



Marine Debris Program, Coral Reef Ecosystem Division, Pacific Islands Fisheries Science Center, NOAA Fisheries

SYNOPSIS OF THE 2005 NWHI MARINE DEBRIS FIELD SEASON

INTRODUCTION

The Northwestern Hawaiian Islands (NWHI) archipelago is a 1,200 nautical mile chain of atolls and islets geographically positioned as a repository for significant amounts of marine debris, including derelict fishing gear. Derelict fishing gear resulting from either accidental losses or voluntary discards circulates within the North Pacific Subtropical Gyre until encountering the NWHI archipelago. As debris conglomerates reach these islands and atolls, wave energy forces these masses across coral reefs, entangling the derelict fishing gear upon corals. Derelict fishing gear devastates coral reef ecosystems on a number of trophic levels, including the degradation of coral reef habitat and entanglement of species of concern such as the endangered Hawaiian monk seal (*Monachus schauinslandi*) and the threatened green sea turtle (*Chelonia mydas*).

The NOAA Fisheries Pacific Islands Fisheries Science Center (PIFSC) Coral Reef Ecosystem Division (CRED) Marine Debris Program is proud to report a successful conclusion to the 2005 Northwestern Hawaiian Islands (NWHI) marine debris field season. 2005 marks the fifth consecutive year that the Coral Reef Conservation Program (CRCP) has provided funding for the PIFSC to lead a cooperative effort to survey for and remove derelict fishing gear from the NWHI archipelago.

The CRED Marine Debris Program collaborated with multiple organizations, including (though not limited to) the NOAA Coral Reef Conservation Program, NOAA Marine Debris Program, NWHI Coral Reef Ecosystem Reserve, State of Hawaii Department of Land and Natural Resources, City and County of Honolulu, U.S. Fish and Wildlife Service (USFWS), U.S. Coast Guard (USCG), U.S. Navy, University of Hawaii, University of Hawaii Sea Grant



An endangered Hawaiian monk seal sleeps against a large piece of marine debris. Marine debris remains a common sight in monk seal habitat. Photo by Eric Dobbs CRED

College Program, Schnitzer Steel Hawaii Corp., (formerly Hawaii Metals Recycling, Inc.), Covanta Energy, Honolulu Waste Disposal, and other federal and local agencies, businesses and NGO partners.

The principle goals for the 2005 field effort were:

- To conduct a large-scale removal of derelict marine debris from shallow water coral reef environments in the NWHI, focusing on French Frigate Shoals;
- To collect samples of net and other debris in an effort to identify source fisheries;
- To survey and evaluate established High Risk Entanglement Zones (HERZ) and newly defined Accumulation Rate Sites (ARS) in an effort to study debris accumulation;
- To remove onshore marine debris in collaboration with the USFWS and NOAA PIFSC Protected Species Division (PSD);
- To assist the USCG with marine debris removal operations at Pearl and Hermes Reef and Maro Reef, and;
- To assist with ongoing data collection efforts and/or pilot studies in support of several multi-disciplinary research projects, including:
 - Gathering accurate *in-situ* depth data using GPS/transducer combinations for bathymetric groundtruthing;
 - Documenting historical artifacts encountered during towboard and swim surveys;
 - Assisting ongoing data collection efforts supportive of a baseline distribution and abundance study of black-lipped pearl oysters (*Pinctada margaritifera*), and crown-of-thorns sea-stars (*Acanthaster planci*);
 - Deploying, recovering and inspecting physical oceanographic equipment;
 - Transporting NOAA PIFSC PSD remote field camp personnel and equipment.

The 2005 field season concluded after overcoming the grounding and evacuation of the M/V Casitas, an accelerated and rigorous redeployment timetable, and an intense survey and removal schedule aboard two USCG vessels and the chartered M/V Freebird which continued into mid-November. The challenges encountered during 2005 were well met by a team of competent and well-trained NOAA divers who turned a difficult field season into a remarkable success.

THE 2005 MARINE DEBRIS FIELD SEASON: M/V CASITAS AND M/V FREEBIRD

M/V CASITAS CRUISE

The M/V Casitas embarked from Honolulu Harbor for the NWHI Archipelago on June 8th 2005 with 7 crew, 16 CRED marine debris divers, and 1 NOAA Fisheries PSD staff member traveling to Laysan Island. Marine debris field operations commenced at Laysan Island with one team collecting 1,084kg of land debris and an additional team inspecting a sea-surface temperature (SST) buoy and installing a subsurface temperature recorder (STR). Upon completion of Laysan Island operations, the M/V Casitas facilitated further land debris operations and oceanographic buoy work at Lisianski Island, Kure Atoll and Midway Atoll with corresponding onshore land debris collections of 1170kg, 1727kg, and 4899kg. Initial towboard surveys were conducted at the Kure Atoll HERZ and ACS before relocating to Pearl and Hermes Reef.

The M/V Casitas arrived at Pearl and Hermes Reef on June 19th to collect land debris, resurvey HERZ, survey ACS, inspect CREWS (Coral Reef Early Warning System) buoys and establish waypoints for USCG marine debris operations. 14,281kg of debris were recovered at Pearl and



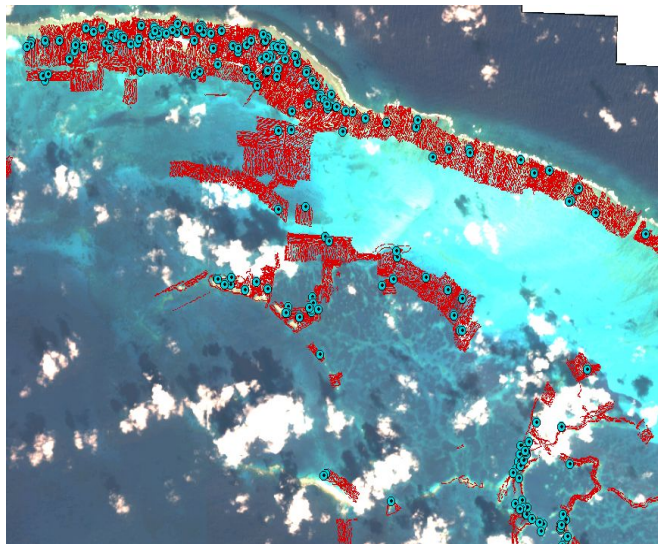
A marine debris diver carefully removes derelict fishing gear entangled on a living coral reef. Photo by Noah Pomeroy CRED

Hermes Reef from June 19th to June 29th upon surveying 3.04km². After repeated difficulties with the ship's desalination system, the M/V Casitas traveled to Midway Atoll to obtain components to repair the malfunctioned equipment. Subsequent plans were to travel to Maro Reef to inspect CREWS buoys and initiate marine debris surveys.

M/V CASITAS GROUNDING

On July 2, the M/V Casitas ran aground on a northeast section of forereef at Pearl & Hermes Reef en route to Maro Reef. The Casitas crew and CRED marine debris divers worked quickly to assess damages and secure items aboard the vessel. CRED marine debris divers loaded water and provisions onto four Avon craft and

launched them at 0430 (this launch was to prevent all Avons from being trapped aboard in the event of a power loss to the ship's crane). By the afternoon of July 2, conditions had not improved and a USCG C-130 dropped dewatering pumps to manage flooding aboard the grounded Casitas. Despite all efforts, the Casitas would prove impossible to move from her position and the captain was forced to give the order to abandon ship. All small craft were loaded with fuel and supplies and then navigated through the shallow reef to North Island where a temporary shelter was constructed. On July 3, all CRED marine debris divers and Casitas crew relocated to the NOAA Fisheries PSD field camp on Southeast Island and afterward were picked up by the NOAA Ship Oscar Elton Sette. CRED marine debris divers returned to Honolulu via a USCG flight from Midway Atoll.



An Arcview image of northern French Frigate Shoals constructed using 2005 survey data combined with IKONOS imagery. Image produced by Sean Guerin CRED

No injuries occurred during the Casitas grounding and all marine debris survey data was retrieved. It is worth remarking that the CRED marine debris divers functioned exceptionally during this event. The successful management of such a traumatic and unforeseeable event is testament to the initial training and regular updates CRED marine debris divers undergo prior to field deployment.

REDEPLOYMENT ON THE M/V FREEBIRD

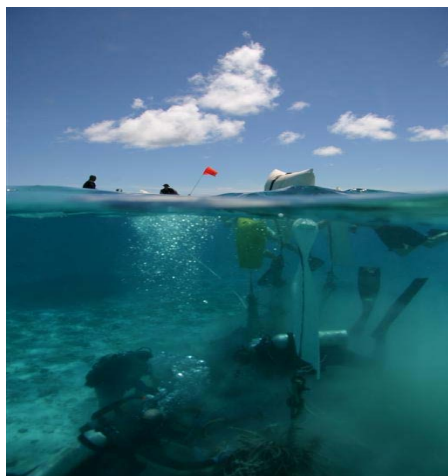
Upon returning to Honolulu, July and August saw an intensive redeployment effort from CRED and its marine debris team. The USCG and American Marine vessels recovered some CRED Marine Debris Program gear from the M/V Casitas; however, a substantial quantity of equipment was either damaged beyond repair or not recovered. Consequently, the following six weeks were spent procuring sufficient replacement gear (boat parts/components, medical and dive equipment, etc.) and an appropriate operational platform to facilitate a safe resumption of the marine debris field season.

On September 19, the marine debris field season resumed when the M/V Freebird embarked from Honolulu Harbor en route for French Frigate Shoals (FFS), where the main focus of marine debris survey efforts were scheduled for 2005. Survey operations commenced on September 23 and continued until November 10. Towboard surveys were directed in the shallow water FFS backreefs, specifically areas nearby Tern Island and the atoll's other northern islands. HERZ and ACS were surveyed in order to augment historical data collected from HERZ surveys and gather new baseline data from the newly defined ACS. The extensive surveys at FFS revealed lower derelict net densities (nets/km²) from those found in other areas of the NWHI (17,793kg of marine debris over 21.4 km² of surveyed area). The thorough survey data collected from the FFS surveys concluded a large scale five-year NWHI marine debris study.

Shipwreck remnants that were discovered during FFS surveys were also documented and presented to Dr. Hans Von Tilburg of the National Marine Sanctuaries Maritime Heritage Program.

THE 2005 UNITED STATES COAST GUARD MARINE DEBRIS CRUISES

The United States Coast Guard provided two Cutter vessels, (USCGC) Walnut and USCGC Kukui, to support the cooperative marine debris project in the Northwestern Hawaiian Islands (NWHI) from August 22nd until September 19th. The program was primarily tasked to remove derelict fishing gear at depths greater than 10 meters within Pearl and Hermes Reef. Upon completion of this primary task, additional debris removal operations were performed within the shallow reef habitats of Maro Reef. These cruises were a tremendous success and serve as an example of the efficiency and productivity possible with interagency and multi-partnership cooperation.



USCG divers recover a buried net at Pearl and Hermes Reef. Photo courtesy of the USCG

The removal of deeper debris at Pearl and Hermes Reef provided new baseline data for accumulation studies on deeper habitats. Future debris removals at PHR can now be well planned by studying historical survey data. At Maro Reef significant portions of previously unsurveyed habitat were covered during this cruise. Much of the area remaining to be surveyed at Maro Reef is exposed to open-ocean conditions, making planning and surveys difficult. Furthermore, greater exposure to open ocean suggests a lesser likelihood of high debris density.

CONCLUSIONS

The 2005 NWHI marine debris field effort represents a variety of remarkable successes and enables the pursuit of future CRED Marine Debris Program goals.

- 2005 NWHI Surveys covered 25.67 km² of area yielding 51,807 kg of total derelict fishing gear recovered from both NOAA and USCG field operations.
- Land debris removal operations conducted cooperatively with PSD personnel and USFWS staff totaled 12,407 kg of derelict fishing nets carefully removed from endangered monk seal and threatened green sea turtle habitat.
- Complete and accurate HERZ surveys expanded historical records for accumulation totals by year and updated monitors on these sensitive areas.
- Survey data collected from the ARS supplied integral baseline data for planning future NWHI surveys.



Marine debris diver display nets recovered from a single day's surveys at French Frigate Shoals. Photo by Suzy Cooper Alletto CRED

Extensive surveys completed at FFS concluded a five-year large-scale marine debris study in the NWHI and successfully mark a transition to reduced scale operations for future NWHI marine debris cruises. Additional significant accomplishments during 2005:

- Deployment of a Ghostnet buoy on a derelict fishing net located in the open ocean en route to FFS assisted the Ghostnet program in tracking high seas derelict fishing gear within the northern subtropical gyre.
- The CRED Marine Debris Team removed a 299 kg derelict fishing net from a beachfront residence on Kaneohe Bay, Oahu. This rapid response recovery suggests the ability for regular marine debris removal operations in the Main Hawaiian Islands;
- Numerous sample additions were made to the Net Analysis Database, a multi-year database used to identify source fisheries for derelict fishing gear;
- A Net Analysis Handbook was produced by Molly Timmers of CRED and Mary Donahue of University of Hawaii Sea Grant College Program;
- Photographs and videos collected on marine life and wildlife by marine debris divers this year will become valuable species identification tools and research material for NOAA Fisheries PIFSC programs;
- Finally, the grounding of the M/V Casitas was a powerful test for the CRED Marine Debris Program. Commendable and professional efforts from NOAA divers resulted in self-rescue along with the rescue of M/V Casitas crew, recovery of all Avon craft and all collected survey data. Perhaps more impressive though is the dedication of the CRED Marine Debris Team to redeploy soon after the grounding to continue marine debris survey and removal efforts in the NWHI.

FUTURE PROGRAM OBJECTIVES

With the conclusion of a five-year large scale NWHI marine debris effort, NWHI efforts in 2006 involve staging operations from NOAA ships and reducing the scale of NWHI survey efforts in order to monitor derelict fishing gear accumulation rates in the NWHI. A marine debris survey database compiled from several years of large-scale survey operations will be scrutinized to construct precise and efficient future NWHI maintenance surveys. Particular attention will be given to the amassed HERZ and ACS data when planning 2006 and future NWHI cruises.

Additional funding has allowed for the development and implementation of a Main Hawaiian Islands (MHI) marine debris survey and removal project. CRED Marine Debris divers recently underwent an emergency helicopter egress and survival course in November 2005 as part of training for helicopter aerial surveys scheduled for early 2006. Marine debris aerial surveys are planned for the Big Island (Hawaii) and Kauai to examine coastline and nearshore reef habitats for derelict fishing gear distribution. Upon completing these local aerial surveys, shoreline inspections and boat-based field surveys will be employed to confirm marine debris locations prior to removal. MHI marine debris efforts will thereby extend the CRED Marine Debris Program and multi-partner mission locally.

Additional future operational objectives include, but are not limited to:

- Continued remote sensing projects at sea with deployment of Ghostnet buoys and utilizing the assistance of the NOAA Fisheries Observer Program for derelict fishing gear locations.
- Continued local emergency response actions
- Assistance to the developing Port Reception Feasibility project in its goals to recover derelict fishing gear encountered by commercial fishermen and the public.



A Ghostnet drift buoy deployed on a large marine debris conglomerate found en route to FFS. The Ghostnet Program uses data from these buoys to track high seas debris. Photo by Amy Hall CRED

TIMELINE OF OPERATIONS

M/V CASITAS

06/08 Depart Honolulu (HNL)
06/13 Arrive Laysan Island: Installed STR, Inspect SST, Land Debris
06/14 Arrive Lisianski Island: Land Debris, Install SST
06/15 Arrive Kure Atoll
06/16 Kure Atoll: Land Debris, ACS, HERZ
06/17 Depart Kure Atoll
06/18 Arrive Midway Atoll (MID): Install SST
06/19 Midway Atoll: Land Debris at Eastern & Spit Islands
06/20 Arrive Pearl and Hermes Reef (PHR)
06/21 PHR: HERZ, Land Debris
06/22-06/29 PHR: Towboard and swim surveys
06/30 Depart PHR
07/01 Arrive MID, Depart MID
07/02 PHR: Grounding on northern reef, North Island camp
07/03 PHR: East Island, NOAA Ship Oscar Elton Sette pickup
07/04 Arrive MID
07/05 Depart MID USCG C-130
07/06 Arrive HNL

USCGC WALNUT

08/22 Depart HNL for PHR
08/26-9/01 PHR: Deep debris recovery
09/02 PHR: Tow surveys of 'sand margin', depart for Maro Reef (MAR)
09/03-09/06 MAR: Swim surveys
09/07 Depart MAR for HNL
09/10 Arrive HNL

USCGC KUKUI

08/31 Depart HNL with items for delivery to MID
09/04 Arrive MID, Depart MID for MAR
09/07 Arrive MAR
09/08-09/15 MAR: Swim surveys, depart MAR for HNL
09/19 Arrive HNL

M/V FREEBIRD

09/19 Depart HNL for French Frigate Shoals (FFS)
09/20 Deployed Ghostnet buoy
09/22 Arrive FFS
09/23-11/11 FFS: Towboard surveys, Land Debris, depart FFS for HNL
11/14 Arrive HNL

**NOAA Fisheries Scientific Personnel
Marine Debris Field Party**

Kyle Koyanagi	Operations Manager/Team Leader/Dive Master/Medical Officer
Amy Hall	Team Leader/Dive Master/Medical Officer/Data Manager
Mark Albins	Medical Officer/Scientific Diver
Charles Young	Medical Officer /Scientific Diver
Oliver Dameron	Data Manager/Scientific Diver
Sean Guerin	Data Manager /Scientific Diver
Stephane Charette	Working Diver
Suzy Cooper Alletto	Scientific Diver
Edmund Coccagna	Scientific Diver
Bonnie DeJoseph	Scientific Diver
Eric Dobbs	Scientific Diver
Susanna Holst	Scientific Diver
Kevin Lino	Scientific Diver
Ann Mooney	Scientific Diver
Noah Pomeroy	Scientific Diver
Coby Sims	Scientific Diver
Joshua Slater	Scientific Diver
Todd Waas	Scientific Diver

Honolulu Support

Rusty Brainard	CRED Chief/Principle Investigator
Seema Balwani	COTR
Brian Zgliczynski	COTR
Jacob Asher	Reserve Team Leader/Reserve Dive Master

HERZ AREA COVERED 2005

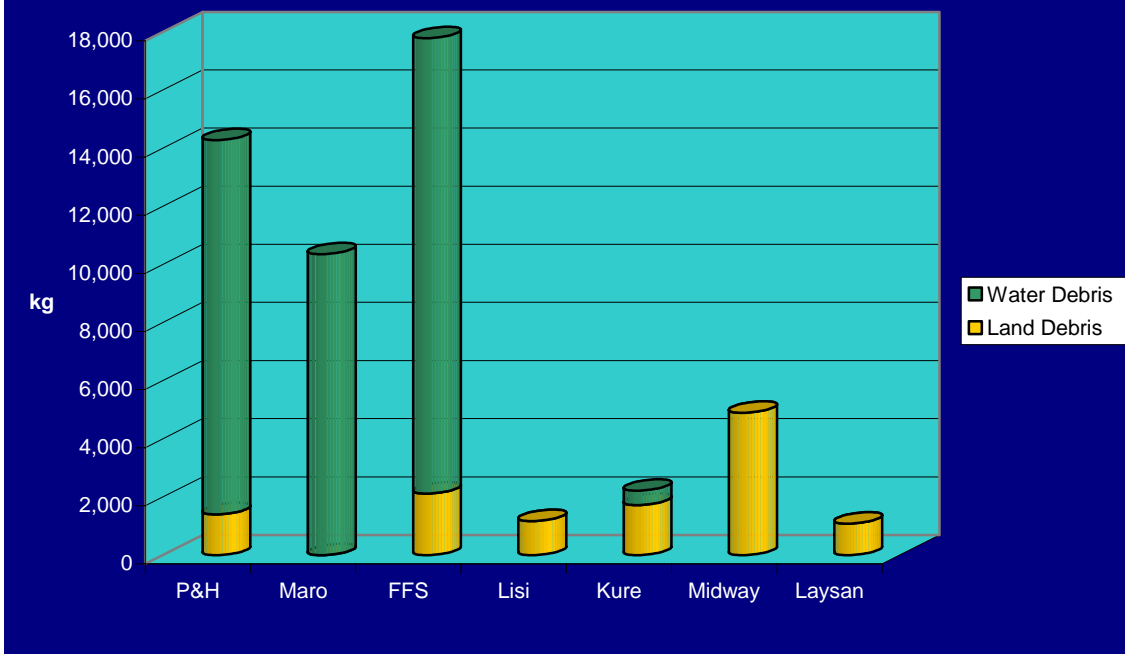
	Area Covered	Number of Net Sites	Weight Removed
Pearl and Hermes Reef	.9710 km2	19	122 kg
Kure Atoll	1.24 km2	10	324 kg

DEBRIS REMOVED BY WEIGHT 2005

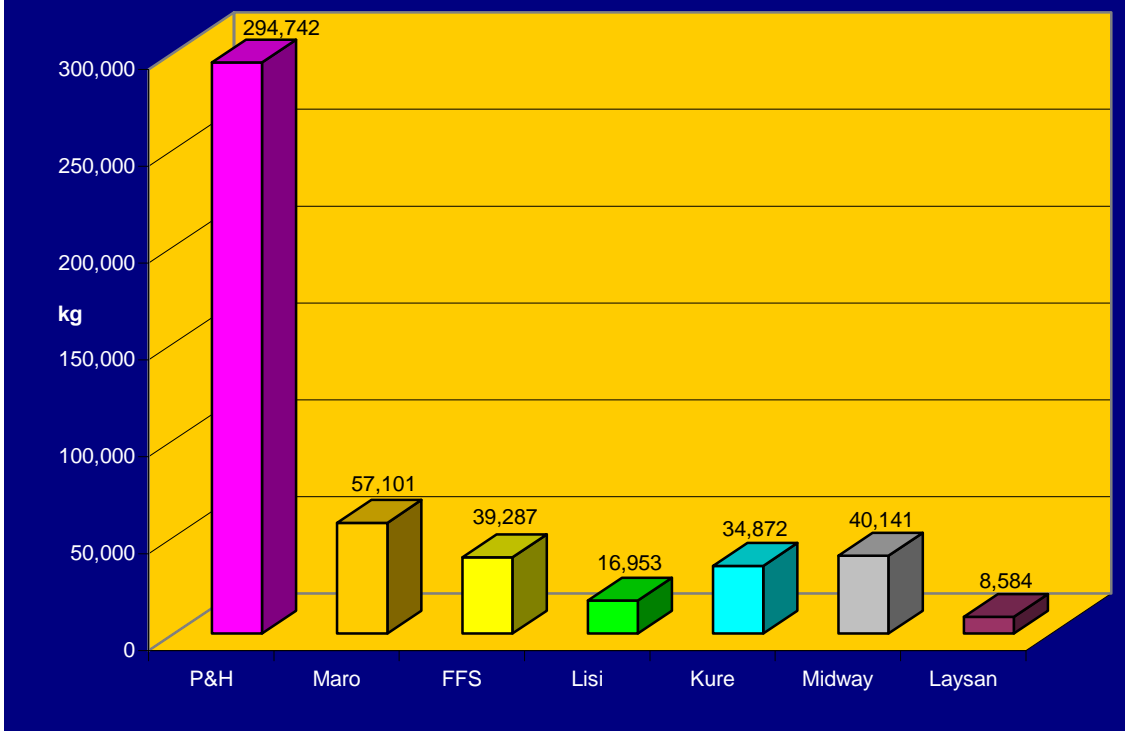
	Land Debris (kg)	Reef tow/swim(kg)	HERZ (kg)	Total (kg)
Kure Atoll	1727	168	324	2219
PHR	1407	12752	122	14281
Maro Reef	-	10361	-	10361
FFS	2120	15673	-	17793
Lisianski Island	1170	-	-	1170
Midway Atoll	4899	-	-	4899
Laysan Island	1084	-	-	1084

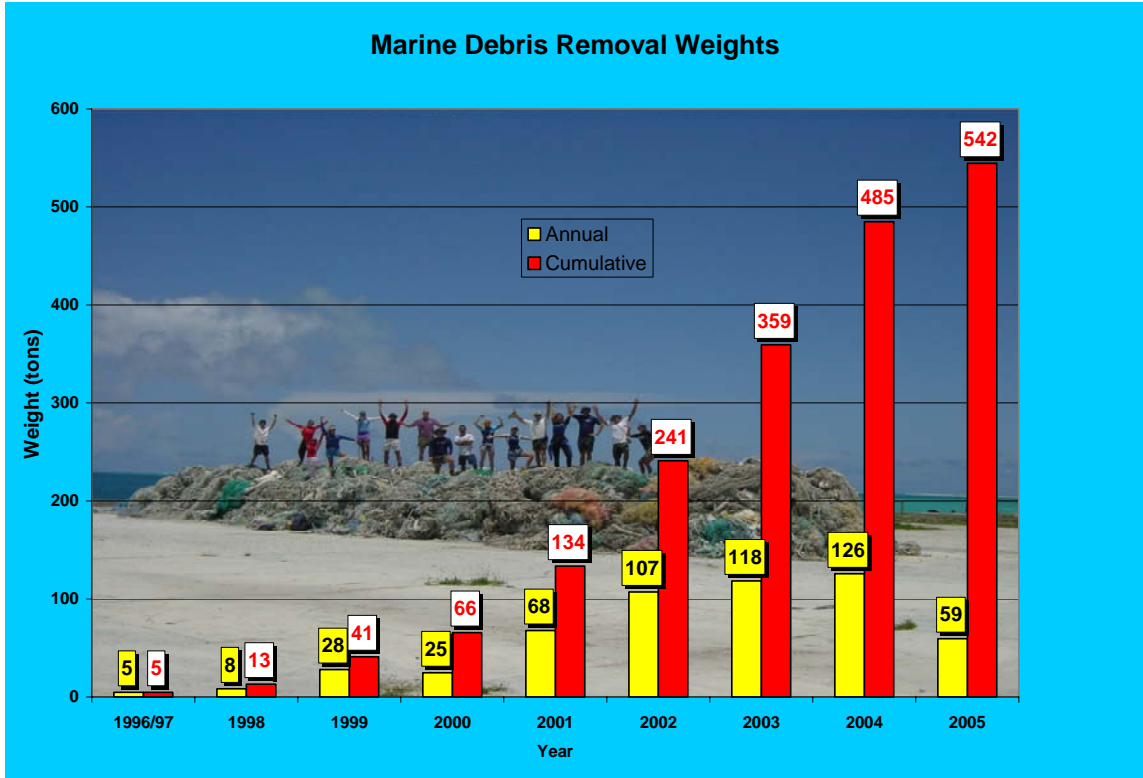
Total Weight 2005: 51,807 kg 51.8 metric tons
Total Weight 1996-2005: 491,680 kg 491.7 metric tons

2005 Debris Removed by Location by Method



Marine Debris Totals by Weight 1996-2005





CREC Marine Debris Divers and M/V Freebird crew from the 2005 French Frigate Shoals marine debris cruise.

MARINE DEBRIS COOPERATIVE PARTNERS

NOAA Fisheries, Pacific Islands Fisheries Science Center, Coral Reef Ecosystem Division
NOAA Fisheries, Pacific Islands Fisheries Science Center, Protected Species Division
JIMAR (Joint Institute of Marine and Atmospheric Research)
NOAA Coral Reef Conservation Program
NOAA Fisheries, Pacific Islands Regional Office
Western Pacific Regional Fishery Management Council
NOAA National Ocean Service
NOS Hawaii Humpback Whale National Marine Sanctuary
NOS NWHI Ecological Reserve
NOS National Marine Sanctuaries Maritime Heritage Program
US Fish and Wildlife Service
US Coast Guard
US Navy
US Department of State
University of Hawaii Sea Grant College Program
Hawaii State Department of Land and Natural Resources (DLNR)
Hawaii State Department of Business Economic Development and Tourism (DBEDT)
City and County of Honolulu
Schnitzer Steel Hawaii Corp. (formerly Hawaii Metals Recycling, Inc.)
Convanta Energy
Horizon Waste Services, Inc.
Hawaii Coastal Zone Management Program
Hawaii Audubon Society
The Ocean Conservancy
Hawaii Ocean Safety Team
Natural Resource Consultants, Inc.
Ocean Futures Society

Russell Brainard, Ph.D.
NOAA Fisheries
Pacific Islands Fisheries
Science Center
Chief, Coral Reef Ecosystem Division
Rusty.Brainard@noaa.gov
(808)592-7011