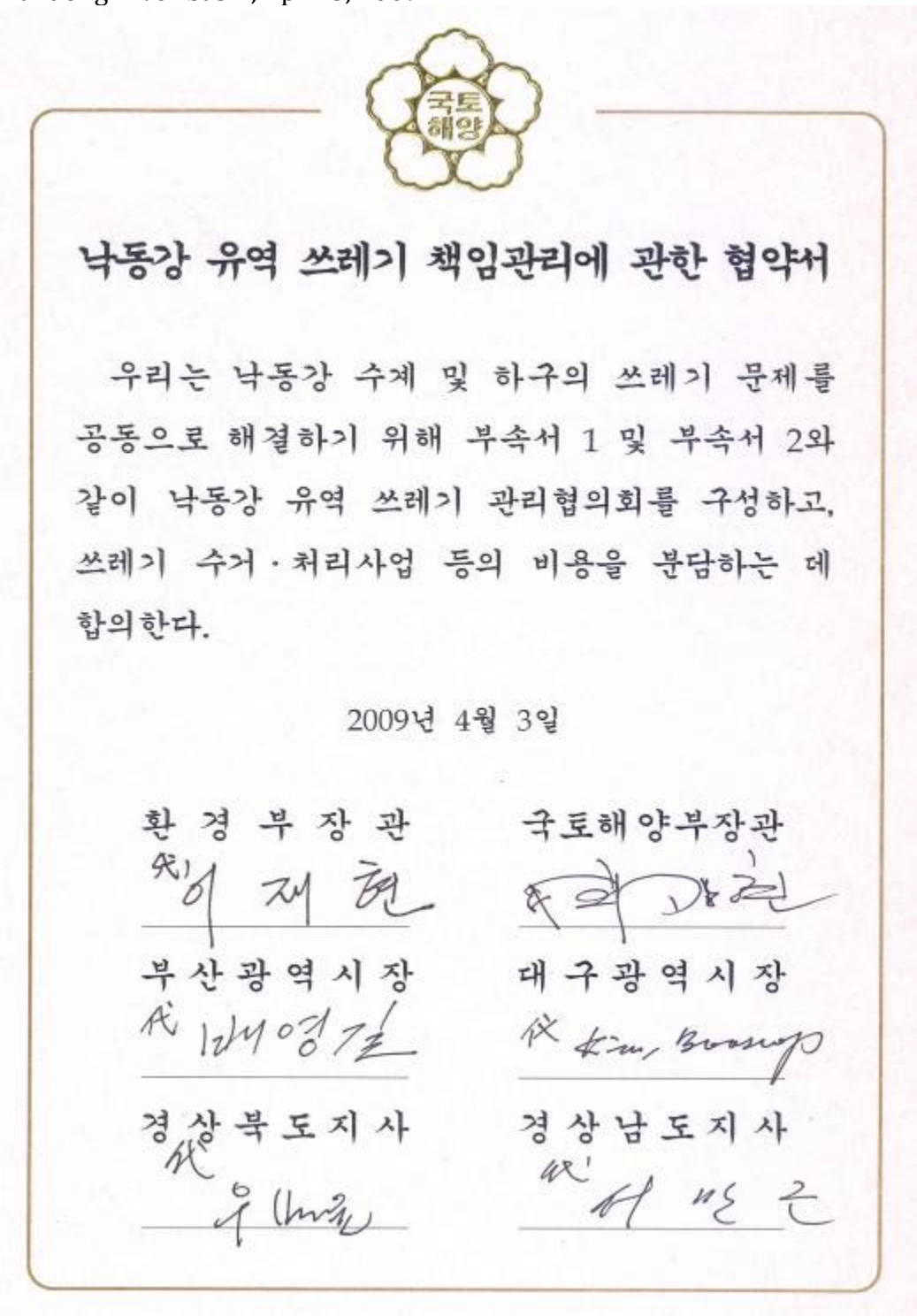
Appendix A. MOU for the responsible management land-based litter input to the Nakdong River basin, April 3, 2009.



국토해양

낙동강 유역 쓰레기 책임관리에 관한 협약서

우리는 낙동강 수계 및 하구의 쓰레기 문제를 공동으로 해결하기 위해 부속서 1 및 부속서 2와 같이 낙동강 유역 쓰레기 관리협의회를 구성하고, 쓰레기 수거·처리사업 등의 비용을 분담하는 데 합의한다.

2009년 4월 3일

환경부장관 代 이재현

국토해양부장관

부산광역시장 代 배영경

대구광역시장 代 Kim, Boosup

경상북도지사 代 우

경상남도지사 代 허

Managing Dedicated Floating Receptacles for Marine Litter

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Abstract
Dedicated floating receptacles for marine litter were installed in Haenam-gun, Cheollanam-do (province) in 2001 and was well-received by fishermen. Fishermen pile up their used nets and farming gear onto the dedicated barge-type receptacles as they are returning from fishing. The Ministry of Land, Transport, and Maritime Affairs plans to enlarge this program to 11 coastal local governments, each receiving three receptacles yearly. The collection cost for marine debris can be reduced and the voluntary recovery of marine debris among fishing communities increased.

Introduction
Marine debris has ecological, economic, and aesthetic impacts to marine and coastal systems. According to the US Environmental Protection Agency, marine debris is regarded as any man-made, solid material that enters our waterways directly or indirectly. In western countries, primary measures for marine debris are coastal clean-up efforts, monitoring programs, legislation, and reusing/recycling efforts.

In South Korea, the situation is somewhat different than in other countries. It was not until the 1970s that Korea began to industrialize, and the speed of this industrialization was tremendous. Moreover, approximately 64% of the population lives near a river or coast, and it has been very difficult to prevent the influx of litter to the ocean.

In 2001, Kang et al. reported the spatial distribution of sustained seabed litter in ports and harbors.

Table 1 shows that much of Korea's marine litter comes from human activities in the ocean, specifically from fishing boats. A review of available literature shows that the problem of marine debris in Korea is unique in the sense that no other country has ever tried to seek specific technological measures to address this issue. We believe that there is a relatively high portion of sustained seabed litter in Korea.

Table 1. Number of people involved in fisheries (from Korean Statistical Information Service homepage)

City/Province	# of people involved in fisheries
Pusan-city	8,196
Incheon-city	7,767
Ulsan-city	3,083
Kyungki-do	4,328
Kangwond-do	10,619
ChungcheonNam-do	26,182
Chullabukdo	9,501
Chullanamdo	61,631
Kyeonsanbukdo	12,386
Kyeonsannamdo	30,184
Jejudo	18,464
Total	**192,341**

As shown in Jung et al. (2005), KFPA (Korea Fishing Port Association) and KOEM (Korea Marine Environment Management Corporation) have removed over 10,000 tons of marine debris since 2000 and more than half of the recovered marine debris consisted of derelict fishing nets.

To solve the problem of marine debris one must start by getting rid of the debris source. However, once it enters the sea, marine debris must be removed. Efficient methods and tools should be used in the removal of the marine debris. After removal, an appropriate treatment technique must be applied.

The dedicated floating receptacle for marine litter was originally installed at Haenam-gun, Cheon-Nam province in 2001 and received good reviews from fishermen. The dedicated barge-type receptacle, placed around the port, was created for the fishermen to pile up their used nets and gear on after returning from fishing. The receptacles made it easier for fishermen to unload their debris as well as reduced the possibility of dumping. The Ministry of Land, Transport, and Maritime Affairs (MLTM, formerly MOMAF) adopted these receptacles as a new nationwide program with the cooperation of local governments. While the program in underway nationwide, the case in Haenam-gun (2009) is presented here.

Table 2. Statistics of sea-bed litter around Korean ports and harbors (Kang et al., 2001a)

Tires	Wire rope	Polypropylene rope	Timber/ Lumber	Metal	Other	Total

4.70%	19.70%	23.40%	7.60%	22.70%	21.70%	100%

Methodology

Various ways of managing the large amount of marine debris have been considered; however proper facilities were insufficient and caused damage to the marine ecosystem. MLTM (Ministry of Land, Transport and Maritime Affairs) recovered 21,871 tons of marine debris through a cleanup program and 29,472 tons through the marine litter buyback program (Noh et. al, 2009). These programs, however, do little to decrease the overall amount of derelict fishing net and gear.

Cheollanam-do province is located in southwestern part of Korea Peninsula. Its population related to fisheries is more than 60,000, the largest in Korea. The main type of fishery in Haenam-gun district in Chellanam-do is abalone (ear shell) and laver (seaweed) farming. A small barge has been used as a receptacle for used nets and farming gear since 2001. This has resulted in fishermen collecting their own used net and gear voluntarily. The dedicated floating receptacles for marine litter had a positive effect on people in the area and thus MLTM began to support the building of barges in coastal local governments.

Table 3. The amount of the collected used fishing gear and marine debris according to the fishing population size and the type of fishery.

Fishing community	Population	Fishery type	Amount (ton)			
			2006	2007	2008	2009.7
A	34	abalone (90%)	40	40	40	40
B	60	abalone (70%) laver (30%)	-	-	-	30
C	200	laver (90%)		100		+

The barge is built of polyethylene to optimize its usability and safety. The standard size for a barge or floating receptacle is 9m X 6m X 1.47m, but can vary according to the characteristics and requirements of the port (Figure 1). Because of its small size, these barges can be easily towed and launched with a smaller ship and thus unloading it is much easier. It can be

towed alongside a pier for easier unloading. MLTM provided 25 million won ($25,000 USD) for receptacle building. Local governments take care of maintenance and upkeep. In 2008, local communities with large amounts of marine litter, large farming areas, enough launching space and facilities ranked high on the list to receive these receptacles. Those villages with clean ports and coasts ranked even higher.

Figure 1. Process of building a floating receptacle for marine litter.

Figure 2. A floating receptacle before and after launching into port.

Results

When the plan to build the first two receptacles for marine litter was announced, the response was so great that ten local fishing villages applied immediately. The local fishermen voluntarily collected their own marine debris and used gear on these dedicated floating receptacles and local authorities entrusted them to deal with waste treatment company. MLTM plans to enlarge this program to 11 coastal local governments each with three receptacles yearly.

Conclusions/Discussion

With the dedicated floating receptacles for marine litter, Haenam-gun reduced the collection cost for marine debris by 30%. Furthermore, voluntary recovery of marine debris now takes place among fishing communities. The resulting benefit is cleaner coastal waters.

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Nearshore Marine Debris Abatement Projects

UNITED STATES

Reel In and Recycle! Monofilament Recycling Program

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Abstract

The BoatU.S. Foundation launched the Reel In and Recycle Program in 2006 with grant funding from the National Fish and Wildlife Foundation and the NOAA Marine Debris program. The program aims to create a nationwide network of fishing line recycling bins to help anglers properly dispose of used fishing line. Monofilament fishing line if left in the marine environment can entangle and harm birds, marine mammals and other wildlife. Since 2006, the BoatU.S. Foundation has received commitments from volunteers across the country to install and maintain monofilament bins and new requests come in daily. Nearly 1,200 PVC monofilament recycling bins have been built and installed with the help of volunteers and over 11 million media impressions have been generated by press releases, radio interviews and multiple magazines stories. The three pronged approach of the Reel in and Recycle program of general education on marine debris, the development of a nationwide network of recycling infrastructure, and the quantification of these efforts through data collection, together show that the program is making a difference reducing marine debris.

Monofilament recycling bin installed in California.

Introduction

Monofilament line and commercial fishing gear are designed to be strong, durable and nearly invisible in the water. These qualities make the materials well suited to catching fish. Unfortunately when left in the marine environment, monofilament line and other derelict fishing gear continue to catch fish, unintentionally entangling marine life. According to the U.S. Commission on Ocean Policy at least 267 species have been impacted by marine debris including 86 percent of sea turtle species, 44 percent of seabird species and 43 percent of marine mammal species.

The aim of the Reel In & Recycle program is to make monofilament recycling a regular part of the fishing lifestyle by providing the infrastructure to make it easy to do the right thing, recycle used fishing line. The primary conservation outcome of the program will be the reduction of monofilament fishing line in the marine environment. Fishing line ranked in the top 10 most dangerous debris items collected worldwide in the 2007 International Coastal Cleanup. Fishing line entanglements

accounted for 65% of the 235 entanglements found during the 2007 International Coastal Cleanup, by far the leading cause of entanglement.

The BoatU.S. Foundation is working to educate boaters about the dangers of marine debris and specifically monofilament line left in the marine environment. While 80 percent of marine debris may come from land-based sources, it is important to minimize the risk of entanglements and reduce marine debris by preventing its introduction at the source. The Reel and Recycle program, combining general education about marine debris and the strengthening of a nationwide network of monofilament recycling receptacles, builds upon a three pronged approach of *education, debris collection, and data gathering*.

Monofilament recycling programs are a proven concept. The State of Florida and other local governments have implemented similar programs with great success. What is new about this program is its scope. The Reel In & Recycle program take the success that has been seen at a few areas of the country on a local level and replicates that into a nationwide monofilament recycling program. Bins are placed at high traffic fishing areas from coast to coast. Emphasis is made that bins be installed in convenient locations right at the land-water interface making it easy for anglers to recycle their used fishing line.

This program is funded in part by grants from the NOAA Marine Debris Program and the National Fish and Wildlife Foundation

The BoatU.S. Foundation is a national 501(c)(3) nonprofit organization dedicated to promoting safe and environmentally-sensitive boating. Our goal is to be the leader in boating safety and environmental education and outreach, with the purpose of reducing accidents and fatalities, increasing stewardship of our waterways, and keeping boating a safe, accessible, and enjoyable pastime

Methodology

The methodology for the program is built around a three pronged approach including: marine debris education/outreach, the development of a nationwide monofilament recycling infrastructure, and the collection of data on the amount of monofilament line recycled. This approach combines general education with the specific enabling activity of debris collection and the ability to quantitatively assess the impact of the activities and translate those actions to debris and entanglements avoided.

Education/Outreach

The program has two primary audiences for its messaging: groups who are interested in hosting and maintaining the fishing line recycling bins, and anglers who have line to recycle.

A volunteer in New Jersey empties the bin and mails the collected line to Berkley Conservation Institute for recycling.

Partner recruitment

To date recruiting local partners to host, install and maintain the recycling bins has not been a challenge. In fact for the last 3 years the list of interested partners has exceeded the number of bins available. Groups or individuals that are interested in hosting a bin register on the Reel In and Recycle website. Bins are allocated based on geographic location. Care is taken to locate bins in coastal areas and to spread the distribution of bins to those areas that do not already have an existing recycling program. Initially, the BoatU.S. Foundation budgeted incentive payments to accompany each bin to cover installation materials, but given the large demand for the program we have not needed to utilize incentives.

To market the monofilament recycling program, the BoatU.S. Foundation utilizes our partnerships with the Coast Guard Auxiliary, Power Squadron, Army Corps of Engineers and scores of local organizations dedicated to making recreational boating safer and more environmentally sound. The availability of monofilament recycling opportunities is marketed through the BoatU.S. magazine, the BoatU.S. website, BoatU.S. cooperating marinas and through our networks of Clean Marinas and other local partnering organizations. To be selected for participation in the program, each recycling location must commit to maintain the receptacles for two years and report the amount of material collected to the BoatU.S. Foundation via our online data reporting website.

Angler awareness

The second component of outreach is targeted to anglers to raise awareness of the importance of and the availability of line recycling. These are the individuals who we want to use the bins, as opposed to maintain the bins. The BoatU.S. Foundation has a long history of working with anglers on safety issues such as life jacket wear. We use various channels to educate this audience and influence behavior including fishing television and radio shows, fishing clubs, and fishing magazines and publications. We utilize our network of fishing pros to have them demonstrate the behavior we want anglers to emulate. We ask the pros to wear life jackets and have them discuss fishing line recycling on their television shows. We have found this role-model, lead-by-example technique to be very effective at

changing behavior amongst the angling audience.

We also have maintained a consistent look and labeling for our 1,200 recycling bins. By having consistent looking bin infrastructure, over time anglers will learn what to look for when they are at a new marina or launch ramp. We are in the process of building a web-based map of recycling locations and will use this an another tool to connect anglers with locations where they can recycle their used line.

Bin Construction

Through the program individuals can get bins in one of two ways. We can either send them a free bin, or they can build their own. We are limited to building 400 bins at a time by funding and storage space. For those groups wishing to build their own bins, we have created a video podcast (http://www.boatus.com/foundation/Monofilament/build.asp) showing step-by-step instructions. For bulk bin construction, we use 6 inch diameter PVC pipe. This can be purchased through a plumbing supply store. The pipe and fittings for 400 bins requires a large storage area. To ease shipping and storing logistics, we have rented a 40 foot shipping container to store the supplies and bins. Bins are constructed in batches of 350 - 400 bins. With 20 to 30 volunteers, we are able to build and box the entire amount in about 4 hours.

BoatU.S. staff volunteer to build 400 bins in July 2009 at BoatU.S. Headquarters in Alexandria, VA

Two steps of the construction process require the use of power tools. For liability purposes, we have staff members use all power tools and keep the volunteers to other tasks. We rent a 12 inch compound miter saw from a local hardware store to cut the 20 foot lengths of pipe into 2 foot lengths. We also use a drill press to drill one hole in the caps to allow water to drain from the bins. Staff using power tools work in pairs and are required to wear goggles and hearing protection. All volunteers and staff are instructed to wear gloves, and old clothing as the PVC is often dirty and the glue can stain hands and clothes.

For assembly we create two lines with folding tables and we place the supplies in the middle. We start the production at the point furthest from the shipping container, allowing the competed bins to be located close to the container opening for ease of moving and storage. The assembly line starts with the 2 foot section of pipe. Using Gorilla Glue or other

adhesive (we do not use PVC Cement due to the noxious fumes) we attach the threaded adapter, then flip the bin over and attach the elbow fitting, using care to see that any writing on the pipe is opposite the elbow opening. We include a plug with each bin, but do not screw on the plug as glue residue could cause it to seal permanently. We apply two stickers to the front of the bins, one to identify the program and recognize sponsors and funders and another to discourage individuals from placing trash in the bins. Once constructed, the bins are placed two in a box and the elbow end of each bin is wrapped in bubble wrap. We found that the elbows can break in shipping if not padded. Each bin is shipped with a metal, UV resistant sigh that identifies the bin, recognizes funders and sponsors and includes a place for the local sponsor to add their name or logo to the sign.

Consistent labeling of the bins is key to branding the program.

The bin design has been tested and the construction and distribution from one location provides the most cost effective method of administering the program. The local groups who receive the bins commit to empty the bins, report the amount of line collected and send the line to a fishing line recycler. Our primary line recycling partner is Pure Fishing Berkley Conservation Institute. They are a leading manufacturer of fishing line. They supply postage paid return shipping boxes to groups wishing to recycle line. The line is sent to their facility in Iowa where it is sorted and recycled into commercially viable products such as line spools and artificial reef materials.

Data Management

A key component to measuring the success of the program is tracking and quantifying the amount of line that is collected and recycled. This has been one of the largest challenges associated with monofilament recycling efforts and is often cited as a barrier by other groups involved in previous fishing line recycling programs.

The BoatU.S. Foundation has designed an online data reporting tool to make it simple for groups to report the line collected. On the website groups enter in their bin location information, and the contact details for the volunteers who maintain each bin. Each time a bin is emptied the volunteers can report on how full the bin was, the amount of trash in the bin, and other comments. Once the group has collected enough line to fill a shipping box, they send the line to Berkeley or another recycler and report the weight of the shipped box.

This program quantifies the amount of line collected two ways, the number of bins of line collected, as well as the weight of the line recycled. This will provide us with two ways to calculate the volume of line kept out of the water. This online data website will also make it

easy to identify sites that are very active and may need more bins, and sites that have a lag in reporting. This also allows us to determine the frequency that bins are being monitored and provide follow-up to the volunteer groups.

If bin hosts fail to report the data on the amount of line collected, we will not be able to measure the full benefits of the program. Our online data collection tool will enable us to keep track of the level of activity at each bin site. We are planning to launch a new incentive program for data reporting by providing a monthly prize drawing for those sites who submit data in a given month.

Results

The three primary measures of progress for this project are:

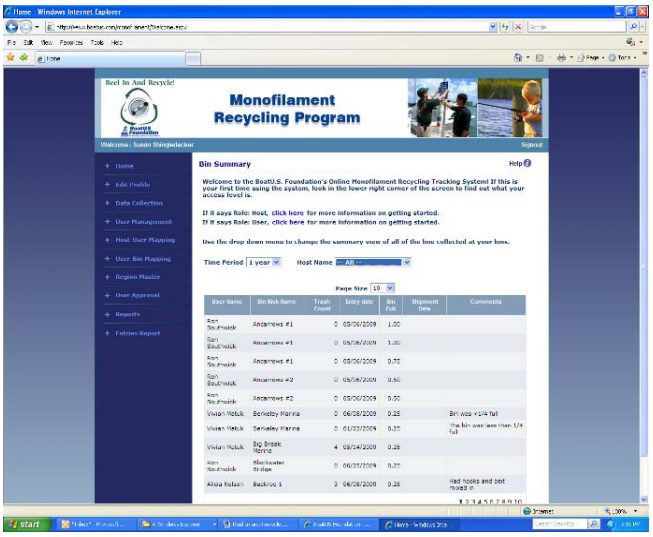
- **The number of recycling bins distributed around the country,**
- **The amount of monofilament line that is returned for recycling,**
- **And, the number of media impressions generated by the program outreach.**

These three indicators give a balanced picture of the program success. First, the number of bins distributed shows us the geographic breadth and density of the program. Second, the amount of line returned will show us the effectiveness of the program and will identify the most active fishing locations. Finally, the third indicator of media impressions shows us how effective we have been at reaching the fishing and boating public to include them, the users, in recycling efforts. In addition to these three primary indicators the BoatU.S. Foundation has engaged a professional evaluation team to establish a baseline for awareness and participation in monofilament recycling. The first set of focus groups will be conducted in August 2009, with follow up evaluation in 2011. This evaluation will enable us to capture some of the less quantitative measure of success and provide a more complete picture of program strengths and weaknesses.

The number of recycling bins distributed around the country.

To date the demand for recycling bins has far outpaced the supply. The BoatU.S. Foundation distributes bins to coastal and Great Lakes states. We are limited in the distribution we can do in inland areas due to the nature of our program funding. We have identified a few funding sources to allow for the creation and distribution of bins to inland areas and hope to be able to serve these areas in the future. To date, the BoatU.S. Foundation has constructed nearly 1,200 bins. These bins have been mailed to groups in 32 states around the country. Each year the demand for the bins continues to grow.

We have seen in a number of states that our initial supply of bins and support has led the states to take up a recycling program and put staff time and additional financial support to the effort. This is particularly evident in California, New Jersey and Virginia. Another development is that many groups are now undertaking bin construction on their own and have turned to the BoatU.S. Foundation to supply them with the decals and signage to accompany their bins. This is a cost effective way to continue to grow the monofilament line recycling infrastructure network.



The online database allows volunteers to report the amount of line recycled.

The amount of monofilament line that is returned for recycling.
The construction of our online data reporting database and website has taken much longer than anticipated. The programming elements were more complicated than originally thought and the contractors experienced delays. That said, we have nearly completed the final phase of testing and refinements. We have worked with a sample of bin hosts to test the program and have received excellent feedback from them. With just over 50 bin locations currently active in the database we have received report of 93 bins of line collected and over 128 pounds of line returned for recycling. This is just the beginning.

With the 400 bins that will be shipped in August 2009, those sites will be ready in the database from the onset. They will work with the program from the first day they install the bins, so data reporting will be a regular part of their interaction with the Reel In & Recycle program. We also will be rolling out the data reporting program to our other existing sites to fully incorporate all sites into the data reporting program.

The number of media impressions generated by the program outreach.
The Reel In & Recycle program has received excellent media coverage, especially through BoatU.S. publications. As of 2008, 11 million media impressions can be tied directly to this program from magazine articles and press releases alone. Additionally the program has conducted several radio interviews, a television PSA for with the help of a national fishing show, two video podcasts hosted on our website and other outreach as well. In the Fall of 2009 we will be expanding our outreach partnering with Great Lakes Productions and the nationally syndicated radio program "Our Ocean World." We will also be producing print PSAs for distribution to major fishing and angling publications. Going forward we are looking to integrate the use of more interactive media including social networking to publicize monofilament recycling and facilitate interaction amongst the volunteer groups who participate in the program.

Lessons Learned

Having a line recycler is key.

Monofilament fishing line cannot currently be recycled though most municipal recycling programs. Therefore the existence of an entity that can collect the line and recycle it is essential. In the United States the primary recipient of collected line is Berkley Conservation Institute, a division of Pure Fishing, one of the country's largest fishing line manufacturers. Without their participation recycling line on a national scale would be very challenging.

Demand for the bins is high.

Demand for the recycling bins remains high, eliminating the need for the planned installation incentives. Because six-inch diameter PVC is not commonly available in hardware stores, volunteer groups greatly appreciate receiving the preconstructed bins. That said, it is helpful and cost effective to have an extra supply of bin signs and stickers for those groups who are able to build their own bins, but would like to have them consistent with the other program bins. We do believe that reporting will be a challenge and that any incentives initially planned for installation should be reprogrammed to reporting incentives.

Having a centralized local partner in a state of region can lead to enhanced program adoption in that area.

Through the program bins have been distributed to individuals, marinas and other groups in quantities of 2 -4 bins, and also to larger state-based of environmental organizations in larger quantities. While we support supplying individuals with bins and will continue to do so, the development of a number of key partnership in various states around the country has allowed the program to thrive in those areas. Our relationships with state government contacts, Clean Marina Program coordinators, and local environmental groups in California, New Jersey, Virginia and Oregon has greatly facilitated the adoption of the program in those states. Having a central contact point provides assistance identifying the most appropriate locations for bins, and additional support when communicating with bin hosts regarding bin maintenance and data reporting.

Conclusion/Discussion

Since the BoatU.S. Foundation began the Reel In and Recycle program in the Fall of 2006 with funding from the National Fish and Wildlife Foundation and the NOAA Marine Debris program, we have made great strides at educating boaters about the challenges of marine debris and recruiting partners in the program. We have received commitments from volunteers across the country to install and maintain monofilament bins and new requests come in daily. Nearly 1,200 PVC monofilament recycling bins have been built and installed with the help of volunteers across the country. Over 11 million media impressions have been generated by our press releases, and multiple magazines stories. We have built, tested and launched our online data reporting website. Together these activities and partnerships are building a nationwide network of monofilament fishing line recycling sites that in time will change behavior and help anglers see recycling used fishing line as commonplace as recycling cans and bottles.

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Netting Solutions: Hawaii's Nets to Energy program and Pier 38 port reception facility

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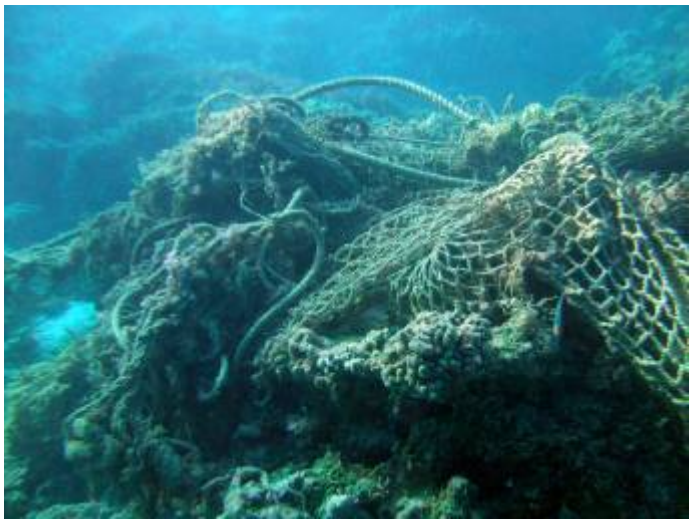
Abstract

In 2002, the Northwestern Hawaiian Islands multi-agency marine debris group devised a unique program to turn derelict fishing net debris into usable electricity as a better way to dispose of one type of marine debris. Today, this successful partnership program recycles an average of 80 tons of derelict nets and monofilament line per year. In total, since 2002, this program has created enough electricity to power 283 homes for a year each.

Introduction

Marine debris of all types accumulates in and around the islands of Hawai'i due to their location in the middle of the North Pacific Subtropical Gyre. Much of the debris is made up of derelict fishing nets. Derelict fishing nets and other fishing gear from domestic and foreign sources in the greater Pacific are safety and navigation hazards and can damage vessels. Carried by currents, the nets wash ashore and snag on the coral reefs of the Northwestern and Main Hawaiian Islands, causing extensive damage and entangling marine mammals, turtles, and other wildlife each year.

In the North Pacific Ocean, Hawai'i-based longline fishermen often encounter derelict fishing nets when traveling to and from fishing grounds and when fishing in areas of current convergence where debris is accumulated. Over the years, many Hawai'i-based longline fishermen have voluntarily brought these derelict nets back to port to eliminate the risk of future at-sea encounters. Additionally, across the Hawaiian archipelago, large conglomerations of these nets, sometimes weighing thousands of pounds, are removed from Hawaii's reefs and shores each year through various large- and small-scale removal efforts.

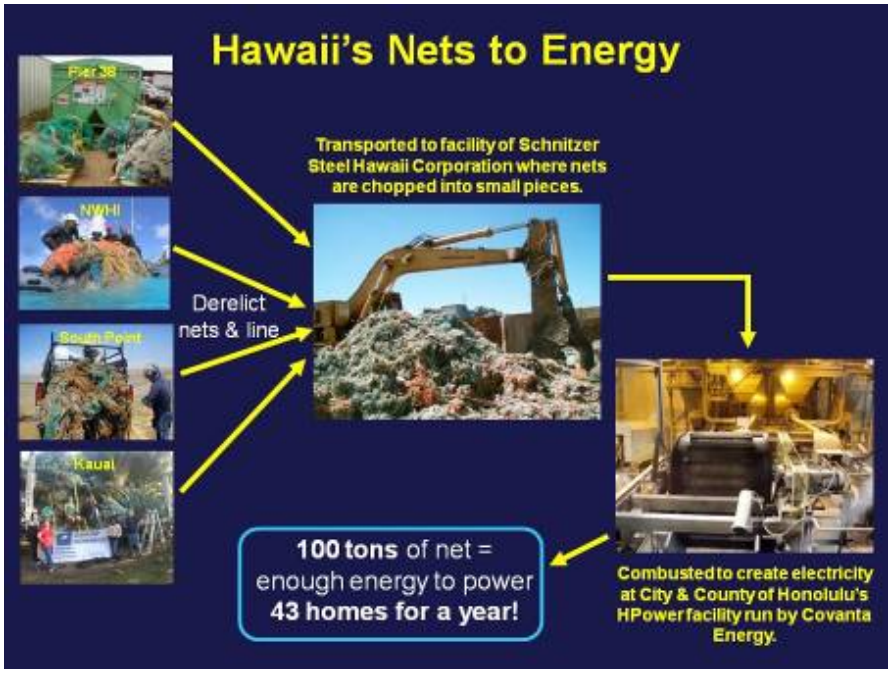


Historically, the collected derelict nets would be disposed of in landfills where they not only take up space, but also break down (fragment) very slowly. These plastic nets (mainly nylon) do not biodegrade or mineralize (break down into inorganic components), but simply break down into smaller and smaller pieces. Therefore, a better disposal method for these nets was needed.

Methodology

Nets to Energy Process

Since 1996, NOAA has led a marine debris removal effort in the Northwestern Hawaiian Islands (NWHI). Since then, over 603 metric tons of derelict nets have been removed. Instead of adding these nets to already congested landfills, in 2002, the Northwestern Hawaiian Islands multi-agency marine debris group devised a unique program to turn this marine debris into usable electricity.



The collected derelict nets are transported to the facility of Schnitzer Steel Hawai'i Corporation, a mainland-based scrap metal recycler. There the nets are chopped into small pieces suitable for combustion at the City and County of Honolulu's H-Power waste-to-energy facility run by Covanta Energy. Schnitzer Steel Hawai'i Corporation transports the chopped net pieces to the H-Power facility. There the nets are burned, producing steam which drives a turbine to create usable electricity. All services (transport included) are donated free of charge.

This program is possible only through the partnership and support of Hawaii's multi-organizational marine debris group including the businesses listed above, as well as Matson Navigation Company and Alliance Trucking.

Today, all NOAA-funded marine debris removal projects in Hawai'i incorporate this program as a component for success.

According to the Hawai'i State Department of Business, Economic Development and Tourism, 100 tons of derelict net provides enough electricity to power 43 O'ahu homes for a year!

Pier 38 Port Reception Program

This project was funded by the NOAA Marine Debris Program in 2005. The project had two parts: 1) a feasibility study for the creation of a marine debris port reception program in Honolulu and 2) implementation of a marine debris port reception program based on the results of the feasibility study. The goal is to help reduce environmental impacts to coastal natural resources in Hawai'i, reduce navigational hazards, and create new partnerships between private and public entities.

Project partners include the Hawai'i Longline Association, Schnitzer Steel Hawai'i Corporation, United Fishing Agency, Pacific Ocean Producers Fishing and Marine, Covanta Energy, Matson Navigation Company, NOAA, Western Pacific Regional Fishery Management Council, Department of Transportation-Harbors Division, City and County of Honolulu, and University of Hawai'i Sea Grant College Program.

1. Port Reception Feasibility Project

NOAA National Marine Fisheries Service's Pacific Islands Regional Office, along with the Western Pacific Regional Fishery Management Council, conducted a survey of the active O'ahu-based commercial longline vessels to determine the frequency (per trip) and approximate weight of encountered derelict fishing nets over the previous year. The volume of debris and method of disposal were recorded along with the feasibility and longliners' willingness to remove and transport derelict net back to a port facility in Honolulu. A determination was then made of the most economic and environmentally friendly approach to debris disposal. The study also assessed the feasibility and cost of providing beacons to commercial fishermen to satellite-tag encountered debris if they are

2. Port Reception Program Implementation

As part of this project, a port reception program, called "Honolulu Harbor Derelict Net Recycling Program," was created and launched in January 2006. Recognizing the efforts made by these longline fishermen, a private-public partnership was formed to help coordinate a more environmentally friendly approach to this debris disposal. A 31-cubic-

net receptacle. The receptacle is kept locked to prevent disposal of other types of materials.

It is maintained on a daily basis by staff with Pacific Ocean Producers Fishing and Marine and United Fishing Agency, both located at Pier 38. Schnitzer Steel Hawai'i Corporation

begins the Nets to Energy process.

Other Nets to Energy Partner Projects

Since the port reception facility opened in January of 2006,

begun to bring derelict nets collected at beach cleanups to the port receptacle. Additionally, the receptacle has become

fishing nets (e.g., for soccer or baseball cage nets).

Beginning in 2008, derelict nets from both the Big Island of Hawai'i and island of Kaua'i are also incorporated into the Nets to Energy Program, a true show of cross-county cooperation. On the Big Island of Hawai'i derelict fishing

southeast coastline near Ka Lae (or South Point), a known accumulation area for marine debris. Those nets are loaded into a container provided by Matson Navigation Company, who picks it up when full and ships it to O'ahu for free.

The island of Kaua'i is host to Hawaii's first "Net Patrol," a band of volunteers with the specific mission to find and remove derelict fishing nets from the shores of the island. This group is coordinated by the

Conclusion

Hawaii's Nets to Energy program was the first of its kind in the United States. It has been, since its beginning, a very successful program that has facilitated and fostered numerous partnerships in marine debris across the state of Hawai'i. The program runs today through the no-cost support and work of Hawaii's marine debris partners, mainly within the private sector. This program has been so successful that it was used as the model for the "Fishing for Energy" program, which was implemented in sites along the northeastern coast of the U.S. beginning in 2008.

Since the start of Hawaii's Nets to Energy program in 2002, over 597 metric tons of derelict net debris has been used to create electricity (an average of about 80 metric tons per year) – enough to power 283 homes for a year each!

Fishing for Energy: A public-private partnership approach to preventing and reducing derelict fishing gear

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[1]Marine Programs, National Fish and Wildlife Foundation

Abstract

Derelict fishing gear is one of the major types of debris impacting the marine environment. It can continue to indiscriminately catch marine species long after it becomes derelict and as such has been identified as a particular conservation concern for a number of different marine species. A complementary problem to the prevalence of derelict fishing gear is the lack of convenient and accessible disposal options for those who encounter it (primarily fishermen). *Fishing for Energy* is a public-private partnership consisting of partners from agency, non-profit, local, state, and corporate sectors with the goal of reducing the impacts of derelict gear on the marine environment, and does so in a way that removes existing barriers to proper gear disposal on a port-by-port basis. With the cooperation of 13 ports in five states, to date *Fishing for Energy* has collected over 180 tons of fishing gear. This realizes an environmental benefit through the diversion of gear from (potentially) the marine environment as well as from landfills, while at the same time raising awareness of marine debris issues in local port communities.

Introduction

Marine debris threatens important living marine resources and their habitat, as well as hinders navigational safety. Derelict fishing gear is one of the major types of debris impacting the marine environment. It can continue to indiscriminately catch marine species long after it becomes derelict. Marine mammals and sea turtles can become entangled and drown, become injured or prevented from catching prey. Marine habitats such as coral reefs or seagrass beds, which are smothered when derelict nets sink from the weight of their catch, are further damaged when nets on the bottom are shifted by storms. It also presents hazards to industry through navigational hazards, or by becoming snagged on active fishing gear, resulting in high costs in both time and money.

The Marine Debris Research, Prevention, and Reduction Act explicitly mandates the prevention and removal of derelict gear (through the National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program) using "effective nonregulatory measures and incentives to cooperatively reduce the volume of lost and discarded fishing gear and to aid in its recovery" (Marine Debris Research, Prevention, and Reduction Act, P.L. 109-449, section 3; 120 STAT. 3334; 33 USC 1952B). Because a comprehensive national program designed to assess or remediate marine debris is not currently available (National Research Council, 2008), the programs most likely to be successful in addressing marine debris are individual, locally-based projects driven by a wide group of affected stakeholders. In this case, commercial fishermen and local ports are the most logical and appropriate groups to be involved. Fishermen have indicated that a significant barrier to proper disposal of

retired gear or willingness to bring in derelict gear found at sea is a lack of disposal mechanisms and disposal costs. The primary disposal method for fishing gear currently available is land-filling. While cost alone can be a disincentive, some landfills no longer accept fishing gear at all due to the fact that long rope and nets entangle earth movers and other machinery. This leaves very limited options for proper disposal. As a public-private partnership consisting of partners from agency, non-profit, local, state and corporate sectors, *Fishing for Energy* addresses the disposal problem by removing existing barriers to proper gear disposal. The program provides not only a disposal mechanism for fishing gear, but also provides an incentive for fishermen and local groups to participate in derelict gear removal as well.

Fishing for Energy is based on the Nets to Energy program in Hawai'i, a program which recovers pelagic nets that wash ashore from distant water fishing fleets. *Fishing for Energy* launched on the east coast United States in 2008 through a partnership of Covanta Energy Corporation, the National Fish and Wildlife Foundation (NFWF), the National Oceanic and Atmospheric Administration (NOAA) and Schnitzer Steel Industries, Inc. with the immediate goal of providing a no-cost solution to fishermen to dispose of old, derelict or unusable fishing gear and to reduce the amount of derelict fishing gear in and around coastal waterways. Based upon successes from the first year of the program, and a five-year commitment by Covanta Energy to support and expand the coverage of the program, *Fishing for Energy* is now an established and proven model for gear disposal. Moving forward, the program now seeks to provide local communities with a means to become more actively involved in addressing marine debris issues through a small grants program (available in the second half of 2009) for projects that raise awareness of marine debris issues and catalyze removal of existing derelict gear.

Methodology

Derelict fishing gear is a widespread concern, and is as geographically prevalent as commercial fishing. *Fishing for Energy*'s business model is to bring the program's services to individual ports that have an interest in partnering and a fishing gear disposal need. Prior to rolling out the program in 2008, an assessment of ports and commercial fish landings was conducted and a GIS map of those ports was overlaid with a layer depicting Covanta Energy facilities. To identify initial ports to target for the program, those ports within a reasonable driving distance (160 miles) to a facility comprised the initial list of potential ports (See Figure 1). The NOAA Marine Debris Program and NOAA National Marine Fisheries Service's Gear Team were then given the list to rank into three tiers for prioritization based on need from an agency priority point of view. The list was then provided to Covanta for their input for ports of strategic importance to them. With a few exceptions, the port list resulting from this process has guided where the program goes. Gear samples were sent to Covanta Energy facilities early on for testing to determine emissions would be within approved, regulated boundaries for all types of gear material.

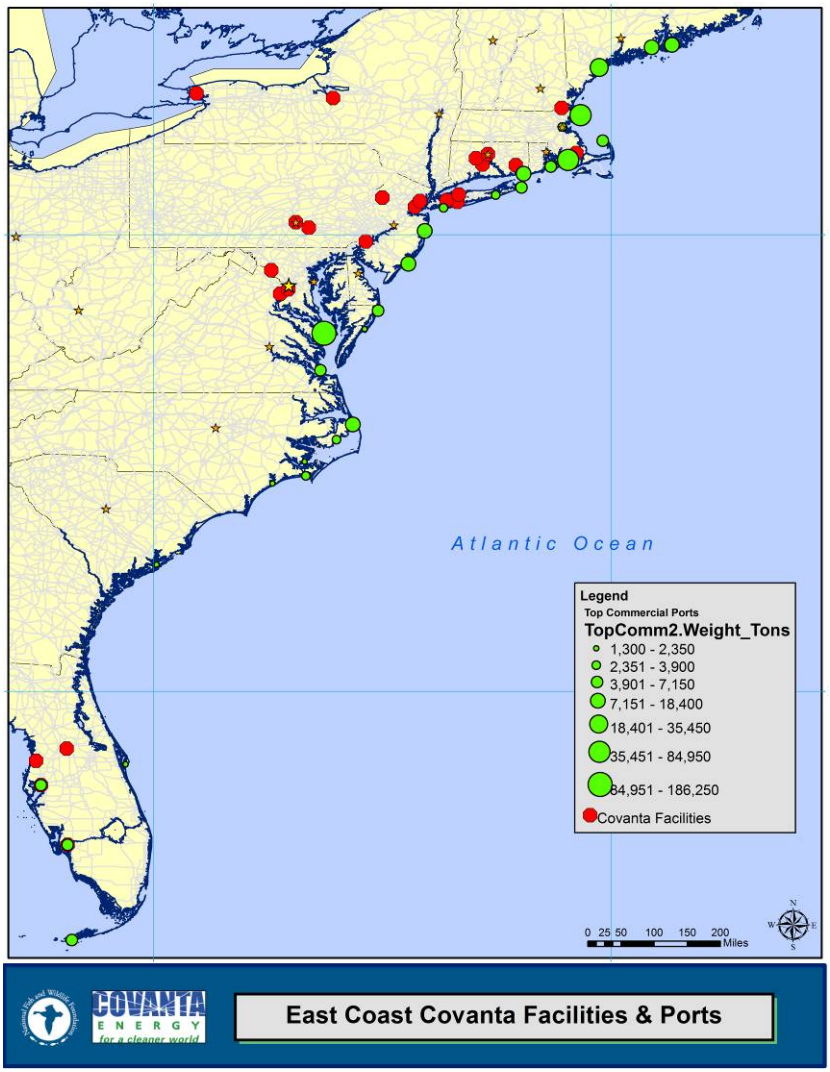

Figure 1 - Initial Map of Ports and Covanta Facilities

There are at least five factors considered when deciding which ports are of interest to the *Fishing for Energy* partners. This port priority is determined by weighing the following factors: 1) proximity to partner facilities (in consideration of monetary and environmental transportation costs), 2) the level of fishing effort at the port (e.g., larger ports typically mean higher gear turnover and increased need for gear disposal), 3) the estimated amount (volume and weight) of gear available for the duration of the bin deployment, 4) any strategic importance to partner operations, and 5) historical significance to the coastal community in general.

Points of contact (harbormasters, port authorities, fishermen associations) are determined through cold-calling leads from internet searches, or going through existing contacts from NOAA or NFWF. Outreach to existing NFWF marine debris grantees, fishery management councils, NOAA agency contacts (regionally and nationally), media stories/articles, and word-of-mouth between ports have also brought other ports into contact with the program.

The logistical details related to gear collection, transport, processing and disposal for each participating port are determined on a port-by-port basis. The Port Nomination Form (See Appendix A), filled out at the beginning of the process by each port, was created to collect important information about the site which is then used to determine the number of bins that might be required, the duration of the deployment, the location of the bin, whether there will be a media event or just a gear collection, among other details (such as volume and frequency of gear disposal needs). At this initial point in the process for each port, we work with our NOAA partner to ensure that there are no regulatory issues that need to be

considered with regard to the handling of fishing gear in state or federal regulations. We also work with our Covanta and Schnitzer Steel partners to ensure that the designated facilities nearest to the port location can handle the incoming gear type and estimated volume.

Bins are provided in-kind by Covanta through existing contract partners they hold in the region and transportation costs are shared by both Covanta and Schnitzer Steel. The program accepts and disposes a wide variety of commercial fishing gear. This includes, but is not limited to: line (nylon, polypropylene, monofilament), traps/pots (wood, vinyl coated wire), fishing gear rigging (trawl dragger "cookies", cans, rollers, chain), and nets (nylon, polypropylene, monofilament). Due to costs associated with transportation, the target collection rate is for each 30-cubic yard bin to be collected up to an average of 4 times per year. Depending on the need of a particular port or fishery, additional bins can be delivered on an *ad hoc* basis to capture excess gear that comes in. Of primary concern is the security of the bin while deployed at the port. Unsecured bins are at risk of being filled with trash and other non-fishing gear debris. To preserve the integrity of the program, ensuring bin security is of utmost concern when working out the logistics of each port deployment. We have ensured bin security in three ways: by placing the bin in a secure location at the port, by providing a lockable bin for which a port staff member will hold the key and grant access at predetermined times, and by renting chain link fencing to surround the bin as a deterrent to illicit dumping. When the bins are filled, our port partner will call to have the bin swapped out. The gear is collected and transported to a nearby Schnitzer Steel facility where the metal (e.g., crab pots, gear rigging, chain, cable) is pulled for recycling, and rope or nets are sheared for easier handling for disposal. From the Schnitzer facility it is brought to the nearest Covanta Energy-from-Waste (EfW) facility where the gear is converted into electricity for local communities (See Figure 2).

When a port has been approved and has agreed to partner with the *Fishing for Energy* program, media event logistics (if applicable to that port) are also worked out. Positive, widespread media attention is an important objective for this program, especially since it is a young program with potential to expand. The diverse group of partners involved in each port, each with different capabilities for reaching different audiences has gained widespread recognition to the program within the Northeast and elsewhere. Media events have a number of different roles in the program: first and foremost they are important opportunities to inform local fishermen and community members of the disposal service provided by the program; secondly, events are also excellent opportunities to increase program and partner visibility within the local community; lastly, they bring the issue of marine debris to the forefront of public awareness, and local dignitaries along with state and federal legislators who are invited to media events further increase that visibility. Events are coordinated with local partners and held on site. Press releases and advisories are sent out to local media prior to the event.

Results

Thirteen ports in five states have participated in the program since February 2008. From these ports *Fishing for Energy* has collected over 180 tons of gear as of June 1, 2009,

involving 28 partners outside of the core *Fishing for Energy* partners (See Appendix B). Eight media events have been held (see Table 1, ports listed in bold) and have received a significant degree of press attention in local and national media markets for the issue of marine debris and derelict fishing gear in the port areas. An estimated two million media impressions to-date have been generated from more than 30 news stories in print, radio, TV news and the web from around the country. Two cable network shows have demonstrated interest in featuring the program; one filmed in fall 2008 and is pending broadcast, the other is in development at the time of writing.

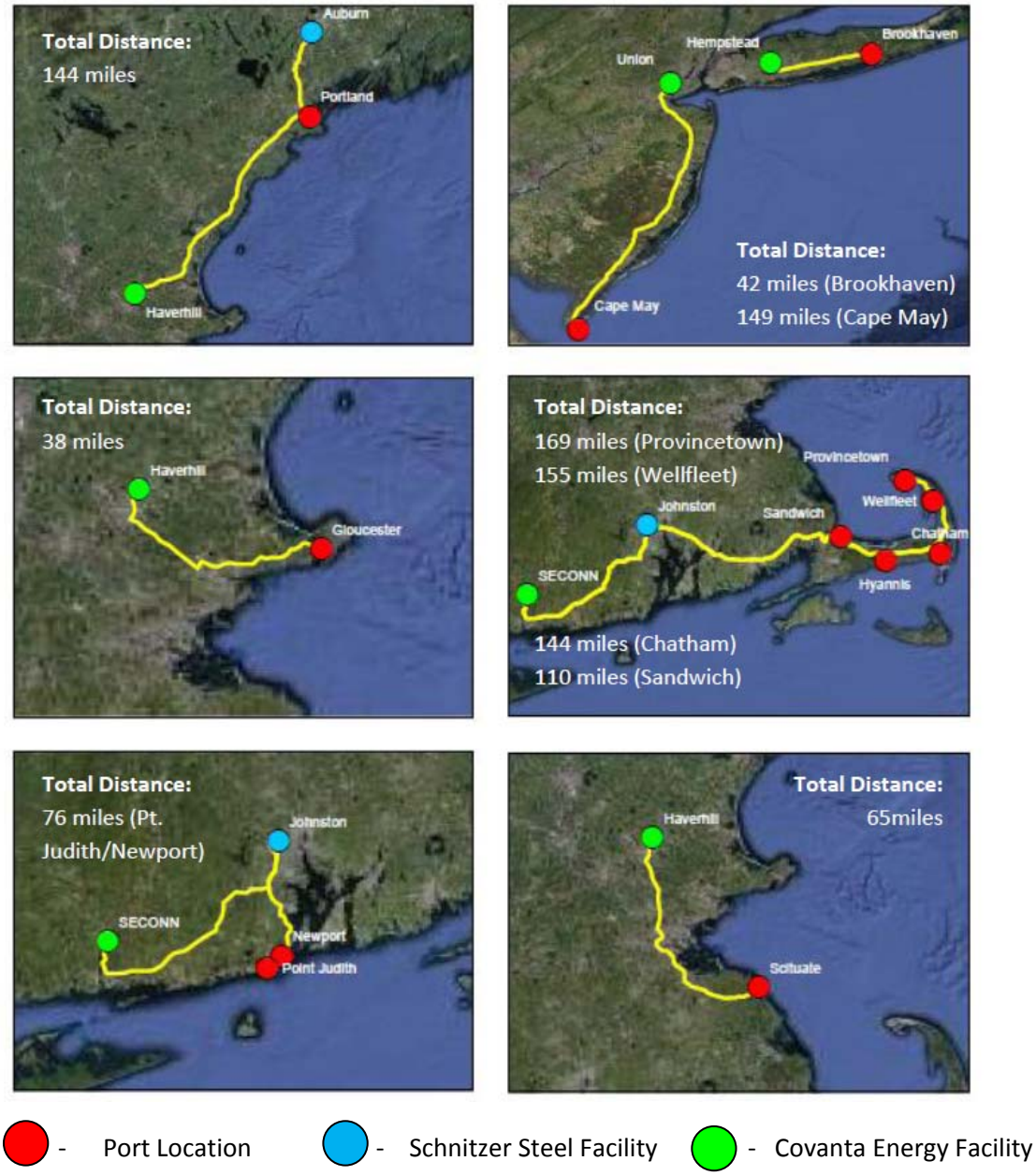

Figure 3 - Gear Collected To-Date by

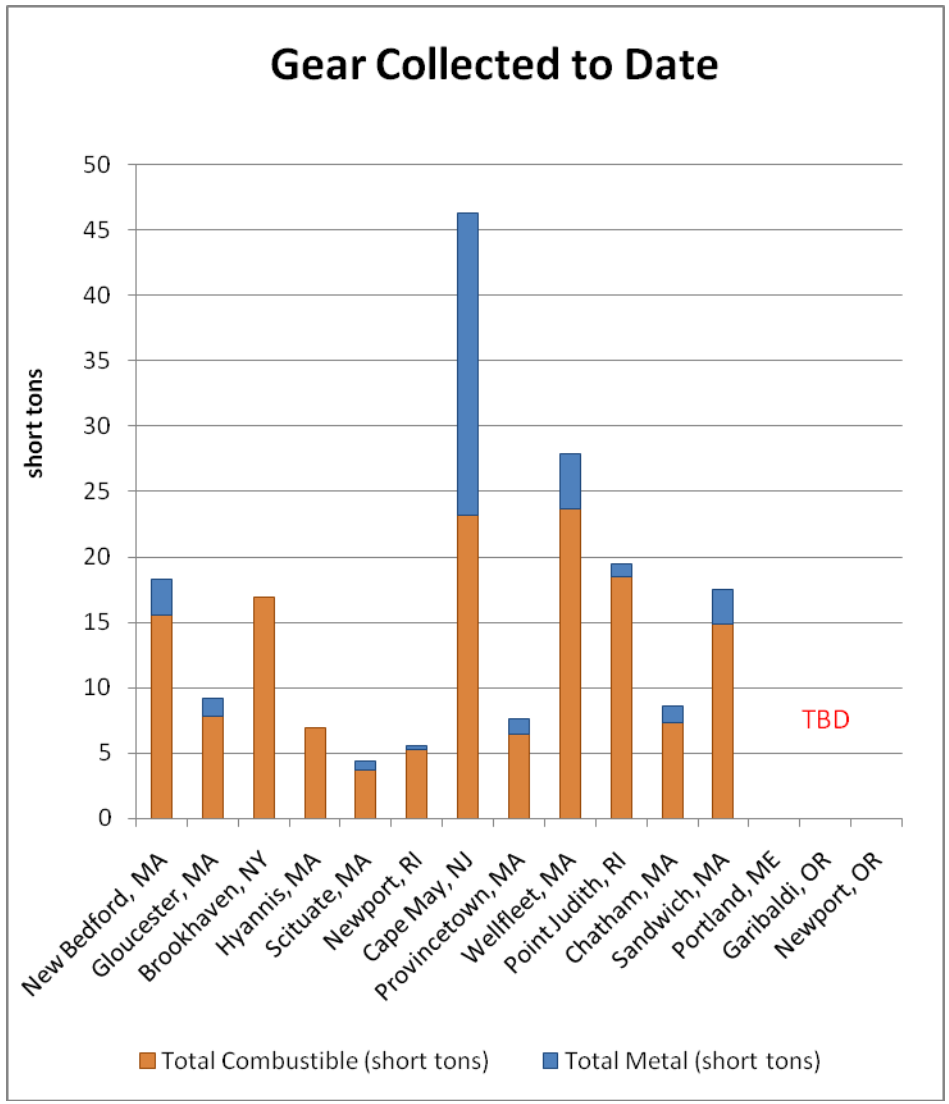

Table 1 - Gear Collected To-Date by Port (ports in bold have hosted media events)

Port Location	***Total Short Tons***	***Total Lbs***
New Bedford, MA	18.31	36,620
Gloucester, MA	9.16	18,320
Brookhaven, NY	16.89	33,780
Hyannis, MA	6.95	13,900
Scituate, MA	4.425	8,850
Newport, RI	5.56	11,120
Cape May, NJ	46.3	92,600
Provincetown, MA	7.65	15,300
Wellfleet, MA	27.86	55,711
Point Judith, RI	19.44	38,881
Chatham, MA	8.61	17,214
Sandwich, MA	17.52	35,030
Portland, ME	TBD	TBD
Garibaldi, OR	TBD	TBD
Newport, OR	TBD	TBD
TOTAL	**182.4**	**364,706.4**

Discussion/Conclusion

There are few limitations to the geographic potential of the *Fishing for Energy* program. The most restrictive limitation, which to date has not been a significant barrier to the ports we have targeted, is the transportation distances from a port to a processing facility. As a majority of services to the program are provided as in-kind contributions of time (travel, meetings) and services (gear processing, bin rental price discounts) real prohibitive costs factor in to the need to transport gear large distances. Thusly tied to partner facility locations, *Fishing for Energy* has not entertained serious bids for bins in the Carolinas, the Gulf States (excluding Florida), Alaska, and to a lesser extent California. These states are by no means excluded from participating in the future and in fact work is currently underway to revise the current business model to accommodate these locations.

Another challenge the program has had to overcome is in gathering gear collection information needed for comprehensive evaluation of the program. While we have the ability to track total weight of gear collected, there is currently no mechanism in place to track each of the different gear types and the volume or weight for each category. While specific gear types are not tracked, gear that is collected is separated out and tracked in 'metal' and 'non-metal' categories. The amount of metal collected and recycled through the program is determined by subtracting the final load weight numbers entering the Covanta facility for processing from the weight numbers entering the Schnitzer Steel facility straight from the port. This method is generally suitable for determining how much gear is being recycled, and how much is diverted from landfill into the Energy-from-Waste (EfW) process. There is however, the potential to lose some accuracy of the figures on a location by location basis, since often times (for cost purposes) loads of gear will be held at the Schnitzer facility until there is enough to make one large haul to a Covanta facility. In these instances, when weights are taken, if the load brought to Covanta is from multiple ports, that information is unfortunately lost. As a measure to overcome this we estimate that 15% of the gear collected is metal and calculations made accordingly, unless we know specifically otherwise (See Figure 1).

The diversity of port partners leads to both challenges for implementation and opportunities for promoting awareness of marine debris issues, as each port has different management structures, available manpower, marine debris disposal needs and connections to local fishermen and stakeholders. For example, in certain areas fishermen operate out of managed centralized ports with a defined and organized authority; others operate out of commercial processing plants (fish houses); others out of municipally- or state-owned piers. Some have ample manpower at their disposal to involve in the program; others do not and rely more heavily on fishermen volunteers to assist in coordinating events and managing the disposal bin. Just as there are local differences from port to port, there can also be significant differences from state to state. Regulations pertaining to handling fishing gear can vary from one state to the next, and these regulations are an important consideration for each new port to ensure the program does not violate, or promote or encourage others to violate, existing laws. In any case, identifying and involving the proper management or regulatory authority, as well as the

appropriate local contacts with ties to fishermen and conservation groups is a critical first step in implementing a successful program. Regardless of the capacity of the port, the most successful results are realized (in terms of media "reach", fisherman participation and, of course, gear collected) when the local partner(s) takes a proactive role in implementing the program in their port.

While the main component to the program is gear collection and disposal, to further enhance the conservation impact of the program, we are interested in helping ports currently participating in the partnership to promote locally-targeted outreach and education on the issues of derelict fishing gear. We have expanded the program in 2009 through a five-year commitment by Covanta and the NOAA Marine Debris Program to support not only gear disposal, but through providing seed-grant funding to ports, local government and conservation organizations in the area to increase capacity and coordination in addressing marine debris locally and to implement pilot incentive programs to increase fishermen participation in debris removal. This will be announced in late-summer 2009. The partners also continue to have a presence at local coastal/marine related events to enhance awareness about *Fishing for Energy*, and to coordinate with state agencies on opportunities to expand port-based collection sites to become comprehensive state-wide collection events.

As fishing fleets continually adapt to regulatory changes, as well as changes in supply and demand for fish products, there is a growing need for economical and environmentally sound opportunities for disposal of gear within the industry. Providing this service with a minimal amount of barriers, especially economic ones, to fishermen and others is the surest way of ensuring as much participation as possible. Without a doubt, *Fishing for Energy* has been successful due to the enthusiasm of participating fishermen and port partners, and the leveraging of shared resources from all participants to achieve the common goal of marine debris reduction in these port areas. United States Senator Sheldon Whitehouse has called *Fishing for Energy* a "collaborative and innovative project [that] will turn an environmental hazard and burden on local fishermen into an opportunity". In the absence of a comprehensive national program to remediate derelict fishing gear, it will be individual, locally-driven programs such as *Fishing for Energy* that stand to make the most initial progress. By providing fishermen a place to dispose of derelict gear they come across while on the water, and by easing the burden of high costs associated with disposing of old fishing gear into landfills, *Fishing for Energy* works to prevent the possibility of creating 'new' derelict gear one port at a time.

Literature Cited

Marine Debris Research, Prevention, and Reduction Act, Public Law 109-449

"Tackling Marine Debris in the 21st Century", National Research Council. National Academy of Sciences, 2008.

FISHING FOR ENERGY

Port Contact / For more information:

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National Fish and Wildlife Foundation

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tom.barry@nfwf.org

COVANTA ENERGY
for a cleaner world

SCHNITZER NORTHEAST

Appendix A

Port Nomination Form

1. Port/Facility Name:
2. Proposed Bin Location (and address):
3. Lead Contact:
4. Other Contacts:
5. Type of Gear Anticipated:
6. Lead Organization that will be available to assist in coordinating any logistics/ events for the partnership (this could be a port authority, fishing association, city, organization, etc.):
7. Description of the conservation/community need for bringing the Fishing for Energy partnership to this location/community:
8. Please check all that apply:
   - ☐ We are willing to survey the local fishing community (suggested template available) to estimate 'on-hand' amount of fishing gear ready to be collected
   - ☐ We are interested in engaging in projects and/or incentive programs to encourage removal of derelict gear
   - ☐ We have the capacity to provide outreach to the local fishing community about the program
   - ☐ We have the capacity to assist with community and media relations
   - ☐ We have the capacity to sponsor an event through location, podium and chairs if needed
   - ☐ We have a location for the bin that can be locked and/or secured to prevent unwanted dumping
9. Please indicate when you will be ready for bin placement
   - ☐ We are ready to host the partnership immediately (30-day minimum notice required):
   - ☐ We would like to host the partnership after (date):
10. Please indicate the type of bin you are interested in for your facility:
    - ☐ Permanent bin to be serviced up to four times per year
    - ☐ One-time event bin placement and removal
    - ☐ We would like to discuss the pros & cons of both types of bin placement to see what would best meet our needs

The Fishing for Energy partnership complies with all state and federal laws pertaining to the extraction, handling and disposal of derelict and non-derelict fishing gear. Any activities undertaken while participating in the Fishing for Energy partnership must adhere to the state and federal laws that currently govern the removal, handling, storage, and disposal of derelict fishing gear.

Name Date

Title

Email Form Print Form

Appendix B

Fishing for Energy Partners 2008-2009

Core Partners

- Covanta Energy
- National Fish and Wildlife Foundation (NFWF)
- National Oceanic and Atmospheric Administration (NOAA)
- Schnitzer Steel Industries, Inc.

Port / Event Partners

- ABC Disposal
- Atlantic Offshore Lobstermen's Association – Rhode Island
- Blue Diamond Disposal – New Jersey
- Cape May National Wildlife Refuge, U.S. Fish and Wildlife Service – New Jersey
- City of Gloucester (Harbormaster and Department of Public Works) – Massachusetts
- City of Portland – Maine
- Cote Fisheries Inc. – Hyannis, MA
- Garden State Seafood Association – New Jersey
- Lund's Fisheries – New Jersey
- Nantucket Soundkeepers – Massachusetts
- New Bedford Harbor Development Commission – Massachusetts
- New York State Department of Environmental Conservation
- Office of Bill Delahunt, United States Representative for the 10th District of Massachusetts
- Office of Jeff Van Drew, State Senator – New Jersey
- Office of Sarah Peake, State Representative for the 4th Barnstable District – Massachusetts
- Office of Sheldon Whitehouse, United States Senator – Rhode Island
- Palombo Fishing Corp. – Rhode Island
- Portland Fish Exchange – Maine
- Provincetown Center for Coastal Studies – Massachusetts
- Rhode Island Department of Environmental Management
- Stellwagen Alive – Massachusetts
- Stellwagen Bank National Marine Sanctuary – Massachusetts
- Town of Brookhaven – New York
- Town of Chatham – Massachusetts
- Town of Provincetown (Harbormaster and Department of Public Works) – Massachusetts
- Town of Scituate – Massachusetts
- Town of Wellfleet – Massachusetts
- Troiano Waste Services

Hawai‘i Marine Debris Action Plan: Statewide collaboration to address marine debris

Carey Morishige[1] and Kris McElwee[1]

[1]National Oceanic and Atmospheric Administration, Marine Debris Program / I.M. Systems Group, Inc.

Abstract

The National Oceanic and Atmospheric Administration Marine Debris Program (MDP) has been a partner in efforts to combat marine debris in Hawai‘i since 2005. Across the Hawaiian Archipelago, a number of efforts are taking place to address the impacts of marine debris. In order to prioritize Hawai‘i marine debris issues, coordinate between projects, and create a strategic plan of action, the MDP supported statewide planning workshops that began in June 2007. From the initial workshop, partnerships were created and a commitment made to develop a Hawai‘i Marine Debris Action Plan (HI-MDAP), the first statewide action plan in the nation to comprehensively address the issue of marine debris. The HI-MDAP includes greater coordination among partners, identification of potential avenues for funding, and increased communication. The development and implementation of the HI-MDAP is being supported by the MDP with assistance from the U.S. Environmental Protection Agency, Region 9.

Introduction

The Hawaiian Archipelago, extending 1,500 miles, is one of the longest and most remote island chains in the world. The Hawaiian Islands are prone to accumulating marine debris due to their proximity to the North Pacific Subtropical Convergence Zone, an area where ocean currents accumulate marine debris (Pichel et al., 2007). Each year, thousands of pounds of marine debris from domestic and foreign sources wash ashore and snag on reefs across the island chain. In Hawai‘i, as well as other parts of the world, marine debris threatens marine ecosystems, safe navigation, and wildlife.

The National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program (MDP) has been a partner in efforts to combat marine debris in Hawai‘i since 2005. The MDP works in cooperation with partners across the U.S. and internationally to address marine debris. Around the Hawaiian Archipelago, a number of efforts are taking place to address the impacts of marine debris.

Methodology

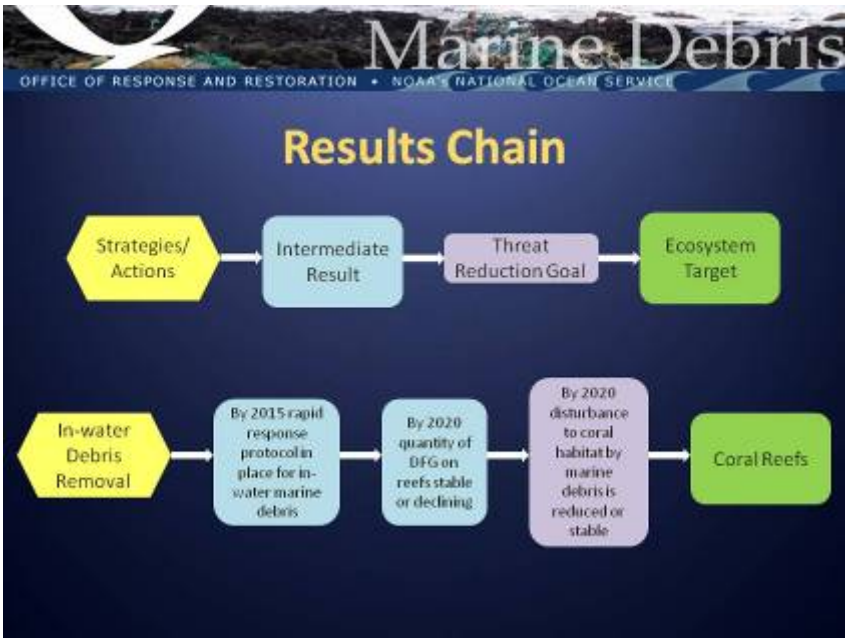
In order to prioritize Hawai'i marine debris issues, coordinate between projects, and facilitate greater collaboration between entities involved in addressing marine debris in Hawai'i, the MDP supported a pre-planning workshop in Honolulu, June 2007.

On January 15, 2008, the MDP coordinated a NOAA in Hawai'i marine debris workshop in order to prioritize marine debris issues and activities by NOAA in Hawai'i. The information and feedback from this NOAA meeting, combined with the pre-planning meeting, went in to planning a 2-day Hawai'i Marine Debris Workshop, January 16-17, 2008 in Honolulu.

The Hawai'i Marine Debris Workshop brought together over 30 representatives from government, academia, nongovernmental organizations, and private businesses working to address the issue of marine debris in Hawai'i. At this workshop, information on marine debris activities and priorities, in both the main and Northwestern Hawaiian Islands, was discussed. From this workshop, partnerships were created and a commitment made to begin the development of a Hawai'i Marine Debris Action Plan (HI-MDAP), which would include greater coordination among partners, identification of potential avenues for funding, and increased communication. The development and implementation of the HI-MDAP is being supported by the MDP and U.S. Environmental Protection Agency, Region 9. A summary report from this meeting is available online at http://marinedebris.noaa.gov/projects/himdap.html.

To begin creating the HI-MDAP, three focus area workshops were held between October and November 2008. Each workshop focused on one or two of the five identified focus areas for the HI-MDAP: 1) Research and Assessment, 2) Outreach and Education, 3) Land-based Debris Prevention, 4) Beach Cleanup, and 5) In-water Removal and Prevention. Representatives from all sectors participated in these workshops and crafted objectives for each focus area. Information on past and ongoing activities was gathered so that a record of what was done could be compiled and built upon. New actions were then brainstormed and discussed in detail. Feasible priority actions that could be completed within the next

three years were identified. During these meetings, a commitment was made by the group to continue to meet twice a year, implement priority activities, and update the action plan as needed.



The MDP has consolidated information for various new actions with assistance from HI-MDAP partners. In order to prioritize strategic new actions to pursue under the HI-MDAP, a tool known as a "results chain" will be used. A results chain is a "tool that clarifies assumptions about how activities or actions contribute to reducing threats and achieving conservation targets" thus allowing for more strategic prioritization of those activities or actions (NFWF, 2008). A results chain for marine debris in the Northwestern Hawaiian Islands has been started by the Papahānaumokuākea Marine National Monument (PMNM).

In fall 2009, the NOAA MDP will coordinate two meetings in order to collaboratively finalize the HI-MDAP with all partners involved. The first meeting will be a small group workshop to flesh out and build upon the results chains completed by the PMNM. The results of this meeting will then be used in a larger workshop with all HI-MDAP partners. During this workshop, priority actions will be reviewed and any identified gaps filled.

In January 2010, a meeting to roll out the new Hawai'i Marine Debris Action Plan to key decision makers, managers, and potential supporters will be held. Information on priority actions in each focus area will be presented by the lead partners. This meeting will help raise awareness of the problem of marine debris in Hawai'i and highlight the successful and ongoing partnerships that are formalized within the new action plan.

More information on all of these meetings can be found on the HI-MDAP website, created by and for all of the various partners, at http://sites.google.com/site/himdap/.

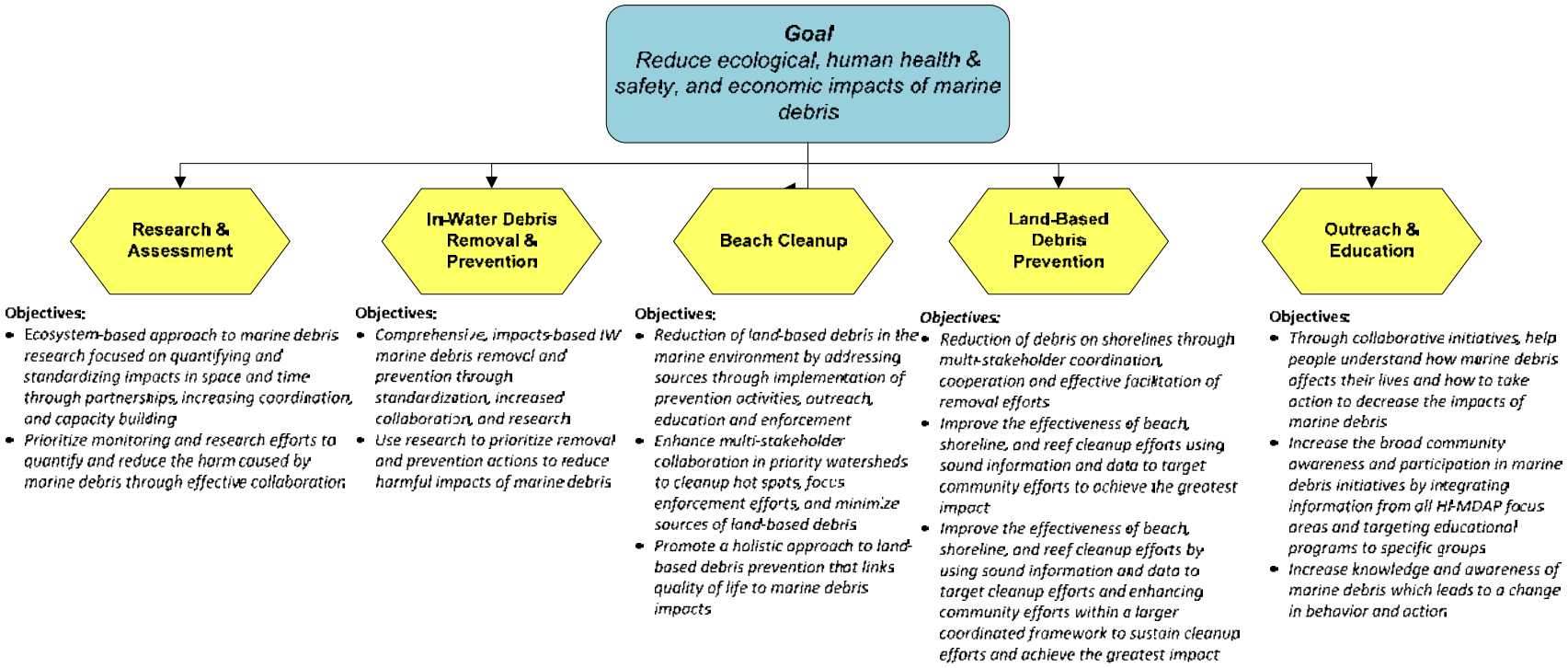
Results

Participants

Partners of the HI-MDAP include, but are not limited to:

- Archinoetics
- Chris Woolaway and Associates, LLC
- City and County of Honolulu, Department of Parks and Recreation
- City and County of Honolulu, Department of Environmental Services
- Community Work Day Program
- County of Hawai'i, Parks and Recreation, Aquatics
- Enchanted Lake Residents Association
- Hawai'i and Pacific Islands Ocean Observing System
- Hawai'i Pacific University
- Hawai'i Wildlife Fund
- Kini Beach
- Malama Na 'Apapa
- NOAA Fisheries Service, Recreational Fisheries
- NOAA Hawaiian Islands Humpback Whale National Marine Sanctuary
- NOAA Marine Debris Program
- NOAA Pacific Islands Fisheries Science Center
- NOAA Pacific Services Center
- NOAA PIRO Observer Program
- NOAA Restoration Center
- Oceanic Institute
- Oceanit
- Oikonos - Ecosystem Knowledge
- Papahānaumokuākea Marine National Monument
- Sea Turtles International
- Sheavly Consultants
- State of Hawai'i, Coastal Zone Management Program
- State of Hawai'i, Department of Business, Economic Development, and Tourism
- State of Hawai'i, Department of Health, Clean Water Branch, Polluted Runoff Control Program
- State of Hawai'i, Department of Land and Natural Resources, Division of Aquatic Resources
- State of Hawai'i, Department of Land and Natural Resources, Division of Boating and Ocean Recreation
- State of Hawai'i, Kahoolawe Island Reserve Commission
- TetraTech
- U.S.U.S. Coast Guard
- U.S.U.S. Environmental Protection Agency, Region 9, PICO Office
- U.S. Fish and Wildlife Service
- University of Hawai'i Sea Grant College Program
- University of Hawai'i, Center for Microbial Oceanography: Research and Education
- U.S. Navy Region Hawai'i
- Western Pacific Regional Fisheries Management Council

Focus Area Objectives



New Actions

Examples of new action items under each focus area:

- Research and assessment - Assess distribution and accumulation rates of derelict fishing gear in high-priority areas.
- In-water debris removal and prevention - Compile current knowledge, methods/techniques, information, and resources/expertise for in-water debris removal.
- Beach cleanup - Create a standard operating procedure or work plan for high risk/priority marine debris response
- Outreach and education - Develop signage on impacts of marine debris at public shorelines, marinas, piers, boat ramps, beach parks, storm drains, etc.
- Land-based debris prevention - Replicate monofilament recovery and recycling project (e.g., U.S. southeast region) in Hawai‘i

Conclusions

Through this process many important lessons were learned.

1. *The process cannot be rushed.* Initially we thought that all of the partners could be brought together, collaboration could occur, and priority actions created within a couple of meetings. Over two years later, the planning and coordination are still ongoing. We wanted to ensure that not only were all of the marine debris entities in Hawai'i involved, but that the plan and priority actions included in the plan were both feasible and effective. Additionally we wanted to ensure that the plan itself would remain dynamic and not sit on a shelf once it was completed. Continued communication and collaboration to implement the various priority actions within the plan are critical to thoroughly addressing marine debris in Hawai'i.
2. *There exists a "strategic learning curve."* We incorporated strategic planning tools and terminology in our action plan workshops not realizing that 1) not everyone was familiar with strategic planning, and 2) folks had differing definitions of various strategic planning terms (e.g., objective).
3. *To obtain strategic action results, you must be strategic in your planning.* Because of the difficulty folks were having with strategic planning tools and terminology we had incorporated into the workshops, we decided to skip it and move on with building the action plan. We realized that what resulted was a laundry-list of everyone's favorite projects versus a list of prioritized and strategic actions. This is the reason for the fall 2009 meetings and the incorporation of the results chain tool.

Overall, the process to create a comprehensive, statewide Hawai'i Marine Debris Action Plan has been a learning experience, but a successful one. There has been a notable increase in collaboration and cooperation between marine debris entities across the state. Information is being shared on activities and projects, and being built upon instead of being "reinvented" by different entities. This plan has already been successful in bringing together the numerous partners across the state of Hawai'i to work collaboratively to better address the problem of marine debris.

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Campaigns that Teach: Diving deeper into marine debris education

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Abstract

In response to a mandate from the Marine Debris Research, Prevention and Reduction Act of 2006, the National Oceanic and Atmospheric Administration (NOAA) Marine Debris Program (MDP) has worked with its partners to create a Web-based educational campaign for marine debris awareness and prevention. This campaign includes resources designed specifically for several target audiences, including boaters/mariners, students/educators, beachgoers, fishers as well as the general public. Each product provides information on the impacts of marine debris and suggestions on how to become part of the solution no matter where you live. The information is easily accessible, free, and downloadable via the MDP website at www.marinedebris.noaa.gov.

Introduction

Marine debris is everyone's problem. It is a global problem affecting everything from the environment to the economy; from fishing and navigation to human health and safety; from the tiniest coral polyps to giant blue whales. Marine debris also comes in many forms, from a cigarette butt to a 4,000-pound derelict fishing net.

Marine debris is any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes.

In an effort to combat this problem, the National Oceanic and Atmospheric Administration (NOAA) implemented its Marine Debris Program, a national and international effort focused on identifying, reducing and preventing debris in the marine environment. As part of this program, NOAA has developed this educational website to inform people on the sources, impacts, and solutions of the marine debris issue.

Methodology

The Web-based educational campaign, called "Marine Debris 101" was produced for the NOAA Marine Debris Program (MDP) under NOAA contract number AB133F06CN0193 by Sheavly Consultants, Virginia Beach, Virginia in close collaboration with the MDP and other partners including Katie Register, Christine Woolaway, and Bertha Walker; web programmer Brian Edwards; graphic designers J. Michael Myers and Wendy Kelly; writer/editor Sara McPherson; and NOAA project advisers Megan Forbes and Jim Coe.

Once the educational campaign was created, the website was posted live and announced by former First Lady Laura Bush during a ceremony to announce a new Marine Debris Initiative on November 2, 2007. Immediately, hits on the MDP website went from an average of 50,000/month to over 140,000 hits/month.

Results

Marine Debris 101 consists of a website, accessible through the MDP's website at www.marinedebris.noaa.gov, as well as downloadable materials geared specifically towards four main target audiences: 1) Beachgoer, 2) Fisher, 3) Boater/Marina Owner, and 4) Student/Educator.

The website is divided into three main sections: 1) Resources, 2) What You Can Do, and 3) Publications.

Resources (http://marinedebris.noaa.gov/marinedebris101/resource.html)
Under "Resources" you will find links to all of the Marine Debris 101 materials including brochures, fact sheets, posters/placards, and guidebooks. Additional materials may be found on the MDP Outreach and Education webpage under "NOAA Educational Resources" (http://marinedebris.noaa.gov/outreach/welcome.html).

Marine Debris 101 materials include:

Brochures	
Marine Debris: Understanding and Preventing Marine Debris This concise brochure provides a basic understanding of marine debris, its sources and impacts and offers readers suggestions to help solve this global problem.	
Land-Based Sources of Marine Debris: How People Can Prevent Marine Debris While on Land Learn how land-based sources contribute to marine debris and discover potential solutions to the problem with this handy brochure.	
Fishing and Marine Debris: How Fishermen Can Prevent Marine Debris With this brochure, fishermen can learn about the sources of marine debris, its effects on the marine environment and steps they can take to help reduce the amount of debris that enters the oceans and waterways.	
Boating and Marine Debris: How Recreational Boaters and Marina Owners Can Prevent Marine Debris This brochure educates boaters on the problem of marine debris - its sources, causes and impacts - and how they can become part of the solution.	
Fact Sheets	
Marine Debris Facts Learn how marine debris has become one of the most pervasive pollution problems facing the world's oceans and waterways and what can be done to solve the problem.	
Land-Based Sources of Marine Debris Learn how land-based sources contribute to the marine debris problem affecting our oceans and waterways and discover potential solutions to the issue.	

Fishing Facts This fact sheet offers important information on marine debris, its effects on marine species and habitat, how fishermen may be part of the problem and how they can help reduce the amount of debris that enters oceans and waterways.	
Boating Facts Boaters will learn what marine debris is, where it comes from, its impacts on the environment and what they can do help stem the tide of debris in our oceans and waterways with this fact sheet.	
Marine Debris Legislation and Policy Fact Sheet There are several major U.S. federal laws that address marine debris. Review this listing to learn more about existing laws and regulations that were designed to deal with marine debris and other pollution.	
Posters/Placard	
Understanding Marine Debris Poster Designed to educate people on marine debris, its sources, impacts and ways to prevent it, this poster provides a concise explanation of the debris problem. Poster prints at 11" x 17".	
Land-Based Sources of Marine Debris Poster This poster offers a succinct explanation of land-based sources of marine debris, its impacts and steps people can take to prevent it. Poster prints at 11" x 17".	

Fishing and Marine Debris Poster This 11" x 17"poster educates fishermen on how they may contribute to marine debris, its impacts on marine species and what they can do to help prevent this widespread problem.	
Boating and Marine Debris Poster This poster offers boaters a concise explanation of marine debris, its causes and impacts and steps they can take to help reduce the amount of debris that reaches oceans and waterways. Poster prints at 11" x 17".	
MARPOL Poster Developed with assistance from the U.S. Coast Guard, this 8" x 11" poster illustrates the various waste disposal restrictions that vessels must observe while at sea (under the MARPOL agreement and U.S. federal law).	
MARPOL Placard This 5" x 8" placard illustrates the various waste disposal restrictions that vessels must observe while at sea (under the MARPOL agreement and U.S. federal law).	
U.S. Boater & Marina Tip Sheet for Preventing Marine Debris Boaters and marina owners can refer to this handy tip sheet to learn some simple - yet effective - steps they can take to help reduce the amount of marine debris that enters the oceans and waterways.	

Guidebooks	
Boating and Marine Debris: Boater's Guidebook to Marine Debris and Conservation This guidebook provides important information to understand aquatic habitats, the effects marine debris has on them and steps boaters can take to help reduce marine debris.	
Reeling in Marine Debris: A Reference Guide to Recycling Monofilament Fishing Line This handy guide educates fishermen on the dangers discarded monofilament fishing line can pose to marine life, habitats and people and offers information on several line recycling programs throughout the United States.	
Guidebook to Community Beach Cleanups A step-by-step guide that provides readers with all the information they need to conduct their own beach or waterway cleanup. The guidebook also offers important information for those sites and coordinators participating in Ocean Conservancy's International Coastal Cleanup.	

What You Can Do (http://marinedebris.noaa.gov/marinedebris101/whatcando.html)
Sorted by target audience, this section provides tips on what each person can do to help prevent marine debris. Examples include:

- Get Involved! Participate in local cleanups in your area!
- Remember that the land and sea, no matter where you are, are connected!
- Reduce the amount of waste you produce.
- Reuse items whenever possible! Choose reusable items over disposable ones.
- Recycle as much as possible! Bottles, cans, cell phones, ink cartridges, and many other items can be recycled!

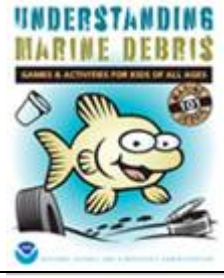
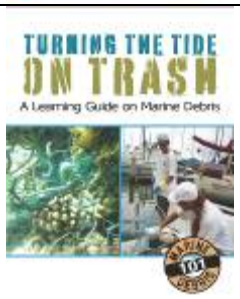
Additionally, this section provides suggestions on volunteer activities to get involved with, including the International Coastal Cleanup coordinated by the Ocean Conservancy, beach cleanups with the Surfrider Foundation, and activities with Keep America Beautiful.

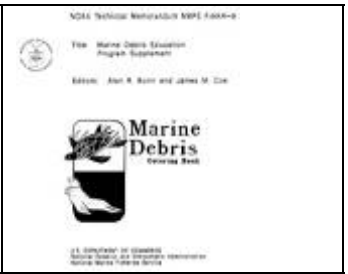
Publications & References (http://marinedebris.noaa.gov/marinedebris101/publications.html)
This section contains listings of publications and references on marine debris separated into three categories: 1) scientific references, 2) non-peer reviewed literature, and 3) international reports. Under "Scientific References" you will find a fairly good (though not comprehensive) list, in alphabetical order, of peer-reviewed scientific publications on marine debris from around the world. Under "Non-Peer Reviewed Literature" you will a good listing of reports and conference proceedings dealing with marine debris from across the US. Under "International Reports" you will find a listing of non-peer reviewed reports on marine debris from sources outside of the US.

Additional Resources and Materials (http://marinedebris.noaa.gov/outreach/welcome.html)
On the "Outreach and Education" page on the main MDP website there are links to several pages full of excellent resources and materials on marine debris, including: 1) NOAA Educational Resources, 2) Marine Debris 101, 3) Other Educational Resources, 4) International Resources, 5) Media, and 6) Videos.

NOAA Educational Resources (http://marinedebris.noaa.gov/outreach/NOAAres.html)
On this page you will find links to download all NOAA-created materials on marine debris. These materials are geared mainly towards the general public, though a few target students and educators. These materials include:

Facts About Marine Debris & How You Can Help An informational 1-page handout with general information on marine debris, including plastics, and information about marine debris concentration in the North Pacific Ocean.	
Information and Common Questions on Marine Debris A fairly detailed handout with answers to frequently asked questions on marine debris. All information within this document is from peer-reviewed and expert sources.	

Marine Debris Impacts Poster Created by the NOAA Marine Debris Program and University of Hawaii Sea Grant College Program in partnership with the NOAA Hawaiian Islands Humpback Whale National Marine Sanctuary. This poster highlights the impacts of marine debris, particularly entanglement and ingestion in marine species such as the humpback whale, green sea turtle, and Hawaiian monk seal.	
Understanding Marine Debris: Games and Activities for Kids of All Ages An assortment of puzzles, brain-teasers, and coloring activities help children understand the problem of marine debris while having fun at the same time. Suitable for all ages. Pages from this activity book are also available in Thai.	
Turning the Tide on Trash: A Learning Guide on Marine Debris Originally developed by the Environmental Protection Agency, this set of lesson plans and background information introduces educators, students and researchers to the topic of marine debris. The interdisciplinary education guide is designed to provide maximum flexibility in the classroom: it can be used as a stand-alone teaching tool or to supplement work in other subject areas. Appropriate for Grades 1 through 12.	
NOAA Protect Our Oceans Activity Book Created by the NOAA Marine Debris Program and Office of National Marine Sanctuaries. Contains marine debris activities from "Understanding Marine Debris: Games and Activities for Kids of All Ages" available in the Marine Debris 101 section.	
Marine Debris is Everyone's Problem Poster This poster contains general information on marine debris and what we can do to help prevent it. This poster is also available in Spanish, French, Japanese, and Korean.	

NOAA Marine Debris Coloring Book This coloring book contains fun pages with phrases on how we can prevent marine debris.	
Keep Oceans Clean Ocean Awareness Campaign The Ocean Awareness campaign was created in partnership with Environmental Defense, Disney, National Marine Sanctuary Foundation, NOAA, and the Ad Council. This website contains fun activities, an interactive game, and good information on how to prevent marine debris.	
A Hawaiian cultural display on marine debris A series of five display panels tying ancient Hawaiian culture and today's marine debris problem were created through a project coordinated by the NOAA Pacific Services Center and funded by the NOAA Marine Debris Program.	

Conclusions

Since the onset of the use of synthetic versus natural materials, the problem of marine debris has become one of the most pervasive forms of water pollution in the world. Targeted outreach and education remains one of the easiest, low-cost, and effective tools to promote and foster marine debris prevention. To ultimately prevent marine debris at its source, there must be a change in the behavior and mind-set of today's societies and industries. However, to cause an effective and noticeable change in behavior is one of the most difficult things to do and measure, and one that will take time.

Measuring the effectiveness of outreach and education efforts is difficult to do and rarely gets done. Currently, the NOAA Marine Debris Programs logs what quantitative information it can to track outreach efforts, such as number of participants to an event or presentation. This number, however, is in no way a measure of effectiveness.

The Web has been one of the most successful outreach and educational tools used. With minimal effort and maintenance, you are able to reach out to thousands. The Marine Debris 101 website receives over 25% of the visits to the NOAA Marine Debris Program's website, and is one of the top 2 most popular sections. Additionally, the use of media (e.g., press conferences, public service announcements, etc.) to drive visits to the website has been a huge success.

While general outreach and educational materials are good, more effective materials include those crafted with messages and information specific to a target audience group, are needed. Additionally, an increase in the use of the internet and social networking tools, such as FaceBook and Twitter, as outreach and education outlets are needed as society turns towards a greater use of these resources for their information (TheOceanProject.org, 2009).

Overall, outreach and education remains a critical component to fighting the problem of marine debris. Collaboration on outreach projects and materials across country borders would help in addressing the global issue and impacts of marine debris.

APPENDIX A

Project Summary Table

PROJECT SUMMARY TABLE

Project name	Location	Brief Project Description	Targeted debris	Pros	Cons	Challenges
Fishing gear buyback program	Republic of Korea - 51 local areas of 38 cities/towns	Incentive program to encourage fishermen to bring back marine debris (mainly from the seabed) encountered during fishing. A small amount is paid for marine debris brought back.	Derelict rope, derelict net, derelict traps recovered by fishermen	- Cost-effective way to remove seabed litter - Helps improve fishermen recognition of marine debris impacts - Provides income to fishermen - Provides proper disposal option	- Does not follow polluter-pays principle - Fishermen may bring their own domestic garbage and used fishing gear	- Budget
Coastal cleanup program	Republic of Korea - 162 sites in 42 administrative units along the coast	Coastal cleanup program to provide paying jobs for the removal of marine debris on the coast.	All types	- Prevents marine debris from entering the sea - More cost-effective than recovering marine debris from ocean - Enhances aesthetic value of coastline - Job creation for the elderly - Education through involvement of many individuals	- Difficult to apply in remote islands - Difficult to get reliable data for regional comparisons	- Budget - Lack of appropriate trash receptacles
Marine litter treatment - Nakdong River (Cost-sharing)	Republic of Korea - Nakdong River	Cost-sharing program between areas (municipals and government) along the Nakdong River for the treatment of marine debris at the river mouth.	Land-based debris, domestic garbage, lumber (also plant material generated during rainy season)	- Determines fair cost-sharing rate based on scientific research - Reduces land-based marine debris generation - Enhances cooperation among central government and local communities to combat marine debris - Increases responsibility of each area - Demonstrates leadership in applying cost-sharing (partly polluter-pays) approach - Built-in schedule for renegotiation of rates can benefit areas that improve waste management	- Difficult to agree to annual activity plan, which determines annual budget (Note: cost-share is determined by project, but budget is not) - Difficult to gather high-quality data on which to base cost-share rates	- Ongoing research necessary to allow renegotiation of rates
Floating receptacles for marine litter	Republic of Korea - Haenam-gun, Cheollanam-do (province)	Placement of dedicated floating marine debris receptacles in port areas for collection of derelict fishing gear.	Derelict fishing gear, ship-generated waste, plastic bags	- Proximity to land makes unloading debris easy - Easy for fishermen to load debris onto barge - Cost-effective to recover marine debris because of ease of disposal - Low cost to make receptacles (barges) - Fishermen voluntarily collect and convey debris to the receptacle - Enhances aesthetic value of port - Reduces bad smell of marine debris at port - Launching and moving the barge are easy	- Fishermen may dump their own aquaculture materials - Barges are vulnerable to the harsh environment (requires movement of barges)	- Waiting to be spread nationwide - Considerging additional supplement to burden the extra fee to fishermen for their own sea-farming debris disposal
Monofilament recycling	United States - Nearly all coastal states	Nationwide network of fishing line recycling bins to help anglers dispose of used fishing line.	Recreational monofilament fishing line	- Applicable to (educates and raises awareness among) a large audience - Debris prevention at source - Makes proper disposal convenient - Simple to replicate - Online tracking system will allow broad viewing of results - Creates a beneficial by-product - Involves angler community in solution	- Very wide network is hard to coordinate and follow up regularly (bin emptying, data reporting, etc.) - Monofilament impact may not be in proportion to effort to combat it - Trash in bins - Accepts only single-strand monofilament	- Keeping up with overwhelming demand! - Data reporting
Nets to Energy	United States - Hawaii	Public-private partnership to use derelict fishing net, line, and rope to create electricity.	derelict fishing nets and line, longline monofilament, nylon rope	- Well established - Good public relations for partners - Keeps nets out of landfills (but see con) - Raises awareness of DFG - "Feel good" project - Disposes of debris from a broad range of removal activities - Creates a beneficial by-product	- Doesn't affect landfill volume - Displaces municipal solid waste - Restricted to ropes and nets	- Ongoing communication and care of relationships - Ongoing commitment of partners
Pier 38 port reception	United States - Hawaii	Port receptacle for derelict nets, line, and rope. Debris from this receptacle goes through the Nets to Energy process.	derelict fishing nets and line, longline monofilament, nylon rope	- Encourages removal - Makes responsible disposal convenient - Good PR for longline fishermen - "Feel good" project - Community beach cleanups feel more effective - Engaging fishing community in the solution	- May receive domestic waste - Maintenance and upkeep (bin loading, unloading, etc.)	- Ongoing communication and care of relationships - Ongoing commitment of partners
Fishing for Energy	United States - States along the northeast and west coasts	The Fishing for Energy partnership provides fishermen a no-cost disposal service for old or derelict fishing gear and coverts it into clean, renewable energy, using state-of-the-art energy-from-waste-technology.	Fishing gear (used or derelict; traps, nets, line, buoys, floats)	- Engaging fishing community in the solution - Flexible/adaptable program - Removes barriers (e.g., cost and convenience) to responsible disposal for fishermen - Increases local and regional awareness of the issue of marine debris - Creates a beneficial by-product - "Feel good" project	- Potentially high travel costs - Geographic limitations - Doesn't take advantage of other disposal or recycling options (e.g., plastic recycling of clean gear)	- Tracking gear types - Working with different resource availability at various ports - Gear collection logistics (e.g., sorting different gear types, bin security) - Debris removal regulations in NE
Hawaii Marine Debris Action Plan	United States - Hawaii	A statewide planning process and action plan to address marine debris impacts in Hawaii collaboratively and effectively.	All types	- Improves coordination - Builds relationships - Potential to focus efforts to make beneficial changes to resources	- Requires funding even though it's just a planning effort (doesn't attain goals directly) - Takes a long time to do it right	- Need for dedicated attention/coordinator
Outreach and Education - Marine Debris 101	United States - Nationwide	A web-based outreach and education campaign (Marine Debris 101) to promote marine debris prevention.	All types	- Typically inexpensive - Activities typically build partnerships - Raises awareness - Behavior changes (see challenges) - Debris prevention - Fun	- Time-consuming - Published materials can become litter	- Diverse audiences require targeted outreach - Difficulty in effective key messaging - Very few quantitative measures of success - Making leap from awareness to behavior change is difficult

APPENDIX B

Meeting Agenda

Marine Debris Abatement Workshop

August 12-14, 2009

Honolulu, HI

AGENDA

Day 1: August 12, 9:00am - 5:00pm	
Start time: 9:00am	
9:00 - 9:15	Introductions & Welcome
9:15 - 9:45	History of MLTM-NOAA joint project; Overview of agenda
9:45 - 10:00	*Break*
10:00 - 10:45	Buyback program for fishing gear and marine litter from fishery activity (MLTM)
10:45 - 11:15	Recovery program for marine litter at the coast (MLTM)
11:15 – 12:45	Lunch (self pay)
12:45 - 1:30	Cooperation program of budget sharing for the treatment cost of the marine litter at the mouth of Nak-dong river (MLTM)
1:30 - 2:15	Managing dedicated receptacles on shipboard for marine litter (MLTM)
2:15 - 2:30	*Break*
2:30 - 4:30	Discussion of each activity: pros and cons? what worked? what didn't work?
End at 4:30pm	

Day 2: August 13, 9:00am - 5:00pm	
Start time: 9:00am	
9:00 - 9:15	Overview of Day 2 agenda
9:15 - 10:00	Monofilament Recycling (BoatUS Foundation)
10:00 - 10:45	Nets to Energy / Fishing for Energy / Port Reception (NOAA & National Fish and Wildlife Foundation)
10:45 - 11:00	*Break*
11:00 - 11:45	Hawaii Marine Debris Action Plan (NOAA)
11:45 - 1:00	Lunch (self pay)
1:00 - 1:30	Outreach and Education (NOAA)
1:30 - 2:30	Continuation of discussion of each activity: pros and cons? what worked? what didn't work?
2:30 - 2:45	*Break*
2:45 - 4:00	Discussion on future partnership projects having to do with "Strategies and Activities for the Prevention and Abatement of Nearshore Marine Debris" that come out of this workshop.
4:00 - 5:00	Put together, lay out, and finalize the summary report document
End at 5:00pm	

Marine Debris Abatement Workshop

August 12-14, 2009

Honolulu, HI

Day 3: August 14, 9:00am – 4:30pm	
9:00	Meet at Pier 38 -- carpool if possible
9:00 - 9:30	Overview and visit to Pier 38 port receptacle
9:30 - 10:30	Visit with Pacific Ocean Producers Fishing and Marine Visit with longline fishing vessel
10:30 - 12:00	Breakfast/Lunch at Nico's (self pay)
12:00	Leave Pier 38 for Campbell Industrial Park (take 2 cars only)
1:00 - 2:00	Tour of Covanta Energy H-Power
2:15 - 3:15	Tour of Schnitzer Steel Hawaii Corporation
4:30 *or so*	Arrive back at Pier 38

APPENDIX C

Participant List

PARTICIPANT LIST

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