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A Public Perception of our Ocean

BY SIMON BOXALL

As educators, we spend much of our time working with students explaining the complexities of the ocean system. Many of us work with schools to encourage young budding scientists to head seaward, we deliver public lectures for the science-hungry masses, and present ocean-related stories in the media. These aspects of our role as science educators have been covered in recent years in my humble pages of this august journal, but what has become clear to me is a public misconception of our ocean. This is partly due to a lack of appreciation of its enormity and a misguided belief that humankind has everything under control.

A couple of years ago, I had to deal with a *Sense About Science* review in which Nicole "Snooki" Polizzi (an American reality show personality for those, like me, not in the know) came up with the statement: *"I don't really like the beach. I hate sharks, and the water's all whale sperm. That's why the ocean's salty."* Evidently being well informed is not a precondition to fame or fortune. My comment on this first pointed out how many amorous whales one would need to add 35 parts-per-thousand whale sperm to the 1.3 billion cubic kilometers of seawater on our planet, and then set the record straight on the true reason. Her statement was up there with (in relation to the 2004 Indonesian tsunami) "*why can't science prevent earthquakes—do we not have really strong glues that could hold the tectonic plates together*" and (in relation to the Gulf of Mexico Deepwater Horizon oil spill) *"why can't we just nuke the oil well shut?"* Both were questions asked of me by interviewers on television, possibly expressing a wider public thought. The first would beg the question that even if we could, which we can't, the effect of stopping plate movement does not bear thinking about. The second? Well, I think I would rather go with the slightly lesser evil of the oil spill in terms of the environmental impact. These odd ideas all arise from a misconception of how vast and inaccessible our ocean is.

An understanding of this immensity is clear to any scientist who has spent time at sea, but it is not at all obvious to the wider public whose main interaction might be a day on a beach. A few years ago, I was on a schooner sailing across the Greenland Sea as a part of an ongoing Science and Arts program called Cape Farewell (www.capefarewell.com). We hit a problem with drift ice, which meant having to travel around the substantive ice flows in September in force 8/9 winds. After five days at sea, with icebergs and rough seas, the artists and film crew on board came to see me. The skipper, a robust and weathered Dutchman, was a man of few words and wasn't forthcoming about the status of the journey. The first question from the seafaring novices was "how long would it take a rescue helicopter to reach us in the [unlikely] event of hitting an iceberg?" Once I explained that the limited range of helicopters ruled out such a rescue, the second question was "how long would it take a ship to reach us?" Having seen that they were expecting an answer in terms of hours rather than days (which was the reality of the situation), I could see their concern grow as the schooner shot past another significant chunk of ice 30 m off its starboard side. We did find land eventually and the artists relinquished their seasickness buckets for the first hearty breakfast in almost a week. What they learned was that we have not tamed our planet, nor can we access every part of it at the drop of a hat—it took a journey such as the one they had experienced to understand that.

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In the ocean there is just you, your ship, and 1.3 billion cubic kilometers of water. *Photo courtesy of Cape Farewell*

This whole issue came to a head for me in March 2014 with the tragic loss of all hands aboard Malaysian Flight MH370 in the Indian Ocean. The story made news headlines for months across the globe, and at the time of writing is still ongoing.

The disappearance of the plane highlighted the number of myths and misconceptions that people have. To begin with, I admit to being one of those who naively thought that all aircraft are tracked while they are in the air. As a regular air traveler, I found it quite disconcerting that this is clearly not the case. It took some time for the authorities to realize that a plane had gone missing and the likely location was vast—an ocean.

Misconception number two was that the spy in the sky is watching you. In any good spy film, the suited Pentagon analyst hits a button and a satellite zooms into place to reveal that Bond is reading the June issue of *Oceanography*. In the extensive media coverage I was subsequently engaged in, there was a wide belief that a satellite must have seen the plane and observed the crash, and hence we should be able to determine where the plane fell into the sea. The middle of the Southern Indian Ocean is not a political or security high priority for geostationary satellites, and even if it were, the resolution is not up to the "James Bond" standard. Add to that cloud cover, night/day issues, and the chance of an orbiting satellite being in the region at the right time, and it becomes clear that there is more chance of a lottery win than a successful find. The reality of satellite observation is a boon for science and can provide a Google Earth image of our car in the driveway sometime over the past three years, but beyond that there are severe limits.

The next problem was that each satellite image seemed to show bits of plane wreckage in the ocean. Every day new revelations were released of a wing, a seat, a piece of paper…the list went on. Though many of these observations actually showed breaking waves from the prevailing storms, they highlighted the fact that garbage in the ocean is not limited to the North Pacific Gyre but rather predominates across our seas. Whether it be a container washed off the side of a vessel during a storm or debris washed into the sea down our rivers, we are having a significant impact on even the most remote areas of planet Earth. None of the sightings, it transpired, were from the missing plane.

Then it came to the search. Surely a Boeing 777 would be easy to find—it is huge after all. On an airport runway it is huge. On a landscape it is large. On the ocean it is tiny. Beneath the ocean it is invisible. There was no real concept that the initial search area was the size of North America and the search tools were

about the same as five people on bicycles with a pair of binoculars between them. Worse than that, the search areas were days away by ship, hours away by plane, and, as in the Cape Farewell story, beyond the reach of helicopters. There was an assumption that technology had it covered—it did not, or rather could not. The ingenuity of science was to use the Doppler shift of the Inmarsat signal from the plane's engines to reduce the search area to the size of Texas—though this bit of science was almost dismissed. In fact, several journalists at the time criticized Inmarsat for not releasing the information more quickly, unaware of the challenge their scientists faced and the remarkable speed with which they accomplished and peer reviewed the process to assure its authenticity.

Questions then came about the nature of the seafloor and occurrences of deep valleys and sediments on the seafloor that might hide a plane wreck. That we have better maps of the Moon's surface than of the seafloor, particularly in such remote locations, is still a mystery to the wider public (journalists and politicians included). There were, some weeks into the search, discoveries of sound signals potentially from the acoustic beacons on board the plane. Whilst the public eagerly awaited the imminent recovery of the plane, scientists around the world advised caution at this optimism. The journalists took an approach of what else could make acoustic noises in such a remote location? Well, quite apart from lots of marine life, there were numerous vessels out there on a search mission and a number of locator beacons deployed by aircraft. It again demonstrated what impact we have on our ocean, not only litter but noise as well.

The search continued with the use of the Bluefin 21 autonomous underwater vehicle—the best available tool at short notice, being both air transportable and capable of deployment from most vessels without modification. However, it was operating at the edge of its depth limit, and because it could not provide real-time imagery, it made the search more difficult in terms of analyzing potential seabed targets. The problem is that the right tools—those capable of very deep deployment and providing live data—are in general research based, a considerable distance away, require specific vessels, and are likely to be committed to research programs for some months or years to come. Contrary to popular opinion, this did become a search rather than rescue operation fairly early on in the incident, and so priorities do change, however unpopular this may be with the public.

The general assumption has been that finding a plane on the seabed should be simple. The reality is that the vastness of the ocean makes it virtually impossible, but should the impossible happen, then recovery is feasible (if expensive). It is a needle in a field of haystacks, but once we know where the needle is, we can get it out.

Does public misconception of our blue planet matter? There is a new program being launched by the Calouste Gulbenkian Foundation's UK branch called "Valuing the Ocean." It springs from awareness that the public, the media, and politicians still undervalue the one of the planet's most valuable resources—its ocean. The Foundation is also aware that while everyone owns the ocean, few take responsibility for its exploitation and welfare. I pointed out in a recent meeting with them that Earth has a population of about 7 billion on 29% of the planet, while the ocean has a population of zero—give or take the odd lone yachtsman—on the remaining 71%, and therein lies the problem. Suggest dumping a million tons of rubbish in Yellowstone National Park and there would be a public outcry—in the ocean, much less so. Yet, on these statistics we each own an amazing 186 million metric tons of ocean. This equates to a 2 m deep swimming pool of 93 square kilometers! The Foundation is among a number of organizations that are keen to raise awareness of these issues, not directly through science but indirectly via the arts and media. One slightly disconcerting comment the "Valuing the Ocean" program has is that "Science dominates decision making at the expense of public engagement; we need to make the issues human." Science, or rather the facts as we have them, must still dominate decision making. We cannot override logic and science for the sake of human perception and emotion. We must, however, engage with the human side of our work to make the wider public and decision makers aware of the scale of our ocean and its problems. Though we never want to lose emotional engagement, it is important to ensure that emotion is well informed. We need to work and actively engage with projects like "Valuing the Ocean" and not view them as unnecessary draws on our time as scientists.

In the case of MH370, the reality of the enormity of the ocean has been replaced by a growing list of implausible conspiracy theories to explain why it cannot be found. Unless we want a world informed by reality show personalities, and full of exhausted whales, we need to engage now.