

Plastic, Plastic Everywhere

Newsletter of the [Algalita Research Foundation](#) 6sep00

**North Pacific Central Gyre 400N 1450W .
Wednesday, Sept. 6, 2000**

Plastic Particles were collected in each and every trawl during ORV Alguita's 6000 mile transect across the North Pacific Central Gyre. The surface layer contained alarming amounts of plastic products, tons of drifting nets, plastic bags, packing straps, and common household items like soap and deodorant bottles. A soup of plastic fragments was seen in the water column every

time we dove to visually confirm our findings at the end of a trawl. A suspected container spill of plastic bags covered more than 10 miles of the center of the gyre. This was a sad confirmation of last year's survey results which found six pounds of plastic for every pound of plankton in our trawls. These processed petroleum products may remain in the ocean for hundreds of years, and will continue to accumulate without intervention and action.

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An Epic 6000 Mile Voyage to Evaluate the Health of Our Ocean

We left Long Beach on July 20, destined for our presentation at the 4th International Marine Debris Conference on Derelict Fishing Gear at the Honolulu Convention Center. During this first 2500 mile leg, we sampled about every 100 miles on the way to Honolulu. Our participation in the Conference included setting up a booth that displayed the results of our 1999 Gyre Survey which found 6 times more plastic than plankton by weight in our surface trawls. We gave out bound booklets with background information on our "Biomass Comparison of Neustonic Plastic and Plankton," co-authored by AMRF Founder, Captain Charles Moore and Shelly Moore, Steve Weisberg and Molly Leecaster of the Southern California Coastal Water Research Project. We had many visitors to our booth, most notably Dr. Anthony Andrady, who is doing work on the breakdown of plastics in the marine environment. We agreed to have ORV Alguita do a special series of trawls for Dr. Andrady when she reached the Gyre on our return trip. We trawled simultaneously on the surface and at the thermocline to see if plastic was accumulating at the point where the ocean's density increases due to a rapid temperature change. Dr. Andrady agreed to later do spectroscopic analysis of the plastic in our samples to obtain more information on its origin and type.

Big Downer in the High: Sailing A Sea of Plastic Bags

The low point of our 6000 mile voyage to the North Pacific High was the discovery of an alarmingly large number of plastic bags in the center of the North Pacific Central Gyre. Soon after sunrise on September 7, in Latitude 38° 56'N, Longitude 142° 37'W. We began seeing plastic bags of several sizes, destined for retailers all over North America, colorfully printed with names, addresses, and logos of intended stores, including Sears, Bristol Farms, The Baby Store, El Pollo Loco, Fred Meyer and most common Taco Bell "Chalupa" bags. Bags were recovered and observed floating semi-submerged over more than 10 miles of the sea's surface. These plastic bags were "T-Shirt" bags, named for their two convenient hand-hold holes. T-shirt bags of this type were first test marketed and introduced in the United States in 1979, and are the reason behind that familiar moral question "Paper or Plastic?" posed to shoppers everywhere for the past two decades. The bags we recovered appeared to be relatively new in the environment, with little fouling, few wrinkles, and little to indicate that they had begun to break down. One very large "Mother Bag" was found, possibly another indication that we had discovered a lost shipment of bags that may have fallen overboard while being transported from the manufacturing and printing location - likely in Asia - enroute to stores all the United States.. We traveled for over 10 miles before the concentration of floating plastic bags began to decrease. One 30 minute visual survey looking only off our port side out to 70 meters documented 49 plastic bags over a 3 mile transect. We wondered if we had discovered the "Exxon Valdez" of plastic bag spills, right in the center of the most remote portion of the Pacific Ocean?

Background: Tar Balls vs Plastic

ORV Alguita's North Pacific Central Gyre 2000 Survey observed only minor oil contamination in our samples. Tiny spots of oil were occasionally observed staining the Manta trawl neuston net, but only a few petroleum droplets were observed in any sample collected. Distribution of tar balls on the surface of the ocean had been a major topic of concern for the Coast Guard in the 1970's. The final years of the "Ocean Station" program were used to conduct systematic tows to document the increase in tar ball concentrations that was being seen worldwide. Dramatic oil disasters in the 1960's and the 1970's, culminating with the Exxon Valdez oil spill, (possibly more than any scientific evidence about chronic oil sources) encouraged Congress and the international maritime community to begin to take action to address the problem of petrochemicals accumulating in the ocean. Chronic causes of oil contamination, including unregulated tank washing and other intentional discharges were eventually discontinued.

The tar ball problem in the North Central Pacific appears to be a success story which may provide a useful model for formulating strategies to address the widespread accumulation of plastic in the marine environment. Systematic reporting of lost shipping containers and abandoned fishing gear, and potential penalties for the loss of processed petrochemical products and other persistent materials may be possible paths to reducing some sources of persistent plastic fragments in the world's seas. Any ultimate solution, however will have to come from the plastic manufacturers themselves, as no amount of policing will stop plastic input to the marine environment. New, biodegradable and photodegradable plastics are needed to stop and eventually reduce the accumulation.

Despite the fact that disposal of plastic trash from ships has been forbidden by MARPOL V since

1986, and contrary to common sense, there appear to be many areas where the amount of plastic floating on the sea's surface actually is greater, the farther away you are from land. Who would have believed that the middle of the ocean, thousands of miles from the nearest source, is filled with persistent plastic debris of every description? Not all of these processed petrochemical products are released intentionally as garbage from ships or arrive from shore based sources. Certainly some plastic is from spilled cargos, resulting when 40 foot long shipping containers are lost over the side of ships at sea.

There is as yet no formal international reporting requirement to report the location of these large and dangerous derelict shipping containers, which may pose navigation threats to vessels, may contain hazardous materials and petrochemicals, and may certainly contain plastic products that can remain floating in the surface layers of the oceans for hundreds of years.

A Constant Contaminant

Plastic particles were observed in every trawl sample taken. Broken down plastic particles that remain in the ocean's surface layer appear to be slightly positively buoyant, resulting in greater concentrations observed when mixing forces such as wave action are decreased.

The amount of plastic in a sample often was greater than the amount of plankton observed. In some areas of the North Pacific Central Gyre, a unique ecosystem, there is more plastic present than biological life.

All of the plastic that has ever been produced still exists in some form. Much of it appears to be accumulating in the oceans. If plastic had existed when Columbus made his voyages, that plastic might still be floating in the environment. Estimated breakdown rates of hundreds or thousands of years may mean that our plastic problem will be around for a long, long time.

Sampling the Gyre

Our Mid Pacific Gyre Survey employs seven sampling methods:

1. Manta Trawl on the surface.
2. Oblique Trawl with zooplankton net sub surface.
3. Visual debris survey from deck level.
4. Visual under water with divers snorkeling and collecting fragments with small net.
5. Controlled volume observation underwater with 2 cubic meter array used to quantify drifting fragments.
6. Transect surveys using the dinghy to observe and recover plastic out to 1 km from the ORV Alguita.
7. Recovery of interesting or noteworthy floating debris spotted in transit between oceanographic stations.

Crewmembers Viewpoints

Commander Daniel Whiting graduated from the U.S. Coast Guard Academy in 1978 with a degree in Marine Science, and eventually became one of a handful of oceanographers serving in the Coast Guard. Most of his career was spent enforcing pollution prevention and environmental laws, and directing oil spill and hazardous materials incident responses. "I always felt the opportunity to do 'real science' was missing from my work with the Coast Guard. Applying science in the interest of public safety and the environment was important work, but working aboard the ORV Alguita has given me a chance to apply the scientific method in a direct, and I believe very important way. You could say I had to wait until I retired from the Coast Guard to be able to go to sea and truly fulfill my ambition of using the scientific method as a tool to help protect the Oceans."

The following is Cdr. Whiting's report:

My schedule aboard ORV Alguita would have made Benjamin Franklin proud. Each day at sea began at 0200 in the morning, with a four hour watch standing routine required to navigate and maintain the vessel. By sunrise we were often launching our first oceanographic station, with combinations of surface "Manta Ray" neuston trawls, thermocline trawls, drift arrays, towed diving observations, small boat transect surveys, surface observations, processing and recording plastic samples, and maneuvering to recover plastic debris spotted by observers stationed on ORV Alguita's deck. Interwoven with the scientific work of observing, sampling and documenting the amount of plastic present in the surface layer, was a wide variety of shipboard tasks, including minor (and sometimes major) repair work, hoisting the Captain aloft to the top of the mast to replace broken halyards, making fresh water, mechanical maintenance on the diesel engines, generator, and other essential operating systems, stowing and retrieving equipment, setting sails and securing unused sails, pumping and bailing water from the bottom of the bilges, household cleaning jobs, cooking, and the thousand other tasks needed to keep the vessel ship shape and on course. Afternoons were often spent sailing to our next oceanographic station and spotting plastic debris along the route, stopping to maneuver and recover interesting or noteworthy items of plastic.

The ORV Alguita is not the glamorous, sexy science of made for TV hunts for sunken ships. This is the real thing, science in the raw: smelly, dangerous, and very demanding. No multi-billion dollar government think-tank spent vast amounts of public resources to decide to go where few researchers have ever bothered to sail. The warm cocoon of academic bureaucracy in no way encumbers this type of scientific endeavor. This is real people, putting their lives and fortunes on the line to go farther out to sea and report back direct observations from the most distant and remote reaches of the central oceans, far from any direct source of human impact. The crew coined the term "Gonzo Science" as the Captain repeatedly was towed behind the ORV Alguita to dive below the surface and document the types of plastic materials that could not be seen from the surface. Towed diving resembled the scene from the

movie "Water World," when Kevin Costner dives into the ocean to offer himself as bait for a waiting sea monster. Fortunately, only the nightmare of plastic breakdown particles waited to greet the Captain as he dove repeatedly to recover subsurface plastic debris.

Tony Nichols:

The circle of life has a new component. Unwelcome and introduced by man, plastic is permanent and must be dealt with! As I worked the trawls on *Alguita* and examined their contents I was frequently amazed by the variety of life in the neustonic plankton. Many organisms were beyond my imagination. The focus however was on plastic; particles, pieces, and whole objects were collected. My mind jumped to the horrible possibilities these symbolized. A sea lion with a net around its neck, dead sea turtles strangled by a baggie they ate, an albatross with a belly full of pellets. Worst yet: my beloved baleen whales with mouth agape to scoop the krill. How much plastic was contained in the TONS of water they filtered daily? I see it here, it must be there.

A combination of experience brought me to the deck of *Alguita*. The past seven years as a whale watching docent in Newport Beach gave me the opportunity to share my love of nature with tourists, schoolchildren, and anyone within earshot. The Gray Whale's annual migration was the catalyst and the American Cetacean Society's WHALE WATCH program the stage. This voyage seemingly had more in common with the portion of my resume from the early 1990's which included many deliveries of racing sailboats from Mexico, Hawaii, etc. It is my love of the sea that brings me aboard.

Here resides Captain Charlie Moore, the DEBRIS AVENGER. His mission is science to reinforce the theory of an emerging menace: marine debris and its abundance. The threat was to more than the charismatic animals conjured up in my mind, mixed in with the minute plastic fragments were jellyfish, shrimp, and other zooplankton. Whatever part of the food chain that was dependent on this pelagic soup got plastic with the menu. ORV *Alguita*'s statement must be heard. The boundless energy of Cpt. Moore and the ALGALITA foundation is well applied. I tried to help.

Even the most committed need encouragement. During our stay in Hawaii we had innumerable compliments. The tourist charters and fisherman all recounted "the ugly crap everywhere" and wished us luck. Little could they imagine our need for a BARGE if we had retrieved every net, float, and plastic piece we saw in the Gyre. Having seen Gray Whales entangled in nets and trailing fishing gear, I must personally apologize for not doing the aforementioned. Nature has shown her adaptability by creating ecosystems around the flotsam. Barnacles, crabs and fish use this for shelter. Excuse my optimism! I should describe the beautiful Red Phalarope that just landed at the debris pile. While picking at the floating buffet he will no doubt eat something indigestible. Sorry little bird, *Alguita* is trying to stop the fouling of your waters. Give us time and hope.

Javier Santiago, an oceanographer from the Autonomous University of Baja California, Ensenada,

Mexico:

We are altering the thin but extensive ocean-atmosphere interface in such a way that threatens many of the living creatures of the world.

The dead end of plastic is not reached for many years, which results in an unbalance between production and degradation, in fact there is no definition of plastic's dead end, since the degradation processes of plastic are uncertain. What we know, unfortunately is that plastics are more persistent in sea water than in air.

The distance between the damage caused by this kind of debris and the possible solution and recovery of the sea's environment is far too long. We need to focus our efforts on education, recycling and on the search for new polymers more friendly to the environment.

"It is a sad discovery that urgently forces us to do something about it".

Chris Thompson, a commercial organic farmer from Santa Barbara.

As a supplier of Alguita's previous voyages, I signed on as a crew member for the return portion of the Pacific Gyre survey of Aug. Sept. 2000. This was the heart of the project, to actually reach the center of the Gyre to sample and retrieve items somewhere between Hawaii and California. Although I have little experience being at sea, I have a great concern regarding the environmental health of our planet. I've been practicing organic agriculture for 25 years and monitoring wilderness sites in the National Forest. So why not extend my practices into the Ocean's health?

The Ocean Research Vessel Alguita is a fantastic ship! She was designed specifically as a research platform that is stable in moderate seas, and equipped with a remarkable variety of tools. Once the new crew had assembled in Hawaii, we headed out to our objective.

The Pacific Gyre is as Capt. Moore describes as " a desert in the middle of the Ocean." In it's center, the normally rough sea is calm, smooth, and with very little wind. The clouds are far off and there is the feeling of endless space because of the High Pressure Cell centered there. Here, far from any point source of pollution, there is a remarkable concentration of debris .As I sat on the deck observing the surrounding sea, it was easy to spot abandoned fishing floats, discarded nets, bits of floating plastic, semi-submerged plastic sheets, old ropes, a bamboo pole, and lots of Styrofoam fragments.

At one point we started to retrieve unused plastic shopping bags. Then we came across a large plastic bale wrapping and suddenly we were surrounded by countless more unused bags! This was possibly a spill of the type that can happen when a container ship loses part of it's cargo. In all the vastness of our travels, when I was on deck, I saw plastic fragments and discarded items go by on a regular basis. This, in conjunction with the tiny pieces that our nets brought in during daily trawls, was very

disturbing! I couldn't help but imagine the huge scope and concentrations of the debris we were seeing. It was not only near the coast, where I have often observed plastic trash wash up on the beach, but all the way across to here with the heaviest concentrations " in the middle of nowhere!"

As a crew, we shared the ups and downs of our discoveries. We worked together, and as we performed the multitude of tasks that are required for a successful voyage, we shared our feelings on the enlightenment each of us has received. Although our ship took us there and back, she suffered the wear and tear of so much use. By the end of the voyage, nearly all of our onboard systems were compromised. It is a testimony of the dedication of Capt. Charles Moore and his Alguita in the pursuit of knowledge of our Oceans health!

In conclusion, we must take immediate measures to prevent plastic from entering the sea. We must put an end to plastics negative effect on the marine environment as it breaks down. We are asking too much of our Oceans to deal with plastic on it's own.

About Algalita Marine Research Foundation

Algalita Marine Research Foundation's (AMRF's) mission is to restore and preserve near-shore and offshore marine environments. We either do the work ourselves, or help others achieve these ends. AMRF is a doing foundation. Whether we're helping researchers gather data for their studies, doing our own studies or implementing programs based on proven research, we do. After the findings are in we keep on doing, by disseminating information to governmental agencies, legislators, industries, organizations, individualsanyone who can help restore the health of our marine environment.

AMRF is proactive, not reactive. Always with the big picture in mind, we evaluate trends, keep on top of recent findings and technologies and then decide what we can do ...what part we can play... In preserving, preventing further harm, or remediating our near-shore and offshore environment. Our mission is not short-term band-aid "end of the pipe" solutions. We are in search of long term, sustainable solutions.

AMRF is international. We are the only research foundation in our field to have a working partnership with Mexico. The Commission for Environmental Cooperation (CEC), part of the North American Free Trade Agreement, was created to implement U.N. Goals to stop land based sources of marine pollution. Our Foundation has received funding from the CEC to test coastal water quality in 90 Mexican sites by providing a platform for Mexican researchers from the Autonomous University of Baja California. Our Founder, is U.S. Chairperson of the CEC's Monitoring and Pollution Committee.

2001 Funding Needed

Friends and Partners with the resources to support the important environmental missions of the Algalita Marine Research Foundation may provide direct support for the following categories of equipment needed to "Keep the Wind in ORV ALGUITA's Sails."

- 1 Sails
- 2 Rigging
- 3 Hydraulics Engines/Machinery
- 4 Electronic
- 5 Hull
- 6 Scientific Equipment
- 7 Field Expenses

**Contact: Director of Development: Susan Zoske,
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Membership \$25.00/yr**

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