



Plastic pollution in ocean. (photo: Surf Rider Foundation)

Science-Based Solutions Reject Boyan Slat's Approach to Rid the Ocean of Plastic

By Marcus Eriksen, EcoWatch, 03 September 15

Decades-old notions of mythical plastic islands and garbage patches invoked hundreds of cleanup schemes, like the Dutch organization “[Ocean Cleanup Project](#)’s” (OCP) 60km-wide Net Array. While the media sensationalism in the early 2000’s created plenty of public outcry, we still today battle misconceptions about the efficacy of ocean cleanup. The latest effort of OCP in the North Pacific and the subsequent public messaging warrant a reminder of the latest science on the issue and some constructive feedback moving forward.

While capture and reclamation of ocean plastics are attractively simple, and can be justified for recovering navigational hazards from lost fishing nets and line, our research has ultimately led us to believe that these types of concepts are not an effective approach to deal with [plastic pollution](#). The [5 Gyres Institute](#) with eight other colleagues conducted 24 ocean expeditions, over 100k ocean miles over seven years, producing the [first global estimate](#) of all plastics in all oceans. As a result 5 Gyres strongly advocates upstream design and policy solutions to clean up the oceans. Our history with Dutch ingenuity goes back several years.

You’ve got to love the Dutch and their marvelous technical approach to managing the ocean, with dams,

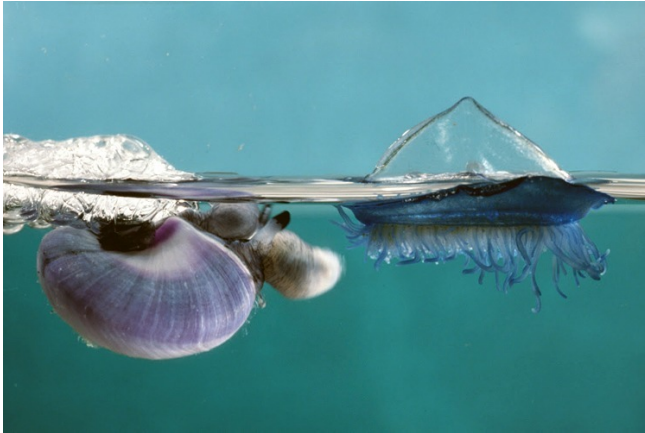
docks and dredges making their life below sea-level warm and cozy. We met one such engineer, Dutch astronaut Wubbo Johannes Ockels, back in 2010 aboard the Stad Amsterdam studying plastic in the middle of the Indian Ocean Gyre. We listened to him describe giant man-made plastic trash islands in the shape of pinwheels that would spin with the aid of large wind-driven parachutes, catching more plastic and creating more real estate for people to live on.

[Boyan Slat](#), founder of OCP, explained his alternate idea to us over dinner in Amsterdam two years later, as a 60 kilometer-wide net and boom system that passively captures drifting plastic. With wide public support he remains undeterred, despite wide criticism from the scientific community on [mechanical design](#) and ecological impacts. OCP has now completed a journey across the North Pacific with 30 vessels, called the [Mega Expedition](#). We respect and admire innovation, but feel the need to offer some important suggestions.

Ecological Impacts Must Be Thoroughly Evaluated

After our meeting in Amsterdam with OCP, then again in Long Beach, we both participated in an [online webinar](#) to discuss the efficacy of the Net Array, with its 60km sweeping arms.

OCP's feasibility study acknowledges that neutrally buoyant marine life will sink and go under the net. When asked during the webinar about the passive floating organisms that do not swim, Slat was not aware of them. The potential for "bycatch" is too great to be ignored. Organisms like the beautiful purple janthina snail, rafting barnacles and numerous jellies, like the wind-driven veleva veleva, could amount to tens of millions of organisms captured over a short time.

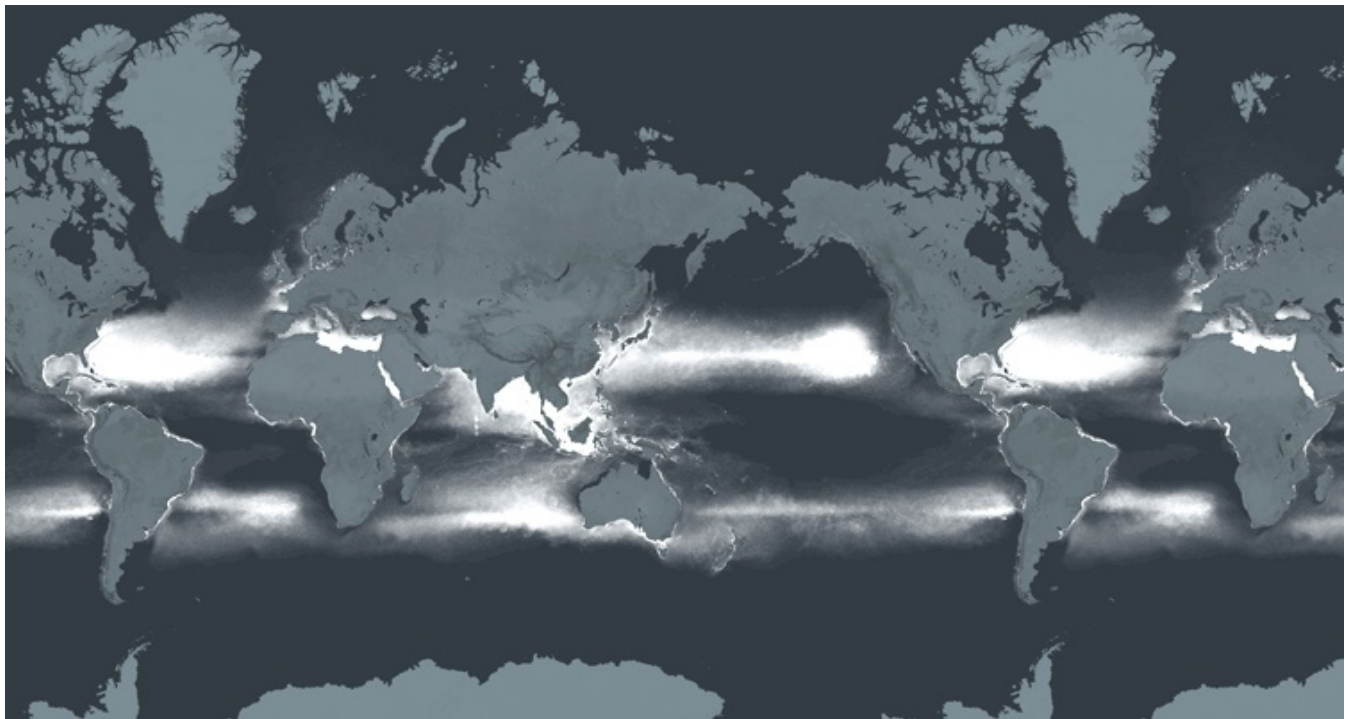


Janthina snail with a common jellyfish called "By the Wind Sailor." (photo: Peter Parks/Norbert Wu Productions)

The solution here is to produce a proper Environmental Impact Report (EIR) from an outside agency. Though we're thoroughly impressed with Slat's "big picture" thinking, he must conform to the ethical standards of any structural development of this magnitude. Knowing the full environmental impact of his project is currently missing from the OCP plan.

There are no islands of plastic, rather a smog of plastic that pervades the oceans. The last four years have produced more research publications on plastic marine pollution than the previous four decades. We understand the problem differently. Our study estimates [269K tons from 5.25 trillion particles](#) globally, of which an astounding 92 percent were particles smaller than a grain of rice, or [microplastic](#).

While an earlier global study of microplastics showed a 100x less on the sea surface than expected, supporting our understanding that the sea surface is not the final resting place. Researchers have now found microplastic and synthetic fibers frozen into ice cores, abundant on the sea floor and on every beach worldwide. Along the way it passes through the bodies of billions of organisms. We now understand that the ocean is moving our trash toward the subtropical gyres, shredding it into microplastic and then distributing it worldwide above and below the waves.



Map of 5.25 trillion plastic particles in the world's oceans. (photo: Laurent Lebreton)

Ocean Recovery Efforts are “Too Late” in the Game to Capture Most of the Trash

The OCP’s Net Array is “too late” in the pathway of trash. The science of plastic in the ocean shows us that the plastic entering the ocean is shredding rapidly into microplastic. It’s mostly small stuff out in the gyres, except for large persistent fishing gear. OCP will mostly capture fishing gear, which is designed to persist at sea (the Mega Expedition has demonstrated this).

Nations are clamoring to stop the flow of trash in their rivers, based on a recent study by [Jenna Jambeck](#) identifying the individual contributions of plastic pollution from 192 countries. Jambeck estimates 4-12 million tons of plastic washing down the world’s rivers. OCP’s recovery innovations, if brought upstream, will capture more plastic before it degrades and impacts marine life, and more than likely at less cost than the Net Array.

What’s out there now is leaving the gyres faster than we think. Drifting balls of tar give us some precedent to understand this. Tarballs were polluting beaches worldwide a lot more in the 1970s than today. As soon as international Maritime Law in the 1980’s stopped oil tankers from washing out oil residues into the sea, we witnessed a rapid decline in tarballs on beaches. The plastic out there now will not be on the surface forever, with the likely endgame being the seafloor.

It is Worthwhile Going After the Macroplastic That’s Out There Now?

Yes, the navigational hazards created by derelict fishing gear costs the maritime industry 100’s of millions of dollars annually and warrant some action. At the same time, large plastics are rapidly becoming microplastics, with horrible repercussions for marine life.

From our global estimate research we found that only 8 percent of the plastic objects in the ocean are macroplastics larger than a grain of rice. Although that 8 percent represents most of the weight of trash in the ocean, more than 70 percent of it is derelict fishing gear (lost nets, line and buoys). It’s useful to capture what’s out there before it becomes microplastics or damages vessels.

At the 2015 G7 meeting in Germany, plastic marine pollution solutions were [put on the table](#), including [Fishing for Litter](#) as the only viable ocean cleanup program, and described as “a useful last option in the

hierarchy, but can only address certain types of marine litter.”

When Slat and I had our webinar last summer I asked him at the very end, “Of the \$2 million you’ve raised so far, would you consider funding a small incentivized recovery program, like Fishing for Litter in the North Pacific to see if fishermen could collect more trash at sea, more efficiently and cheaper, than you can?”

What we know is that similar incentivized recovery programs are proving to be successful in the North Sea and around Scotland. In Korea a \$10 incentive per 100 liter bag of trash picked up by fishermen is working. But again, this is only a temporary solution.

We advocate solutions to derelict fishing gear that create Extended Producer Responsibility—EPR, like net tagging or lease programs for fishing fleets, where nets, buoys and lines are borrowed and returned, and heavy fines if lost. Slat followed the webinar with “No.”

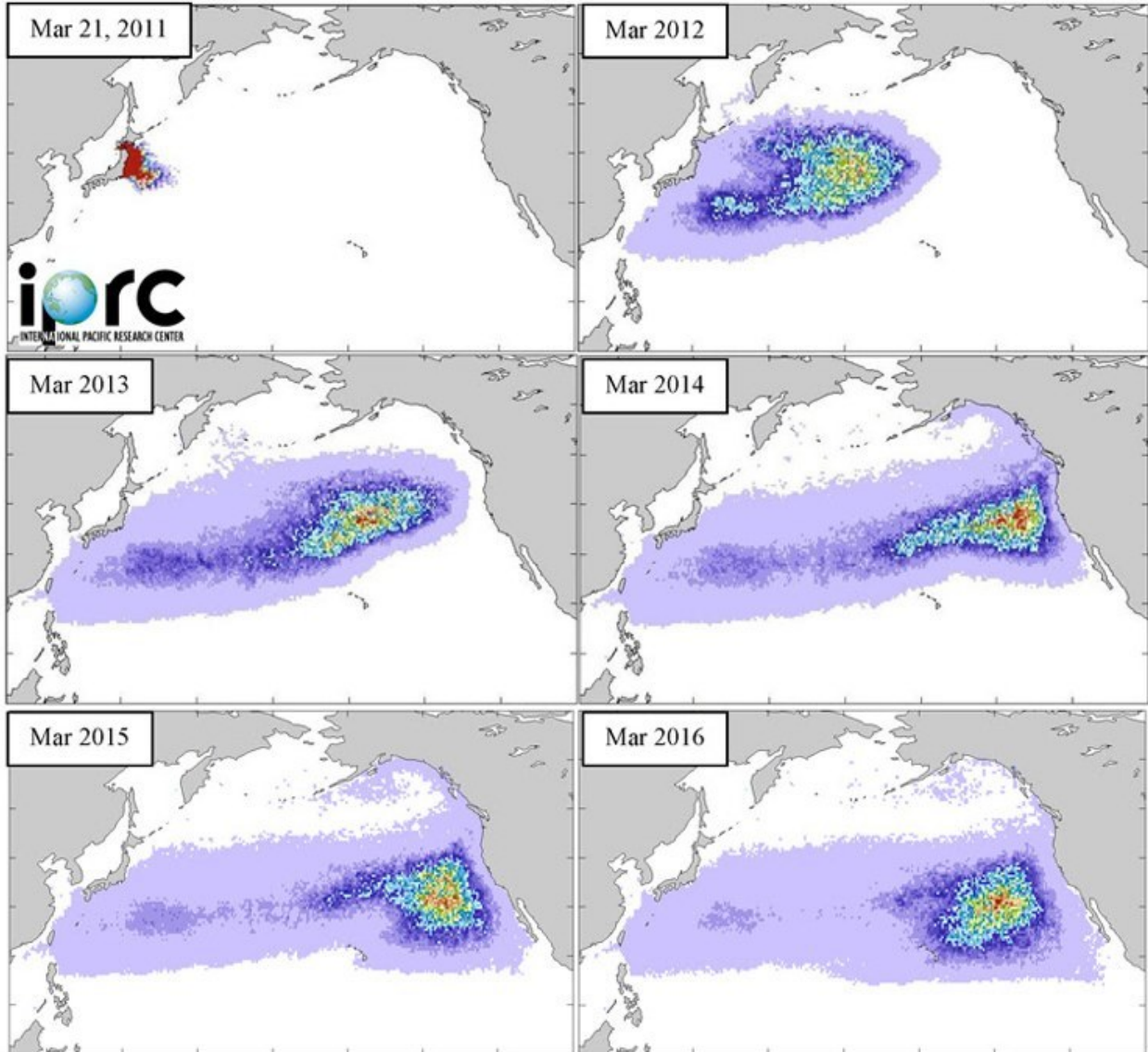
The Mega Expedition’s Claims Need to Be Revisited

All data is useful data. Based on an idea suggested by Charles Moore last year when we all sat down in Long Beach, California, Slat arranged for 30 boats to sail from Hawaii back to the west coast of North America. OCP claims it has collected more data [than all previous science work in the last 40 years](#) and will provide the most updated analysis of plastic in the world’s oceans. Both of these statements need clarification.

First, the last 40 years amounts to 11,000 samples. There is simply not enough time for 30 boats in three weeks to even come close to match this. Second, this is not a global analysis. It is a snapshot of the ocean in one place for, one month, in one year, and is heavily biased by the 2011 Japanese Tsunami.

OCP is surveying the one place in the ocean where oceanographer Nikolai Maximenko has predicted the debris field from the 2011 Japanese Tsunami now resides. OCP is measuring the effects of a catastrophic event—a plastic pollution anomaly.

When 5 Gyres and [Algalita](#) teamed up to sail from Tokyo to Hawaii in 2012, we studied the sub-surface debris field of tsunami debris, and found plenty of it. Thanks to modeling work done by the [IPRC](#), we knew very well that by 2015-2016 all of what we saw would be in the accumulation zone between Hawaii and California, where the Mega Expedition recently surveyed.



2011 Tsunami debris movement mapping. (photo: International Pacific Research Center)

The one significant scientific contribution that OCP can make is to compare the 2015 Mega Expedition snapshot data to all previous data in the same region to see how early levels of plastic marine pollution compare to the catastrophic event that was just recently sampled.

Constructive Suggestions for Ocean Cleanup Project:

1. Consider moving the Net Array upstream to capture trash before it fragments. Many countries around the world are deploying structures of all kinds to catch trash downstream, from nets to waterwheels, with the last stop at river mouths. OCP could contribute their engineering expertise to the growing industry designing systems to tackle waste upstream.

2. OCP must produce a thorough environmental impact statement. There is the potential for the Net Array to capture significant bycatch, therefore a thorough environmental impact statement from an outside agency is necessary.

3. Examine alternatives. It would be a cost effective exercise to support an incentivized program for fisherman to recover plastic pollution in the region where OCP plans to deploy the Net Array. It may prove to do a better job. It is likely that Hawaiian fisherman would gladly collect derelict fishing gear if given \$1 euro/kilo, which is a fraction of OCP's \$4.5 euro/kilo anticipated cost/benefit of the net. It's worth a try. Also, consider supporting a [net](#)



[lease program](#) with a commercial fishing fleet. Because derelict fishing gear is the most abundant and most damaging to marine life and ocean navigation, this upstream solution is long-term and only beginning to be implemented.

4. Support design change and EPR. Consider supporting other upstream solutions, like EPR and product design, in order to reduce the trash load heading downriver. One of our Dutch heroes are the [Plastic Soup Foundation](#), which were the first to campaign for the removal of plastic [microbeads](#) from consumer products.

We want to encourage innovation from people like Boyan Slat, but with the guidance of good, open-minded, pragmatic science. What we know about the problem has changed drastically since OCP first proposed the Net Array. We believe that the public will support a shift in priorities if presented well and reflects wide scientific agreement and collaboration. Willingness to change course with new information is admirable, and I think OCP's funders will appreciate that.

In the meantime, we welcome a dialogue, even another [public webinar](#) like the one we had last year to address these concerns.