Unveiling the role of Tsunami Debris on Transoceanic Invasion

On March 11th, 2011 and powerful earthquake was felt off the coast of Japan triggering a Tsunami that struck the coast of Honshu. This wall of water reached nearly 40m high and not only devastated the coastline, but also washed millions of objects out to sea. Nothing was spared from plastic bottles to entire piers. Scientists were able to track some of these debris as they were carried by ocean currents to eventually make landfall on islands across the pacific and the west coast of North America. Scientists were interested if this debris had the potential to facilitate marine invasive species, providing rafting material to aid in transoceanic introductions.

The Researchers were able to track down 634 pieces of debris originating from the tsunami. The flotsam was then carefully examined, and all organisms identified. Scientists refer to this measure as the richness, or number of species present in a defined area. What they found were highly diverse communities of organisms, most of which were not native to the areas they were found, but rather the coast of Japan where they originated. These species spanned multiple taxonomic groups with molluscs, crustaceans, sponges, fish and many more all represented. The total number of unique species reaching a staggering 289, but even this is likely an underestimate of the true number.

The data does shows that larger pieces of debris such as boats, or sections of docks tended to house a higher richness of species, either by providing more space and less competition, or providing some level of protection. Similarly earlier arrivals showed higher species richness with less time exposed to the potential threats of the open ocean. But perhaps the most amazing discovery from this article was that some species were able to survive 6 years at sea and travel over 7000km before arriving at their destination. This is 4 years longer than any previously documented rafting event. Many species were composed of multiple generations meaning that while at sea they sustained viable reproductive populations. This and overall survival demonstrate a remarkable plasticity, or adaptability, a key attribute in successful invasive species.

Marine rafting is not a new phenomenon is known to effectively transport marine invasives; providing large numbers of adult individuals, often with time to acclimate and adjust to new areas due to their slow movement speed. What is changing however, is the material that these rafts are made of. Unlike natural materials that may decay or break apart after only a short time, plastics, fiberglass, and other synthetic materials remain intact for decades or longer. Coupled with climate change increasing the frequency and severity of storms across the planet we may see more plastic debris entering our oceans increasing the risk of marine invasive species hitching rides on these robust rafts.

Original Article:

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Debris Drift: A Vector of Transoceanic Invasion

James T. Carlton et al., Tsunami-driven rafting: Transoceanic species dispersal and implications for marine biogeography.Science357 ,14021406(2017).DOI:10. 1126/science.aao1498

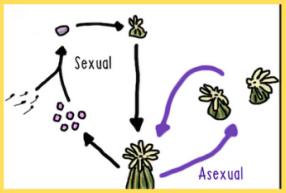
Millions of pieces of debris were washed to sea following the 2011 tsunami in Japan. Researchers tracked them down after making landfall across the pacific and identified the organisms that survived.
So what did they find?

Richness is the number species found in an area. **289** species were found on transpacific debris.

2011 Tōhoku earthquake and tsunami

Larger debris such as boats and piers housed **higher** species richness

Species survived **6 years** at sea and were able to **reproduce.**



Climate change is projected to increase the severity and frequency of storms, resulting in more debris entering our oceans

Production of plastics and other synthetic materials are rapidly increasing. These robust rafts can last longer and can travel further than natural materials, increasing the risk of transporting invasive species across oceans